Lewisville City Council

The agenda and backup items follow in one continuous document. However, to view documents individually, click on the bookmark tab at the left of the screen. A list of all documents contained in the packet should appear in a screen to the left. If it does not, click on the "Show/Hide Navigation Pane" button in the toolbar at the top of the page.

Click on the item you would like to view, and it will appear in the window to the right.

A G E N D A

LEWISVILLE CITY COUNCIL MEETING
OCTOBER 17, 2016

LEWISVILLE CITY HALL
151 WEST CHURCH STREET
LEWISVILLE, TEXAS 75057

WORKSHOP SESSION - 6:00 P.M.
REGULAR SESSION - 7:00 P.M.

Call to Order and Announce a Quorum is Present.

WORKSHOP SESSION - 6:00 P.M.

A. Discussion of the Future of Library Services presented by Carolyn Booker, Director of Library Services

B. Discussion of Regular Agenda Items and Consent Agenda Items

REGULAR SESSION - 7:00 P.M.

A. **INVOCATION:** Mayor Durham

B. **PLEDGE TO THE AMERICAN AND TEXAS FLAGS:** Councilman Daniels

C. **PROCLAMATION:** Declaring the Week of October 17-21, 2016, as "Texas Chamber of Commerce Week"

D. **PRESENTATION:** Certificate of Achievement for Planning Excellence

E. **PUBLIC HEARINGS:**

1. **Public Hearing: Consideration of a Boundary Adjustment Agreement Between the City of Lewisville and the City of Highland Village Which Adjusts Their Common Boundary Lines and Releases Certain Parcels of Land.**

ADMINISTRATIVE COMMENTS:

The Texas Local Government Code allows adjacent municipalities which desire to make mutually agreeable changes in their boundaries of areas that are less than 1,000 feet in width to do so by agreement. Section 43.063 of the Texas Local Government Code requires that two public hearings be held. Notice of the hearings were published in a newspaper of general circulation.

RECOMMENDATION:

That the City Council conduct the first public hearing considering the boundary adjustment agreement as set forth in the caption above.

PRESENTATION: - Eric Ferris, Assistant City Manager

2. Public Hearing: Consideration of a Boundary Adjustment Agreement Between the City of Lewisville and the City of Highland Village Which Adjusts Their Common Boundary Lines and Releases Certain Parcels of Land.

ADMINISTRATIVE COMMENTS:

The Texas Local Government Code allows adjacent municipalities which desire to make mutually agreeable changes in their boundaries of areas that are less than 1,000 feet in width to do so by agreement. Section 43.063 of the Texas Local Government Code requires that two public hearings be held. Notice of the hearings were published in a newspaper of general circulation.

RECOMMENDATION:

That the City Council conduct the second public hearing considering the boundary adjustment agreement as set forth in the caption above.

PRESENTATION: - Eric Ferris, Assistant City Manager

3. Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Office District (OD) to Old Town Mixed Use Two District (OTMU2), on a 0.450-Acre Tract of Land out of the J. W. King Survey, Abstract No. 696; Located on the West Side of Herod Street Approximately 200 Feet North of West Main Street, at 119 Herod Street, as Requested by 119 Herod, LLC, the Property Owner (Case No. PZ-2016-09-22).

ADMINISTRATIVE COMMENTS:

The applicant recently purchased the subject property which had been used as a residence by the previous owner until a few years ago and has since been demolished. The Old Town Master Plan recommends OTMU1 District zoning for this site. The OTMU2 District is broader in scope, allowing retail and service uses in addition to office uses, while also allowing the residential component that the OTMU1 District allows. The proximity of the site to new restaurant under construction, the adjacent bank, West Main Street and the growing entertainment district makes a strong case for rezoning to OTMU2 versus OTMU1. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of September 6, 2016.

RECOMMENDATION:

That the City Council approve the proposed ordinance as set forth in the caption above.

AVAILABLE FOR QUESTIONS: - Nika Reinecke, Director of Economic Development and Planning

4. Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Light Industrial District (LI) Zoning to Old Town Mixed Use Two District (OTMU2) Zoning, on 0.2132 Acres Legally Described as Lot 5, Block A, H. D. Williams Addition, Located on the Northeast Corner of North Kealy Avenue and East Walters Street, at 308 North Kealy Avenue; as Requested by Hector Morales, on Behalf of Amy Sadeghian, Trustee of the Kamy Real Estate Trust, the Property Owner (Case No. PZ-2016-09-23).

ADMINISTRATIVE COMMENTS:

The existing residence on this property was built in 1970 and, like other parts of Old Town with residential structures, was rezoned to a commercial designation, even though it was being used as a residence. The applicant is proposing to purchase the property and would like to rezone it to OTMU2 to continue using it as a residence and be able to add a residential storage building onto the property. The request complies with the Old Town Master Plan zoning recommendations. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of October 4, 2016.

RECOMMENDATION:

That the City Council approve the proposed ordinance as set forth in the caption above.

AVAILABLE FOR QUESTIONS: - Nika Reinecke, Director of Economic Development and Planning

5. Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Light Industrial District (LI) to Old Town Mixed Use Two District (OTMU2) on 0.517 Acres Legally Described as a Portion of Lot 7, and all of Lots 8, 9 and 10, Block 7, Kealy Addition, Located on the Northwest Corner of East Church Street and Harris Street, at 219 and 231 East Church Street; as Requested by Robert Gavitt, on Behalf of Les Moore Construction Inc., the Property Owner (Case No. PZ-2016-09-24).

ADMINISTRATIVE COMMENTS:

The subject property is currently vacant. The applicant has expressed an interest in development of the property for a Domino's Pizza restaurant which will include a limited seating area. The request complies with the Old Town Master Plan zoning recommendations. The Planning and Zoning Commission recommended unanimous approval (5-0) of the zone change request at their meeting of September 20, 2016.

RECOMMENDATION:

That the City Council approve the proposed ordinance as set forth in the caption above.

AVAILABLE FOR QUESTIONS: - Nika Reinecke, Director of Economic Development and Planning

6. Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Office District (OD) to Single Family Residential District (R-7.5); on a 0.309 Acres Legally Described as Lot 3, Block E, Hivue Addition; Located on the North Side of Millican Drive Approximately 150 East of North Stemmons Freeway, at 721 Millican Drive; as Requested by Joseph Ungeheier, the Property Owner (Case No. PZ-2016-10-26).

ADMINISTRATIVE COMMENTS:

The current residence on this property was built in 1960 and the site was originally zoned Single-Family Residential (R-7.5). The property later gained a corner clip of General Business (GB) from a City-initiated zone change along the I-35E corridor. In 2000, the property was rezoned to Office District (OD) but was never redeveloped into an office use. The request for Single-Family R-7.5 is simply restoring the original zoning to the property and would allow the owner to make residential improvements to the property as allowed by city ordinances. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of October 4, 2016.

RECOMMENDATION:

That the City Council approve the proposed ordinance as set forth in the caption above.

AVAILABLE FOR QUESTIONS: - Nika Reinecke, Director of Economic Development and Planning

7. Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Agricultural Open-Space District (AO), Light Industrial District (LI) and Specific Use – Landfill Operations District (SU – Landfill Operations) to Specific Use – Landfill Operations and Accessory Uses District (SU – Landfill Operations and Accessory Uses); With Seven Associated Variances, on Approximately 470 Acres Situated in the P.O. Leary Survey, Abstract No. 974; A.J. Chowning Survey, Abstract No. 1638; P. Higgins Survey, Abstract No. 525; H. Harper Survey, Abstract No. 605; and the S. M. Hayden Survey, Abstract No. 537; Generally Located at the Southern Terminus of Huffines Boulevard and South of the Future Extension of East Corporate Drive, at 580 Huffines Boulevard; as Requested by Jason Edwards of Weaver Consultants Group, LLC on Behalf of the City of Farmers Branch and Camelot Landfill TC, LP, the Property Owners (Case No. PZ-2016-09-27).

ADMINISTRATIVE COMMENTS:

The Camelot Landfill has been owned by the City of Farmers Branch since 1978. In 2009, the City of Farmers Branch received zoning and platting approval for the current landfill. This request would expand the landfill property by approximately 120 acres with the actual landfill footprint expanding approximately 38 acres. The application also incorporates the new maximum height of the landfill not to exceed an elevation of 675 feet, which would extend the lifespan of the landfill approximately 40 years. The seven variances for consideration are: a) to allow overhead electrical lines to the existing methane gas facility and proposed temporary employee breakroom; b) to allow metal or wood sided buildings for the existing methane gas facility, proposed temporary employee breakroom and existing temporary equipment storage building; c) to allow the existing portable restrooms to remain in lieu of connecting to sanitary sewer until construction of the proposed entrance facilities and office /maintenance building are complete; d) to allow portable buildings without fixed foundations; e) to waive the interior landscaping and irrigation for temporary and permanent parking areas; f) to allow a dead end waterline that exceeds 600 linear feet until the construction of Corporate Drive; and g) to allow gravel or crushed rock in lieu of asphalt or concrete for the drive surface to access the temporary buildings and the bay doors of the proposed maintenance building. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of October 4, 2016.

RECOMMENDATION:

That the City Council approve the proposed ordinance as set forth in the caption above.

AVAILABLE FOR QUESTIONS:
- Nika Reinecke, Director of Economic Development and Planning

PRESENTATION:
- Shane Davis, Environmental Services Manager, City of Farmers Branch
- Jason Edwards, Weaver Consultants Group

8. **<u>Public Hearing:</u> Consideration of an Ordinance Granting a Zone Change Request From Light Industrial District (LI) to Warehouse District (WH); on 17.007 Acres Legally Described as Lots 1A, 1B, 1C and 2, Kealy Park Addition; Located on the East Side of North Mill Street Approximately 550 Feet South of Valley Ridge Boulevard, at 902 North Mill Street; as Requested by Robert Schneeberg of Gonzalez & Schneeberg, Engineers & Surveyors, Inc. on Behalf of Chris Holmes, Builders FirstSource, the Property Owner (Case No. PZ-2016-09-25).**

<u>ADMINISTRATIVE COMMENTS</u>:

The 17.007-acre property is located on the east side of North Mill Street, between the DCTA rail line and Prairie Creek. Three of the four existing lots owned by the applicant are developed and contain parking, buildings, lumber sheds and outside storage. The applicant is proposing to expand the current operation to incorporate the remaining parcel to accommodate the increase in demand of lumber sales and requires Warehouse zoning as a first step to accommodate the additional outside storage. The Planning and Zoning Commission recommended unanimous approval (5-0) of the zone change request at their meeting of September 20, 2016.

<u>RECOMMENDATION</u>:

That the City Council approve the proposed ordinance as set forth in the caption above.

AVAILABLE FOR <u>QUESTIONS:</u> - Nika Reinecke, Director of Economic Development and Planning

9. **<u>Public Hearing:</u> Consideration of an Ordinance Granting a Special Use Permit for a Wholesale Establishment with Outside Storage on More Than Ten Percent of the Platted Lot on 17.007 Acres Legally Described as Lots 1A, 1B, 1C and 2, Kealy Park Addition, Located on the East Side of North Mill Street Approximately 550 South of Valley Ridge Boulevard, at 902 North Mill Street; as Requested by Robert Schneeberg of Gonzalez & Schneeberg, Engineers & Surveyors, Inc. on Behalf of Chris Holmes, Builders FirstSource, the Property Owner (Case No. SUP-2016-09-09).**

ADMINISTRATIVE COMMENTS:

The 17.007-acre property is located on the east side of North Mill Street, between the DCTA rail line and Prairie Creek. The applicant is proposing to expand the current operation to incorporate an undeveloped lot into its current operations to accommodate the increase in demand of lumber sales. The SUP is required for the additional outside storage needed for the business. The SUP for expansion of the existing operation provides significant improvements to the building exterior, substantial landscaping and effective screening in addition to improved access to and from the site. On September 20, 2016, the Planning and Zoning Commission recommended unanimous approval (5-0) of the SUP.

RECOMMENDATION:

That the City Council approve the proposed ordinance and associated variance as set forth in the caption above.

AVAILABLE FOR QUESTIONS:

- Nika Reinecke, Director of Economic Development and Planning
- Robert Schneeberg, Gonzalez & Schneeberg Engineers & Surveyors, Inc.

10. Public Hearing: Consideration of Deeming Substandard a Single Family Dwelling Located at 729 Red Wing Drive, Timberbrook 4 Subdivision, Block A, Lot 2, Lewisville, Texas.

ADMINISTRATIVE COMMENTS:

On October 18, 2015, a two-alarm fire substantially damaged a single family residence located at 729 Red Wing Drive. The Building Official has determined that the structure is substandard. The Lewisville City Code requires that a public hearing be held in order for the City Council to deem the structure substandard. The owner of record is Melva J. McFerren, who is deceased. Current owners are Patricia and Patrick Malone. All required notifications have been given and procedures have been followed by the City.

RECOMMENDATION:

That the City Council deem the single family structure substandard as set forth in the caption above.

AVAILABLE FOR QUESTIONS:

- Cleve Joiner, Director of Neighborhood Services

11. <u>Public Hearing</u>: Consideration of Deeming Substandard a Single Family Dwelling Located at 401 Village Drive, Serendipity Village Subdivision Block E, Lot 1.

<u>ADMINISTRATIVE COMMENTS:</u>

On September 17, 2015, a two-alarm fire substantially damaged a single family residence located at 401 Village Drive. The Building Official has deemed the structure substandard. The Lewisville City Code requires that a public hearing be held in order for City Council to deem the structure as substandard. The owner of record is Mark Kelly. All required notifications have been given and procedures have been followed by the City.

<u>RECOMMENDATION</u>:

That the City Council deem the single family structure substandard as set forth in the caption above.

AVAILABLE FOR <u>QUESTIONS:</u> - Cleve Joiner, Director of Neighborhood Services

12. <u>Public Hearing</u>: Consideration of Deeming Substandard a Single Family Dwelling Located at 810 Foxwood Place, Serendipity Village Subdivision, Block 5, Lot 23, Lewisville, Texas.

<u>ADMINISTRATIVE COMMENTS:</u>

On November 26, 2014, a two-alarm fire substantially damaged a single family residence located at 810 Foxwood Place. The Building Official has deemed the single family structure to be substandard. The Lewisville City Code requires that a public hearing be held in order for City Council to deem the structure as substandard. The owners of record are Brad and Cara Gill and Nancy and David Koehring. All required notifications have been given and procedures have been followed by the City.

<u>RECOMMENDATION</u>:

That the City Council deem the single family structure substandard as set forth in the caption above.

AVAILABLE FOR <u>QUESTIONS:</u> - Cleve Joiner, Director of Neighborhood Services

F. **VISITORS/CITIZENS FORUM:** At this time, any person with business before the Council not scheduled on the agenda may speak to the Council. No formal action can be taken on these items at this meeting.

G. **CONSENT AGENDA:** All of the following items on the Consent Agenda are considered to be self-explanatory by the Council and will be enacted with one motion. There will be no separate discussion of these items unless a Council Member or citizen so request. For a citizen to request removal of an item, a speaker card must be filled out and submitted to the City Secretary.

13. APPROVAL OF MINUTES: City Council Minutes of the October 3, 2016, Workshop Session and Regular Session.

14. Approval of a First Amendment to Agreement By and Between City of Lewisville, Texas and City of Farmers Branch, Texas Regarding the Expansion of the Camelot Landfill.

ADMINISTRATIVE COMMENTS:

Farmers Branch requests consideration of an amendment to the existing agreement between Lewisville and Farmers Branch relating to the Camelot Landfill, which was signed on January 6, 2016. Specifically, Farmers Branch requests that in lieu of strict compliance with the tree mitigation regulations, Camelot Landfill would allow Lewisville residents free disposal of solid waste at the Landfill without charge one day per calendar month. Such rights would begin following the closure of the DFW Recycling and Disposal Facility--the landfill that currently provides this service to Lewisville residents. Farmers Branch has also requested that it be allowed to retain road escrow funds relating to the construction of Huffines Boulevard until such time as the funds are needed to pay for the construction of the Huffines Extension.

RECOMMENDATION:

That the City Council approve the First Amendment as set forth in the caption above.

15. Approval of a Resolution of the City Council of the City of Lewisville, Texas, Approving the Major Permit Amendment Application, Revised August 2016, for Camelot Landfill, TCEQ Permit No. MSW-1312B.

ADMINISTRATIVE COMMENTS:

Section 361.1231 of the Texas Health & Safety Code provides, in part, that the TCEQ may not approve an application for the issuance, amendment, or renewal of a permit that seeks to expand the area or capacity of a landfill unless the governing body of the municipality in which the landfill is located first approves by resolution or order the issuance, amendment, or renewal of the permit. Staff has reviewed the above-referenced amendment application and is satisfied that it meets the requirements of the settlement agreement entered into with the City of Farmers Branch on January 6, 2016.

RECOMMENDATION:

That the City Council adopt the proposed resolution as set forth in the caption above.

16. Approval of an Award for the Lewisville Raw Water Intake Electrical Improvements to Russell Madden, Inc., Aubrey Texas, in the Amount of $218,001; and Authorization for the City Manager to Execute the Contract.

ADMINISTRATIVE COMMENTS:

A total of fourteen (14) bid invitations were downloaded from Bidsync.com. A total of two (2) bids were received and opened September 22, 2016. This project consists of electrical improvements including the replacement of the 480-volt motor control center; installation of variable frequency drives and harmonic filters; and provisions for a docking station for the emergency generator. Funding is available in the Lewisville Intake Electrical Upgrade capital project.

RECOMMENDATION:

That the City Council approve the contract as set forth in the caption above.

17. Approval of a Wholesale Untreated Water Purchase Contract Between the City of Dallas and City of Lewisville; and Authorization for the City Manager or Her Designee to Execute the Contract.

ADMINISTRATIVE COMMENTS:

The City of Lewisville purchases both Wholesale Treated and Untreated Water from the City of Dallas. The current Untreated Water Contract will expire December 17, 2016. The contract has been negotiated between both entities and is now ready for Council approval. The contract term is for 30 years with an expiration date of December 17, 2046. The new contract extends the current available untreated water capacity to be utilized over the term of the agreement. No major modifications to the contract were made during the negotiations.

RECOMMENDATION:

That the City Council approve the contract as set forth in the caption above.

18. Approval of a Memorandum of Understanding (MOU) for an Interlocal Agreement Among the Cities of Lewisville, Highland Village, The Colony and the Town of Flower Mound for the Shared Use of 3D Scanning Devices Purchased With Grant Funds by the City of Lewisville; and Authorization for the City Manager or her Designee to Execute the Agreement.

ADMINISTRATIVE COMMENTS:

The City of Lewisville was successful in securing a Criminal Justice Grant funding of $124,364.89 for the purchase of 3D scanning devices. Part of the reason for the City securing this grant was the agreement to collaborate with other agencies on the use of this equipment. This MOU stipulates the terms and conditions associated with the collaborative effort.

RECOMMENDATION:

That the City Council approve the agreement as set forth in the caption above.

19. Approval of a Memorandum of Understanding (MOU)/Release of Liability Agreement Between the City of Lewisville and Denton County Allowing Use of Vacant Buildings; and Authorizing the Mayor to Execute the Agreement.

ADMINISTRATIVE COMMENTS:

This MOU/Release of Liability agreement allows use of vacant county buildings at 190 N. Valley Parkway for City of Lewisville police and fire training exercises, which may result in the partial or total destruction of said vacant buildings.

RECOMMENDATION:

That the City Council approve the Memorandum of Understanding/Release of Liability agreement as set forth in the caption above.

20. Approval of a Resolution for Financing by the Woodloch Health Facilities Development Corporation of a Health Facility Located Within Lewisville, Texas for Senior Care Living VII, LLC.

ADMINISTRATIVE COMMENTS:

Woodloch Health Facilities Development Corporation is proposing to issue bonds on behalf of the City of Woodloch, Texas for the development of a senior care and related facilities located on Round Grove Road in Lewisville. The facilities will be owned by Senior Care Living VII, LLC (the borrower). The bonds are issued pursuant to the Health Facilities Development Act, Chapter 221. The consent of Lewisville is required prior to financing of the facilities with bond proceeds due to the location of the project in the Lewisville city limits.

RECOMMENDATION:

That the City Council approve the proposed resolution as set forth in the caption above.

21. Approval of a Resolution Authorizing Agreements Between the City of Lewisville and Community Development Block Grant Sub-Recipients; Between the City of Lewisville and City Social Service Agency Fund Recipients; and Between the Neighborhood Services Department and the Public Services Department for FY 2016-2017; and Authorization for City Officials to Execute the Agreements.

ADMINISTRATIVE COMMENTS:

The City of Lewisville, a U.S. Department of Housing and Urban Development (HUD) Entitlement City, has submitted its 2016 Annual Action Plan as required by HUD to receive Community Development Block Grant (CDBG) funds. A contract is forthcoming from HUD for FY 2016-2017. Additional funds are allocated from the City Social Service Agency Fund. Agreements have been prepared for execution in accordance with the 2016 Annual Action Plan item that was approved by the City Council on August 1, 2016 and the FY 2016-2017 budget.

RECOMMENDATION:

That the City Council approve the resolution and authorize appropriate City officials to execute the agreements.

22. Approval of Excusing Deputy Mayor Pro Tem Vaughn From Attendance at the City Council Meetings Held on September 12th, September 19th, and October 3, 2016.

ADMINISTRATIVE COMMENTS:

Due to serious health concerns, Deputy Mayor Pro Tem Vaughn was unable to attend the September 12th, September 19th, and October 3, 2016, City Council meetings. In accordance with Section 3.02 Qualifications of the City Charter, the City Council may excuse Deputy Mayor Pro Tem Vaughn for theses absences.

RECOMMENDATION:

That the City Council excuse Deputy Mayor Pro Tem Vaughn as set forth in the caption above.

23. Acceptance of a 4.308 Acre Tract of Land in the Russell Craft Survey, Abstract No. 255; Located on the North-Bound Access Road of I-35 Between Millican Drive and Valley Ridge Boulevard; Being Donated to the City of Lewisville, Texas by Deed From TAT Lewisville I-35, LLC.

ADMINISTRATIVE COMMENTS:

The Texas Department of Transportation bought a portion of a tract of land owned by TAT Lewisville I-35 LLC (the "Owner") that fronts onto the north bound I-35 access road between Millican Drive and Valley Ridge Boulevard. The Owner wants to donate the remainder of the tract of land to the City of Lewisville.

RECOMMENDATION:

That the City Council accept the 4.308 acre tract of land to be donated to the City of Lewisville, Texas by TAT Lewisville I-35, LLC.

H. **REGULAR HEARINGS:**

24. Consideration of Two Variances to the Lewisville City Code Section 6-103 (Access Management) Regarding Deceleration Lane and Driveway Spacing Requirements Related to the La Quinta Located at 1657 South Stemmons Freeway, as Requested by Kevin Patel, Triangle Engineering, LLC, on Behalf of the Owner.

ADMINISTRATIVE COMMENTS:

The subject site is a 2.947-acre lot zoned Light Industrial (LI) within the La Quinta Addition. The property owner is proposing to build a new four-story hotel with 129 rooms at this location in full compliance with the City's hotel requirements. Texas Department of Transportation (TxDOT) has acquired right-of-way along the IH-35E frontage of this property for its future needs which caused the previous development, hotel and restaurant, to be demolished. Staff has reviewed and approved the engineering site plan for La Quinta subject to the City Council approval of the two variances: a) to waive the deceleration lane requirement along IH-35E and b) to allow driveway spacing less than 230' along IH-35E.

RECOMMENDATION:

That the City Council approve the variances as set forth in the caption above.

AVAILABLE FOR QUESTIONS: - Jeff Kelly, P.E., Assistant City Engineer
- Kevin Patel, P.E., Triangle Engineering LLC

25. Consideration of an Ordinance of the Lewisville City Council Amending Chapter 16, Utilities, Article IX, Municipal Setting Designations, of the Lewisville City Code by Repealing and Replacing Article IX in its Entirety; Providing for Severability; Providing a Penalty; Providing an Effective Date; and Declaring an Emergency.

ADMINISTRATIVE COMMENTS:

In February 2015, City Council approved Ordinance No. 4158-02-2015 regarding the process for establishing Municipal Setting Designations (MSD) on properties with contaminated groundwater. Subsequent to Council approval of this ordinance, the City received and processed two MSD applications, which were approved by Council in late 2015. Staff members involved in MSD application review determined that the process for reviewing, meeting with applicants, conducting public meetings and public hearings, and seeking Council approval for site specific MSDs needed revision to allow staff more time to conduct its review and data gathering. As a result, the ordinance has been revised to extend the timeframes associated with application review and public input. Additionally, the ordinance was revised to include additional pertinent definitions and required information to enhance staff's ability to make recommendations concerning MSD applications in the future.

RECOMMENDATION:

That the City Council consider and approve the proposed ordinance as set forth in the caption above.

I. **REPORTS**: Reports about items of community interest regarding which no action will be taken.

J. **CLOSED SESSION:** In Accordance with Texas Government Code, Subchapter D,

1. Section 551.072 (Real Estate): Property Acquisition

2. Section 551.087 (Economic Development): Deliberation Regarding Economic Development Negotiations

K. **RECONVENE** into Regular Session and Consider Action, if Any, on Items Discussed in Closed Session.

L. **ADJOURNMENT**

The City Council reserves the right to adjourn into closed session at any time during the course of this meeting to discuss any of the matters listed above, as authorized by Texas Government Code Section 551.071 (Consultation with Attorney), 551.072 (Deliberations about Real Property), 551.073 (Deliberations about Gifts and Donations), 551.074 (Personnel Matters), 551.076 (Deliberations about Security Devices) and 551.087 (Economic Development).

LEWISVILLE PUBLIC LIBRARY

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

October 2016

LIBRARY OVERVIEW

Library Vision, Mission, Purpose

Vision

A Vibrant Center for Education and Culture in Our Community.

Mission

The Lewisville Public Library delivers equal access to high quality education and technology to all ages.

Purpose

inspire reading | cultivate learning | connect people | partner for success

Accepted by the Library Board, March 2013

What is the future of the Library?

- Aspen Institute Dialogue on Public Libraries, Rising to the Challenge: Re-Envisioning Public Libraries, Washington, D.C.: The Aspen Institute, October 2014 – Link to report
- Library Staff and the Library Board have been working with the Aspen Institute's Action Guide in order to evaluate current services and develop action steps
- Community needs continue to change
  - The Lewisville Library can be at the center of these changes as a trusting and welcoming public institution
    - Provide a platform for learning, creativity and innovation
    - Help sustain the educational, economic and civic health of the community

Key assets of Public Libraries

- People
  - Librarians are actively engaged with the community and connect citizens with local and national resources as well as facilitate learning
- Place
  - The Library's public space welcomes people for a wide range of purposes – reading, learning, playing, meeting, socializing and more.
- Platform
  - A variety of tools, resources and programming can facilitate opportunities for individuals and groups

Library Facility

- 1197 W. Main Street has been the Lewisville Library's location since 1989.
- February 2017 will mark the 10 year anniversary of the Library renovation and expansion. This expansion was accomplished with 4B sales tax. No personnel were added with the expansion.

East Entrance

West Entrance (off Civic Circle)

Enjoy a Community Gathering Space

With study tables, study rooms, meeting rooms, and comfortable seating areas, the Lewisville Public Library is a hub of community activity.

- Information Desk and patron computers were recently rearranged to allow more choice for patrons, improved line of sight and improved security and customer service by moving two service desks closer together.
- Meeting room policies now allow for advance reservations.

The Library as a Place

- Funds have been allocated to expand the Bennett Program Room
  - will allow for a more flexible space for programs and more attendance
- PALS and the Library are collaborating on adding outdoor seating and a bike fixit station.
- A 16/17 action step will improve meeting rooms with the addition of mounted projectors and speakers.

Library Online Presence

http://library.cityoflewisville.com

The new website will emphasize the physical features of the Library and why citizens want to use the space, emphasizes social media, how to get involved and has improved navigation.

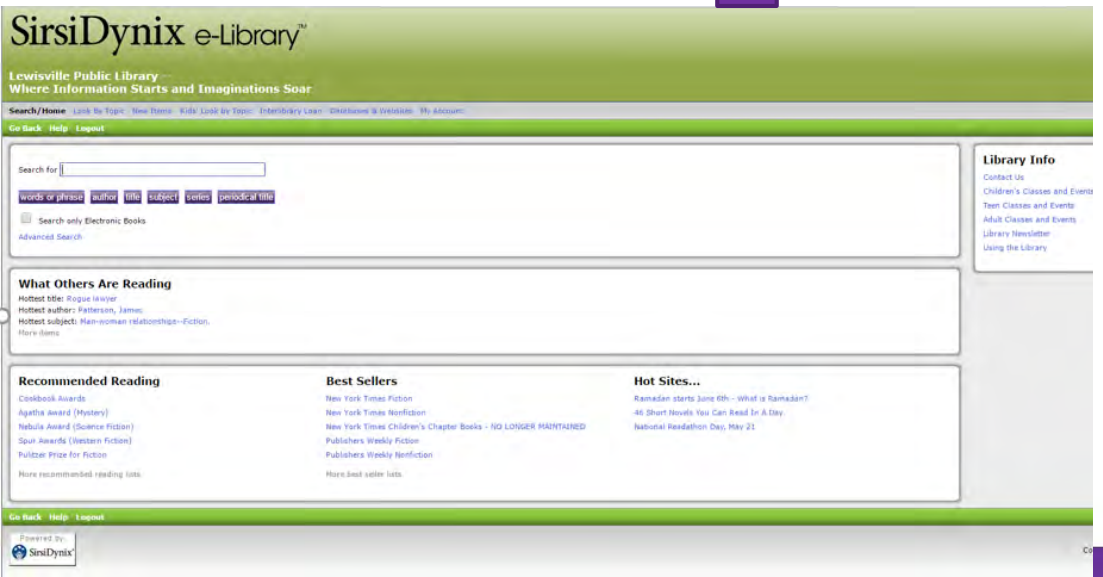
Library Online Presence

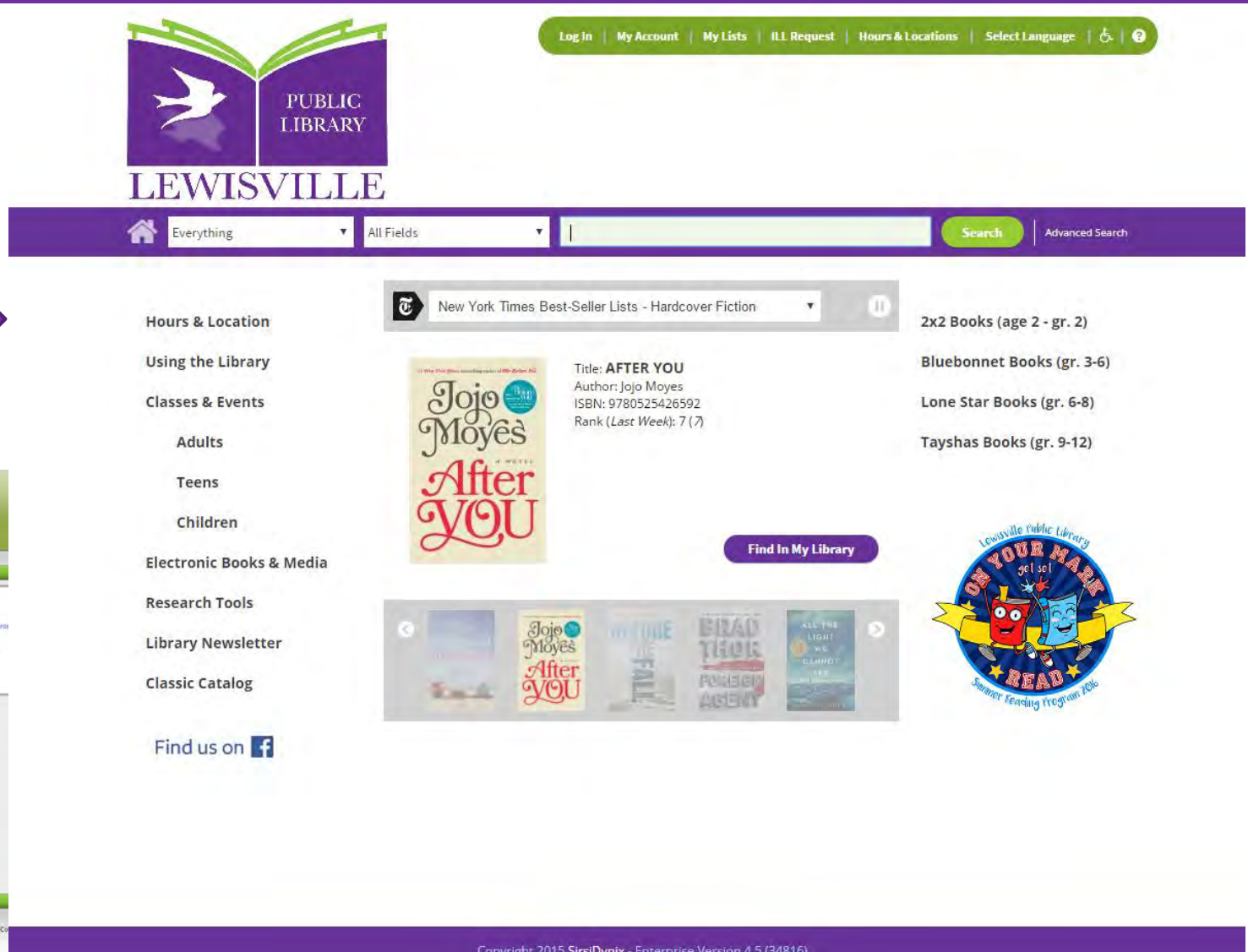
http://lewp.ent.sirsi.net

Migrated to Saas server.

Upgraded to a new catalog.

Integrated eBooks & eAudio.





Library Online Presence – FY 16/17

- Adding to the existing social media presence with Twitter and Instagram
- Improving the downloadable audiobook collection
- Digital Magazines available now through Zinio
- Building a Spanish Language ebook collection
- Marketing with Library Aware and Novelist Plus to connect readers with library books
- Exploring "Cloudlinking" with area libraries to extend our Cloudlibrary collection

Access Online Resources & Materials

- Downloadable eBooks
- Downloadable Audiobooks
- Streaming movies & music
- Digital Magazines
- Online non-credit CE courses
- Language learning
- Reading recommendations
- Test preparation
- Research & Information databases:
  - *Business, Marketing & Sales*
  - *Legal*
  - *Auto Repair*
  - *Home Improvement*
  - *Small Business*
  - *Job & Career*
  - *Health & Medicine*

TumbleBooks

NoveList®

e-audiobooks
OneClick digital
Downloadable audiobooks including popular fiction, non-fiction, history, biography and language learning.

zinio
Digital Magazines

CL
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123 SESAME STREET eBooks

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Learn a language now!

Small Business Reference Center

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Over 500 Online Continuing Education Courses
Universal CLASS

ABC CLIO WORLD geography

Legal Information Reference Center

Job & Career Accelerator from LearningExpress

ABC CLIO WORLD HISTORY
ANCIENT AND MEDIEVAL ERAS

Points of View Reference Center powered by EBSCOhost

referenceUSA from infogroup

pronunciator:

ENCYCLOPÆDIA Britannica Online

Home Improvement Reference Center

Auto Repair Reference Center

LearningExpress LIBRARY™
TEST PREP • COMPUTER SKILLS
JOB SEARCH • ONLINE LEARNING

Becoming a Maker Library

The Lewisville Makerspace will be:

- A place to develop new expertise
- A place to share and work as a team
- A place to explore and experiment
- An open environment that fosters innovation and imagination

Who are makers?

- Self-starters. Creators. Artists. Thinkers. Geeks. Crafters.

We are becoming a maker library because:

- We want to provide richer experiences
- Our community seeks social interaction and development
- Making creates alternative pathways to learning

Becoming a Maker Library

- Library staff have begun the process of integrating elements of making into library programs
- Began circulating STEM Kits. 20 kits, 10 topics
- Adding Maker Kits
- Items in Kits can also be used for outreach and library programs
- Library staff visiting area maker libraries for ideas and best practices

The Lewisville Library hopes to connect with a vibrant maker community, which will help the Library focus our maker space plans to meet the specific needs of our citizens.

Becoming a Maker Library

- After exploring the possibilities and cementing plans and the vision for a Lewisville Makerspace, the Library will develop a staffing plan, request equipment, explore funding and propose reconfigurations to the space within the Library to achieve a
  - Digital Media Lab upstairs
    - Hardware and software for digital innovation and creativity
  - Dirty Maker Space downstairs

    Equipment could include many things, including:
    - Long arm quilter, engraving machine, tools, sewing machines, soldering equipment, woodworking, crafting supplies

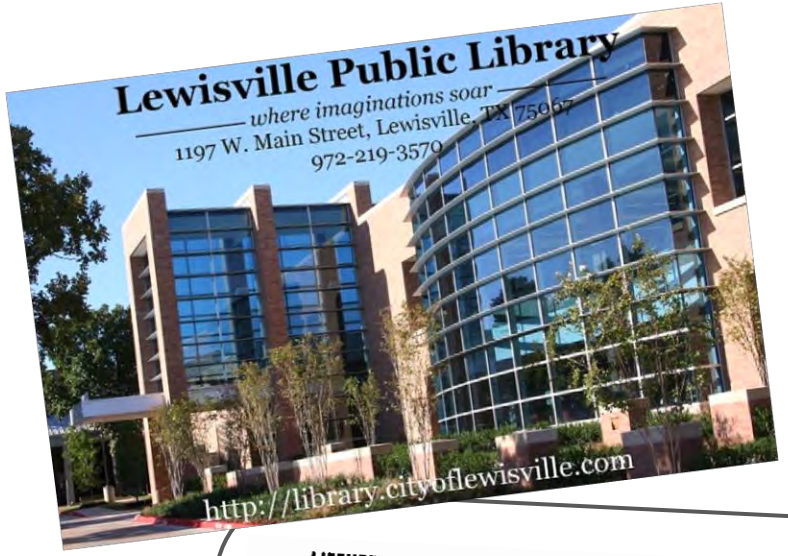
Who uses the library?

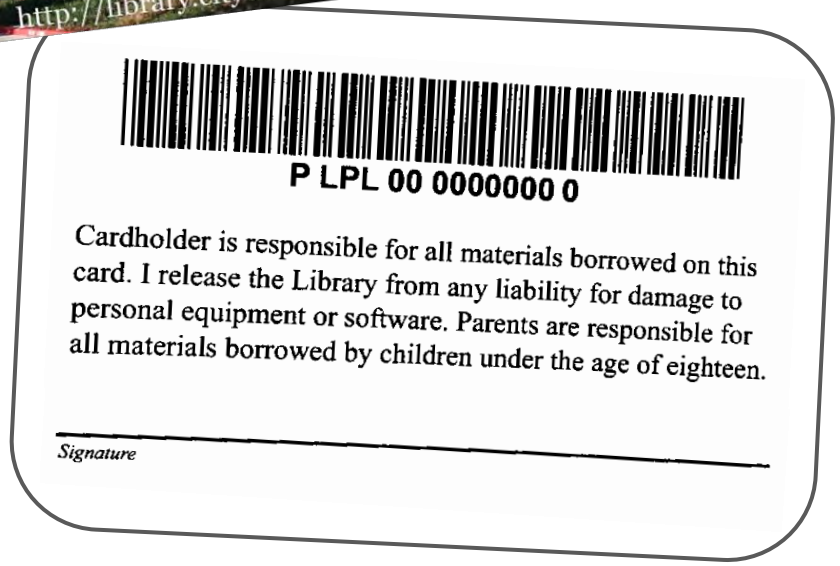
- Students
- Young Families
- Job Seekers
- Technology Users
- ESL Adults/Immigrants
- Self Employed
- Recreational Readers
- Lifelong Learners
  - And many more!

Resulting in

Discovery
Skills
Access
Enrichment
Quality of Life
Small business success
Economic Stability
Community
Creation
Communication
Economic Development
Connections
Business Success
Employment
Growth
Education
Citizenship
School success

What is the Library's reach?





- Library Active Users from July 2015- July 2016
  - To improve the Library's reach into the community:
    - Staff are participating in community events
    - A bilingual librarian will improve services to Spanish speakers in 2017
    - The Library is working to offer student library cards in partnership with LISD

New Outreach Ideas

Mobile City Hall

- Storytimes / Early Literacy Classes
- Computer classes using Library laptops
- Library card sign-up
- Pop Up Library
- Library visits to senior living centers

Entrepreneurial Center

- Librarian led classes
  - Reference USA - Industry Information
  - Reference USA -Market Research
  - Marketing with Social Media
  - Gale Legal Forms
  - Small Business Resources
- Business Book Club

Vision 2025 and the Library

- Employment Centers
  - The Library supports job seekers through training, online education, career resources, and access to computers, internet, printing, etc. This year the Library added mobile printing, improved the process for reserving meeting space, added fax and scanning services and plans to lend laptops.
- Marketing & Communications
  - The Library staff actively engage with the community through Facebook, print newsletters, the website, and other city publications. The staff take programs to the community through outreach at schools, retirement homes, events, etc.
- Sustainability
  - The Library is improving materials and programming to educate and inform Lewisville residents about sustainability. This year the Library is circulating STEM and sustainability kits.

What else is out there for the Library?

- Digital Outreach
  - Linked data, geolocation of Library Materials
- Materials Return Sorter
  - Harnesses existing RFID technology, resulting in reduction of repetitive tasks, quicker return, allows for more customer service rather than back-of-the house tasks
- Services at the Multi-generational Rec Center
  - Self-service lending of digital services and registration for a Library card
- More active play in the children's area
  - Encourages social engagement and pre-school skills

cloudLibrary™ discoveryTerminal

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Carolyn Booker, Director of Library Services

DATE: October 10, 2016

SUBJECT: **Library Update for Council**

BACKGROUND

The Lewisville Public Library was expanded in 2007 from 26,241 square feet to its current space of 77,822 square feet. The library is open 64 hours a week including evenings and weekends to provide citizens with access to materials and resources and to promoting literacy and improve the overall quality of life for citizens. During FY 2015-16, the library had over 345,000 visits and over 585,000 items were circulated through the library. Currently, there are over 60,000 library card holders.

When the library was expanded, no additional staffing was added at that time. Over the last two fiscal years, three full time staff have been added including two librarians (one bilingual) and one paraprofessional positon. Currently there are ten Librarians on staff including two Library Services Supervisors and the Director. In addition to the ten Librarians, there are seven paraprofessional support staff. Due to the number of hours of operation, the Library relies heavily on part-time employees. Currently, there are 21 part-time employees at the Library. In addition, there is an ITS System Support Specialist assigned to the Library who provides technology support and maintenance of the library's systems.

The Library is organized into four areas as described below:

Adult Services
Library Services Supervisor - Kelly Brouillard
The Adult Services Desk is located on the 2nd floor and the Information Desk is located on the 1st floor. Both are staffed by Adult Services personnel who provide research and information for adults who visit the library. In addition, they offer adult education opportunities, public computers and a computer lab, exam proctoring, and community outreach and collaboration.

Youth Services
Library Services Supervisor - Andrea Ortiz
Youth Services staff the desk located in the children's area on the 1st floor. Youth Services offer Early Literacy Programs, youth & teen classes and events, and research and information geared toward the youth. In addition, they work with the Teen Advisory Group and many teen volunteers. There are also computers available for the youth in the children's area.

Accounts Services
Account Services Supervisor - Gay Yarnell
Account Services staff the Accounts Desk which manages all of the library accounts including fines and fees, book returns and check-ins, inventory and shelving.

Technical Services
Librarian - Charissa Stewart
Technical services is responsible for the acquisitions and ordering of new materials, supplies and equipment. The division receives new collection materials and catalogs and process the materials. In addition, they manage the online library catalog and library databases.

In addition to the staff, the City is supported by the Friends of the Lewisville Library, a registered 501(c)3 nonprofit organization. The Friends support the Library through the semi-annual book sale, by managing the ongoing "Book Nook" sale, receiving donations, and other special fundraising projects. These efforts allow the Friends to provide funding for Library programs and events, summer reading program events and reading incentives, staff appreciation activities, staff training and development, and publicity, displays, and advocacy.

A seven-member Library Advisory Board was established for the City of Lewisville by ordinance. The Library Board is chaired by Kathaleen Rodriguez and members include Cheryl Moore, Jennifer B. Linde, Jean Ferguson, Gail T. Robison, Rosario Klier, and Carolyn Richard. Members are appointed by Mayor and Council and serve a two-year term.

The Library Board acts in an advisory capacity to the city council. The board reviews and evaluates the library's strategic plan and recommends the adoption of standards for library facilities and programs. The Library Board meets on the third Wednesday or the month at 7:00 p.m.

ANALYSIS

In 2015, staff conducted a library study which focused on a review of the current library services, planning efforts (including Lewisville 2025 involvement), emerging trends in libraries, staffing, and collection development. One of the major questions addressed in the study was what does the future of the library look like? The study referenced information gathered from the Aspen Institute which has provided a framework for the library staff and the Library Board to evaluate current services and develop action steps to expand the role of the library as a community gathering place which contributes in a meaningful way to the quality of life in our community.

Staff has prepared a presentation for Council that focuses on new and exciting outreach opportunities. The two new positions funded in this budget year will be used in part to take library services out to the community via Mobile City Hall and the Entrepreneurial Center. There are many opportunities ahead to connect with our community helping shape the new ideas and perspectives that are central to a creative and innovative society.

PROCLAMATION

WHEREAS, communities across the state of Texas will recognize Chamber of Commerce Week on October 17-21 to celebrate the hard work and accomplishments of chambers of commerce and the communities they represent. The proclamation of the week issued by Governor Greg Abbott states, "…chambers of commerce have fostered job creation, improved education and developed infrastructure, these organizations have literally laid the foundation for many communities, contributing to a better future for all Texans"; and

WHEREAS, Texas Chamber of Commerce Week is coordinated annually through the Texas Chamber of Commerce Executives organization (TCCE). TCCE is an organization of chamber executives from across the state, working together to improve the business climate in Texas, while developing ways to enhance the quality of life in the communities that they represent; and

WHEREAS, The Lewisville Area Chamber of Commerce members, staff and volunteers are routinely involved in many areas of the community. These include the Lewisville City Council. Lewisville Planning and Zoning Commission, Old Town Design Review Committee, Blue Ribbon/Lewisville 2025 Advisory Committee, Lewisville Industrial Development Corporation, business development, business retention, business recruitment, education and workforce development, community development and beautification among others; and

WHEREAS, The Lewisville Area Chamber of Commerce was recently recognized as the Most Award Winning Chamber of Commerce in Denton County by earning more awards over the last three years from the Texas Chamber of Commerce Executives organization than any chamber in Denton County; and

WHEREAS, The Lewisville Area Chamber of Commerce recently earned a Four Star Accreditation from the US Chamber of Commerce which places them in the top 3% of all chambers of commerce organizations in these United States of America; and

WHEREAS, In recognition of this year's celebration the Lewisville Area Chamber of Commerce will provide several opportunities for business people and community members to connect.

THEREFORE, I, Rudy Durham, Mayor of the City of Lewisville, Texas and on behalf of the Lewisville City Council, do hereby proclaim the week of October 17-21, 2016 as:

"TEXAS CHAMBER OF COMMERCE WEEK"

PROCLAIMED this 17th day of October, 2016.

_____

Rudy Durham, Mayor
City of Lewisville

American Planning Association
Texas Chapter

Making Great Communities Happen

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August 15, 2016

Rudy Durham, Mayor
City of Lewisville
P.O. Box 299002
Lewisville, Texas 78029-9002

Dear Mayor Durham,

It is with great pleasure that the Texas Chapter of the American Planning Association presents its 2016 Certificate of Achievement for Planning Excellence to your Planning Department. This Certificate recognizes the Professional planning standards demonstrated by your planning staff and the support exhibited by your City Council and Planning Commission. More specifically, the City of Lewisville meets the Chapter's goals for:

- Increasing awareness of professional planning;
- Recognizing Planning Departments which meet certain professional requirements;
- Enhancing neighborhood and citizen recognition of planning efforts;
- Encouraging the funding of professional training for Commissioners and staff; and
- Aiding in economic development and community image.

I encourage you to share this award with your City Council and Planning Commission. The Board of Directors and members of the Texas Chapter APA thank you for your support in your community's planning program.

Respectfully,

Kim Mickelson JD, AICP
President, Texas Chapter APA

American Planning Association
Texas Chapter
Making Great Communities Happen

CERTIFICATE OF ACHIEVEMENT
for
PLANNING EXCELLENCE

Presented to the

City of Lewisville

2016

Recognizing a commitment to professional planning by City Administration, Elected and Appointed Officials and exemplary professional standards demonstrated by the Planning Staff

Awarded by
Texas Chapter of the American Planning Association

Kimberley Michelson, AICP
President, Texas Chapter APA

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Eric Ferris, Deputy City Manager

DATE: October 13, 2016

SUBJECT: **Public Hearing: Consideration of a Boundary Adjustment Agreement Between the City of Lewisville and the City of Highland Village Which Adjusts Their Common Boundary Lines and Releases Certain Parcels of Land.**

BACKGROUND

With the widening of I-35, the existing city limit line for Lewisville and Highland Village needs to be adjusted. At the City Council workshop session on April 18, 2016, staff presented the new boundary limits for both cities. The Texas Local Government Code allows adjacent municipalities which desire to make mutually agreeable changes in their boundaries of areas that are less than 1,000 feet in width to do so by agreement. Through this agreement, Lewisville and Highland Village agree to establish new boundary lines over the land described in the exhibits attached to the agreement.

On October 3, 2016, City Council approved a resolution approving the boundary adjustment agreement, setting two public hearings and directing staff to prepare a service plan. Both public hearings are scheduled for October 17, 2016, with the second public hearing immediately following the first public hearing. A service plan has been prepared and added to the boundary adjustment agreement as Exhibit D.

ANALYSIS

The existing Lewisville city limit line is aligned along the old/former western right-of-way line of I-35 (mainly north of Garden Ridge Boulevard). The City of Lewisville currently has enforcement and control of both northbound and southbound lanes of I-35 in this area. Therefore, to be consistent with this approach, it is necessary to approve a boundary adjustment keeping the new western right-of-way line as the new Lewisville city limit line.

At the April 18, 2016 City Council workshop session, Council directed staff to proceed with a boundary adjustment agreement that would incorporate the new western right-of-way line as the new Lewisville city limit line (area north of Garden Ridge Boulevard). In addition, Lewisville would release its current jurisdiction aligned over the Copperas Branch fork of Lake Lewisville to the City of Highland Village (see attached map). In this area, the City of Lewisville's northern city limit line would be adjusted to follow the United States Army Corps of Engineers southern property line along that portion of Lake Lewisville. In other words, the City of Highland Village

would have that portion of Lake Lewisville (Copperas Branch fork) within their city limits.

Also, part of the I-35E project includes construction of a bike and pedestrian trail bridge across Lake Lewisville (Copperas Branch fork) which will connect to the City of Highland Village's existing public trail system and to the east toward the DCTA train station. The Texas Department of Transportation ("TxDOT") has expressed a desire that the Trail Bridge be located within the jurisdiction of only one of the Cities in order to facilitate future maintenance of the Trail Bridge when construction is completed. The Cities desire to modify their mutual boundary so that the entirety of Lake Lewisville (Copperas Branch fork) is located within Highland Village's incorporated limits.

All of the land affected by the boundary adjustments described above is uninhabited and owned by either the United States of America or the State of Texas such that there will be no impact on residents of either City nor any loss of ad valorem or sales tax base by either City.

Please see the attached highlighted map for further clarification of proposed changes.

RECOMMENDATION

It is City staff's recommendation that the City Council conduct the public hearings as set forth in the caption above.

STATE OF TEXAS §
§ **BOUNDARY ADJUSTMENT AGREEMENT**
COUNTY OF DENTON §

This **Boundary Adjustment Agreement** ("Agreement") is made by and between the **City of Highland Village** ("Highland Village") and the **City of Lewisville** ("Lewisville"), both being Texas home rule municipalities (collectively referred to as "Cities"), acting by and through their authorized representatives.

Recitals:

WHEREAS, a portion of Highland Village's eastern boundary is located along the western boundary of the existing southbound lanes of Interstate 35E ("I-35E"), which boundary is also contiguous to the boundary line of Lewisville's incorporated limits; and

WHEREAS, the new southbound I-35E bridge over Lewisville Lake is being constructed within Highland Village's incorporated limits; and

WHEREAS, absent some adjustment in the boundaries of the Cities along the I-35E corridor, Highland Village will have traffic enforcement jurisdiction on the new southbound lanes of I-35E while Lewisville has traffic enforcement jurisdiction on what will become only northbound lanes of I-35E; and

WHEREAS, the Cities desire to modify their mutual boundary so that Lewisville will have primary traffic enforcement jurisdiction of all lanes of I-35E upon completion of construction of the new southbound lanes; and

WHEREAS, part of the I-35E project includes construction of a bike and pedestrian trail bridge ("the Trail Bridge") across the body of water located on the south of Highland Village Road and west of I-35E commonly known as "Copperas Lake" which will connect to Highland Village's existing public trail system; and

WHEREAS, the incorporated limits of the Cities presently bisect Copperas Lake; and

WHEREAS, the Texas Department of Transportation ("TxDOT") has expressed a desire that the Trail Bridge be located within the jurisdiction of only one of the Cities in order to facilitate future maintenance of the Trail Bridge when construction is completed; and

WHEREAS, the Cities desire to modify their mutual boundary so that the entirety of Copperas Lake is located within Highland Village's incorporated limits; and

WHEREAS, all of the land affected by the boundary adjustments described above is uninhabited and owned by either the United States of America or the State of Texas such that there will be no impact on residents of either City nor any loss of ad valorem or sales tax base by either City; and

WHEREAS, the Cities desire to enter into an agreement providing for the adjustment of their boundaries pursuant to Tex. Loc. Govt. Code §43.031, as amended; and

WHEREAS, the boundary adjustment proposed by this Agreement is exempt from the requirements of Tex. Loc. Govt. Code §43.052; and

NOW THEREFORE, in exchange for the mutual covenants set forth herein and other valuable consideration, the sufficiency and receipt of which are hereby acknowledged, the Cities agree as follows:

Article I
Statement of Intent

It is the intent of the Cities to modify their respective boundaries in accordance with this Agreement.

Article II
Release of Territory

To accomplish the objective set forth in Article I:

(a) Highland Village hereby grants, releases, and apportions unto Lewisville for inclusion within Lewisville's incorporated limits the property which is more particularly described and identified in Exhibit "A" attached hereto and incorporated herein by reference ("the I-35E Tract").

(b) Lewisville hereby grants, releases, and apportions unto Highland Village for inclusion within Highland Village's incorporated limits the property which is more particularly described and identified in Exhibit "B" attached hereto and incorporated herein by reference ("the Copperas Lake Tract").

Article III
Waiver of Extraterritorial Jurisdiction

(a) Highland Village does hereby waive all of its extraterritorial jurisdiction rights, if any, existing by reason of the I-35E Tract in favor of Lewisville. It is expressly agreed and understood that this waiver shall operate only in favor of Lewisville, and shall not constitute a waiver of any right, including extraterritorial jurisdiction rights, which Highland Village may be able to assert against any other municipality.

(b) Lewisville does hereby waive all of its extraterritorial jurisdiction rights, if any, existing by reason of the Copperas Lake Tract in favor of Highland Village. It is expressly agreed and understood that this waiver shall operate only in favor of Highland Village, and shall not constitute a waiver of any right, including extraterritorial jurisdiction rights, which Lewisville may be able to assert against any other municipality.

Article IV
Service Plans

(a) Upon ratification and adoption of this Agreement by an ordinance adopted by the City Council of the City of Highland Village, Highland Village does hereby agree to immediately begin implementation into the affected area of the service plan attached hereto and made a part of this Agreement as Exhibit "C" with respect to the Copperas Lake Tract.

(b) Upon ratification and adoption of this Agreement by an ordinance adopted by the City Council of the City of Lewisville, Lewisville does hereby agree to immediately begin implementation into the affected area of the service plan attached hereto and made a part of this Agreement as Exhibit "D" with respect to the I-35E Tract.

Article V
Severability

Should any provision of this Agreement be declared void by a court of competent jurisdiction, the remaining provisions of this Agreement shall remain in full force and effect.

Article VI
Effective Date

The Cities agree that the boundary adjustment set forth in this Agreement shall take effect only upon ratification and adoption by the governing bodies of each City.

(signature pages to follow)

SIGNED AND AGREED this _____ day of _____, 2016.

City of Highland Village, Texas

By: _____
Michael Leavitt, City Manager

ATTEST:

_____
Angela Miller, City Secretary

APPROVED AS TO FORM AND LEGALITY:

_____
Kevin B. Laughlin, City Attorney

ACKNOWLEDGMENT

STATE OF TEXAS §
§
COUNTY OF DENTON §

This instrument was acknowledged before me on the _____ day of _____, 2016, by Michael Leavitt, City Manager of the City of Highland Village, a Texas home rule municipality for and on behalf of said municipality.

_____
Notary Public, State of Texas

My Commission expires: _____

SIGNED AND AGREED this _____ day of _____, 2016.

CITY OF LEWISVILLE, TEXAS

By: _____
Donna Barron, City Manager

ATTEST:

_____
Julie Heinze, City Secretary

APPROVED AS TO FORM:

_____
Lizbeth Plaster, City Attorney

THE STATE OF TEXAS §
§
COUNTY OF DENTON §

This instrument was acknowledged before me on the ____ day of _____, 2016, by Donna Barron, as City Manager of the City of Lewisville, a Texas home rule municipality, on behalf of said municipality.

_____
Notary Public, State of Texas

My Commission Expires: _____

EXHIBIT "A"
DESCRIPTION OF I-35E TRACT

BEING A TRACT OF LAND OUT OF THE W.P. PEARCE SURVEY, ABSTRACT NO. 1015, AND THE STEPHEN BURNLEY SURVEY, ABSTRACT NO. 116, DENTON COUNTY, TEXAS, AS SHOWN ON THE ATTACHED EXHIBIT A, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

IT IS THE INTENT TO DESCRIBE A TRACT OF LAND BEING BOUNDED ON THE NORTH BY THE SURVEY LINE BETWEEN THE STEPHEN BURNLEY SURVEY, ABSTRACT NO. 116, AND THE WILLIS HAMMONDS SURVEY, ABSTRACT NO. 550, BEING BOUNDED ON THE EAST BY TO OLD RIGHT OF WAY LINE FOR IH 35E, BEING BOUNDED ON THE SOUTH BY CITY LIMIT LINE BETWEEN THE CITIES OF HIGHLAND VILLAGE AND LEWISVILLE, PER RESOLUTION #95-857, 2075-12-95(R) AND BEING BOUNDED ON THE WEST BY THE WEST LINE OF THE NEW RIGHT OF WAY FOR IH-35E PER THE TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) RIGHT OF WAY PLANS FOR IH-35E, DENTON COUNTY, PROJECT NO. 0196-02-110, DATED FEBRUARY 22, 2011:

The POINT OF BEGINNING is at the intersection of the north line of the Right of Way for Highland Village Road and the west line of the new Right of Way for IH-35E per said TxDOT plans;

THENCE North 09°06'29" West, with said Right of Way line, a distance of 325.00 feet to a point;

THENCE North 06°47'15" West, with said Right of Way line, a distance of 104.70 feet to a point at the beginning of a tangent curve to the right;

THENCE, with said Right of Way line, along a curve to the right, having a radius of 11798.00 feet, through a central angle of 09°08'16", an arc distance of 1881.58 feet, and having a chord which bears North 02°13'07" West, a distance of 1879.59 feet to a point;

THENCE North 05°53'04" East, with said Right of Way line, a distance of 600.35 feet to a point;

THENCE North 04°17'16" East, with said Right of Way line, a distance of 161.60 feet to a point, said point being an existing north line of the City Limit for the City of Highland Village, and being the line common to the Burnley and Hammonds Surveys;

THENCE North 89°44'34" East, with said City Limit line, a distance of 150.74 feet to a point, said point being on the west line of the old Right of Way line of IH-35E;

THENCE South 05°18'44" East, with said Right of Way line, a distance of 276.55 feet to a point;

THENCE South 04°25'19" West, with said Right of Way line, a distance of 611.13 feet to a point at the beginning of a non-tangent curve to the left;

THENCE with said Right of Way line, along a curve to the left, having a radius of 5047.15 feet, through a central angle of 14°01'24" an arc distance of 1235.30 feet, and having a chord which bears South 02°12'08" East, a distance of 1232.22 feet to a point;

THENCE South 09°12'50" East, with said Right of Way line, a distance of 986.24 feet to a point;

THENCE South 40°03'10" West, with said Right of Way line, a distance of 66.99 feet to a point;

THENCE South 09°12'50" East, with said Right of Way line, a distance of 30.00 feet to a point;

THENCE South 45°11'50" East, with said Right of Way line, a distance of 70.00 feet to a point;

THENCE South 00°07'50" East, with said Right of Way line, a distance of 260.47 feet to a point, said point being on the south line of the City Limit for the City of Highland Village per Resolution No. 95-857, 2075-12-95(R);

THENCE South 36°57'45" West, with said City Limit Line, a distance of 189.44 feet to a point, said point being on the west line of the Right of Way for IH-35E, per said TxDOT Right of Way plans;

THENCE North 09°06'29" West, with said Right of Way line, a distance of 400.25 feet to a point on the south line of the Right of Way for Highland Village Road;

THENCE North 31°21'43" West, crossing Highland Village Road, a distance of 204.12 feet to the POINT OF BEGINNING, and containing approximately 17.22 acres of land.

NOTES:

COE = United States Corps of Engineers

No field survey was performed for this survey. All bearings, distances, and monument calls are based on recorded plat and deed information.

In the event of the creation of changes in the west Right of Way for IH-35E in this area, the City limit line between Lewisville and Highland Village will be based on the most current changes and will be the same as the newly created Right of Way line.

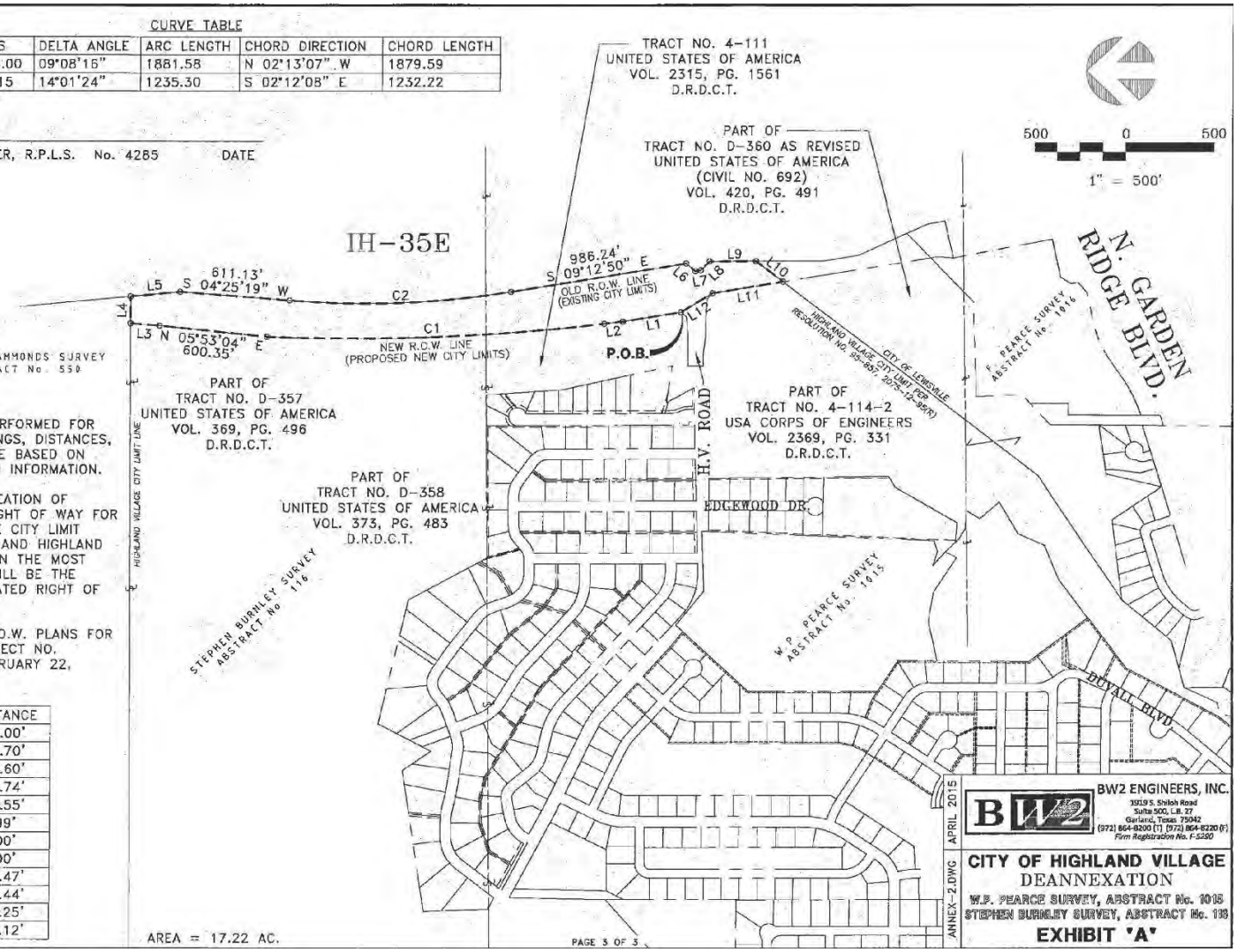
_____ _____

John F. Wilder, RPLS 4285 DATE

CURVE TABLE

NUMBER	RADIUS	DELTA ANGLE	ARC LENGTH	CHORD DIRECTION	CHORD LENGTH
C1	11798.00	09°08'16"	1881.58	N 02°13'07" W	1879.59
C2	5047.15	14°01'24"	1235.30	S 02°12'08" E	1232.22

JOHN F. WILDER, R.P.L.S. No. 4285 DATE



NOTES:

1. NO FIELD SURVEY WAS PERFORMED FOR THIS SURVEY. ALL BEARINGS, DISTANCES, AND MONUMENT CALLS ARE BASED ON RECORDED PLAT AND DEED INFORMATION.
2. IN THE EVENT OF THE CREATION OF CHANGES IN THE WEST RIGHT OF WAY FOR IH-35E IN THIS AREA, THE CITY LIMIT LINE BETWEEN LEWISVILLE AND HIGHLAND VILLAGE WILL BE BASED ON THE MOST CURRENT CHANGES AND WILL BE THE SAME AS THE NEWLY CREATED RIGHT OF WAY LINE.
3. NEW R.O.W. PER TxDOT R.O.W. PLANS FOR IH-35E DENTON CO., PROJECT NO. 0196-02-110, DATED FEBRUARY 22, 2011.

LINE TABLE

NUMBER	DIRECTION	DISTANCE
L1	N 09°06'29" W	325.00'
L2	N 06°47'15" W	104.70'
L3	N 04°17'16" E	161.60'
L4	N 89°44'34" E	150.74'
L5	S 05°18'44" E	276.55'
L6	S 40°03'10" W	66.99'
L7	S 09°12'50" E	30.00'
L8	S 45°11'50" E	70.00'
L9	S 00°07'50" E	260.47'
L10	S 36°57'45" W	189.44'
L11	N 09°06'29" W	400.25'
L12	N 31°21'43" W	204.12'

AREA = 17.22 AC.

PAGE 3 OF 3

BW2 ENGINEERS, INC.
3919 S. Shiloh Road
Suite 500, LB. 27
Garland, Texas 75042
(972) 864-9200 (T) (972) 864-9220 (F)
Firm Registration No. F-5280

APRIL 2015

ANNEX-2.DWG

CITY OF HIGHLAND VILLAGE
DEANNEXATION
W.P. PEARCE SURVEY, ABSTRACT No. 1015
STEPHEN BURNLEY SURVEY, ABSTRACT No. 116
EXHIBIT "A"

EXHIBIT "A" TO CITY OF HIGHLAND VILLAGE/ CITY OF LEWISVILLE BOUNDARY ADJUSTMENT AGREEMENT – PAGE 3

EXHIBIT "B"
DESCRIPTION OF COPPERAS LAKE TRACT

DESCRIPTION

BEING A TRACT OF LAND OUT OF THE FRANCIS PEARCE SURVEY, ABSTRACT NO. 1016, AND THE W.PL PEARCE SURVEY, ABSTRACT NO. 1019, DENTON COUNTY, TEXAS, AS SHOWN ON THE ATTACHED EXHIBIT A, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

IT IS THE INTENT TO DESCRIBE A TRACT OF LAND BEING BOUNDED ON THE NORTHWEST BY THE CITY LIMIT LINE FOR THE CITY OF HIGHLAND VILLAGE PER HIGHLAND VILLAGE RESOLUTION NO. 95-857 (RESOLUTION NO. 2075-12-95 (R)), BEING BOUNDED ON THE EAST BY THE WEST LINE OF THE RIGHT OF WAY FOR IH 35E, PER THE TEXAS DEPARTMENT OF TRANSPORTATION RIGHT OF WAY PLANS FOR IH 35E, DENTON COUNTY, PROJECT NO. 0196-02-110, DATED FEBRUARY 22, 2011, AND BEING BOUNDED ON THE SOUTHEAST BY 1) THE NORTH LINE OF HIGHLAND LAKES, PHASE II, AN ADDITION TO THE CITY OF LEWISVILLE, TEXAS AS RECORDED IN CABINET O, SLIDE 97 OF THE DEED RECORDS OF DENTON COUNTY, TEXAS (DRDCT), 2) THE NORTH LINE AND WEST LINE OF A TRACT OF LAND AS DEEDED TO THE CITY OF LEWISVILLE AND RECORDED IN VOLUME 2215, PAGE 523, DRDCT, 3) THE NORTH LINE OF MEADOW LAKE 4, SECTION 2, AN ADDITION TO THE CITY OF LEWISVILLE AS RECORDED IN CABINET F, SLIDE 278, DRDCT:

The POINT OF BEGINNING is a 5/8 inch iron rod found for the northeast corner of said Highland Lakes, Phase II, being on the west line of said Right of Way for IH 35E,

THENCE South 44°59'47" West, departing said Right of Way line with a north line of Highland Lakes, Phase II, a distance of 343.67 feet to a Corps of Engineers monument;

THENCE South 87°56'39" West, continue with said north line, a distance of 529.91 feet to a Corps of Engineers monument;

THENCE South 02°15'33" East, with a west line of Highland Lakes, Phase II, a distance of 260.12 feet to a point;

THENCE South 46°25'45" West, with a north line of Highland Lakes, Phase II, a distance of 63.37 feet to a point being a northwest line of Highland Lakes, Phase II, and being the northeast corner of said City of Lewisville tract;

Thence South 46°20'49" West, with the north line of the City of Lewisville tract, a distance of 167.72 feet to the COE monument No. D 360-5;

THENCE South 00°39'52" West, with the west line of City of Lewisville tract, a distance of 269.90 feet to COE monument No. D 360-6/D 361-I, said point being the northeast corner of said Meadow Lake 4;

THENCE South 81°48'11" West, with the north line of Meadow Lake 4, a distance of 275.00 feet to a COE monument;

THENCE South 13°17'21" West, continue with said north line, a distance of 314.09 feet to a point;

THENCE North 33°51'46" West, continue with said north line, a distance of 328.00 feet to a COE monument;

THENCE South 82°55'14" West, continue with said north line, passing at 436.00 feet a COE monument, in all, distance of 450.00 feet to a 5/8 inch iron rod found for the northwest corner of Meadow Lake 4, said point being on the Highland Village City Limit line per Resolution No. 95-857;

THENCE North 56°12'55" East, with said City Limit line, a distance of 833.00 feet to a point;

THENCE North 36°57'45" East, continue with said line, a distance of 1799.93 feet to a point on the west line of the Right of Way for IH 35E;

THENCE South 09°06'29" East, with said Right of Way line, a distance of 832.64 feet to the POINT OF BEGINNING, and containing approximately 19.96 acres of land.

NOTES:

COE = United States Corps of Engineers

No field survey was performed for this survey. All bearings, distances, and monument calls are based on recorded plat and deed information.

In the event of the creation of changes in the west Right of Way for IH-35E in this area, the City limit line between Lewisville and Highland Village will be based on the most current changes and will be the same as the newly created Right of Way line.

_____ _____

John F. Wilder, RPLS 4285 DATE

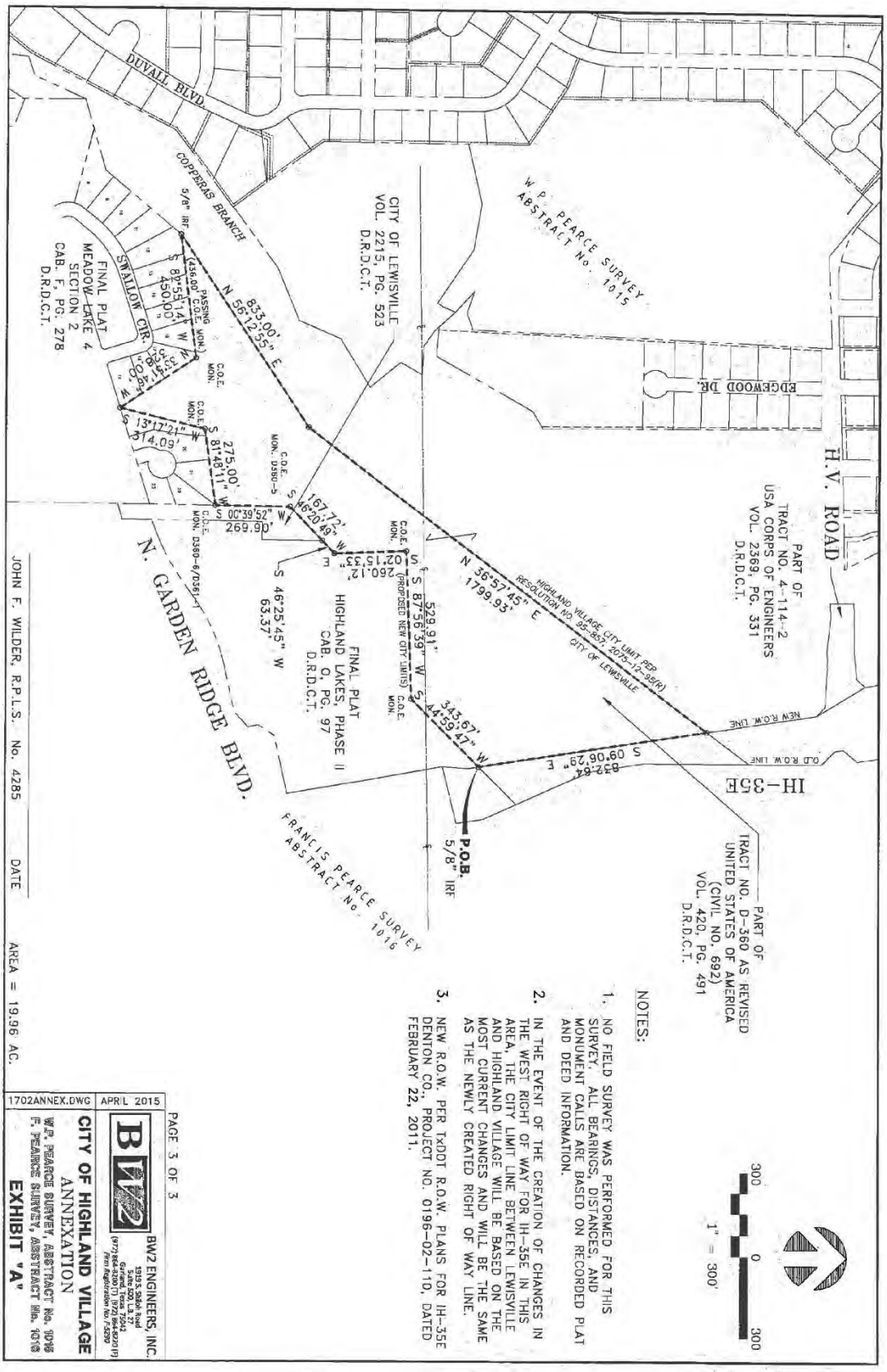


EXHIBIT "B" TO CITY OF HIGHLAND VILLAGE/ CITY OF LEWISVILLE BOUNDARY ADJUSTMENT AGREEMENT – PAGE 3

EXHIBIT C
HIGHLAND VILLAGE SERVICE PLAN

As required by Texas Local Government Code Section 43.065, following is the Service Plan for the property more particularly described and identified as the "Copperas Lake Tract."

As the result of a series of negotiations, the Cities of Highland Village and Lewisville have agreed to a boundary adjustment covering the property described and identified as the Copperas Lake Tract in the Boundary Adjustment Agreement.

The following Municipal Services will be provided by Highland Village to the area within the Copperas Lake Tract upon the effective date of the City of Highland Village ordinance approving and ratifying this Agreement:

A. Police Protection

Police enforcement and protection services are to be provided by the extension of patrol into Copperas Lake Tract and by response from the Highland Village Police Department to individual requests.

B. Fire Protection (including emergency ambulance)

Fire protection personnel and equipment, and emergency medical personnel and equipment will be provided.

C. Solid Waste Collection

In so far as the Copperas Lake Tract is owned by the United States solid waste collection services are anticipated to be necessary. If needed, Highland Village will provide it.

D. Water Service

In so far as the Copperas Lake Tract is owned by the United States of America and constitutes a portion of Lewisville Lake, no extension of water service is anticipated to be necessary. If needed, Highland Village will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

E. Sanitary Sewer Service

In so far as the Copperas Lake Tract is owned by the United States of America and constitutes a portion of Lewisville Lake, no extension of sanitary sewer service is anticipated to be necessary. If needed, Highland Village will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

F. Maintenance of Roads and Streets

The Copperas Lake Tract is a body of water with construction of no roads or streets anticipated.

G. Parks and Recreation

Not applicable since there are no residents to serve within the Copperas Lake Tract.

H. Street Lighting

Not applicable since there are no streets to be served or to be constructed.

I. Traffic Engineering

Not applicable since there are no streets to be served or to be constructed.

K. Planning and Zoning

The planning and zoning jurisdiction, including the subdivision platting process, of the City of Highland Village extends to the Copperas Lake Tract, but will be subject to the Supremacy Clause in the Constitutions of the United States of American and the State of Texas for so long as the property is owned by the federal government.

L. Storm Drainage (including flood plain regulations)

The City's regulations relating to flood plain development and storm water drainage will apply.

M. Capital Improvements

In so far as the Copperas Lake Tract is a body of water owned by the United States of America with no residents, the construction of capital improvements to serve existing developed properties is not required.

N. Miscellaneous

General municipal administrative and code enforcement services of the City of Highland Village will be provided.

EXHIBIT D
LEWISVILLE SERVICE PLAN

As required by Texas Local Government Code Section 43.065, following is the Service Plan for the property more particularly described and identified as the "I-35E Tract."

As the result of a series of negotiations, the Cities of Highland Village and Lewisville have agreed to a boundary adjustment covering the property described and identified as the I-35E Tract in the Boundary Adjustment Agreement.

The following Municipal Services will be provided by Lewisville to the area within the Copperas Lake Tract upon the effective date of the Lewisville ordinance approving and ratifying this Agreement:

A. Police Protection

Police enforcement and protection services are to be provided by the extension of patrol into the I-35E Tract and by response from the Lewisville Police Department to individual requests.

B. Fire Protection (including emergency ambulance)

Fire protection personnel and equipment, and emergency medical personnel and equipment will be provided.

C. Solid Waste Collection

Solid waste collection service is to be provided in accordance with City of Lewisville ordinances, resolutions, and regulations.

D. Water Service

In so far as the property within the I-35E Tract is owned by either the United States of America or the State of Texas, contains no residents, no extension of water service is anticipated to be necessary. If needed, Lewisville will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

E. Sanitary Sewer Service

In so far as the property within the I-35E Tract is owned by either the United States of America or the State of Texas, contains no residents, no extension of sanitary sewer service is anticipated to be necessary. If needed, Lewisville will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

F. Maintenance of Roads and Streets

Not applicable. There are presently no roads or streets owned by the City of Lewisville which serve the I-35E Tract and none are anticipated to be constructed.

G. Parks and Recreation

Not applicable as there will never be any residents within the I-35E Tract to be served.

H. Library Service

Not applicable as there will never be any residents within the I-35E Tract to be served.

I. Street Lighting

Not applicable. There are presently no roads or streets owned by the City of Lewisville which serve the I-35E Tract and none are anticipated to be constructed.

J. Traffic Engineering

Not applicable. There are presently no roads or streets owned by the City of Lewisville which serve the I-35E Tract and none are anticipated to be constructed.

K. Planning and Zoning

The planning and zoning jurisdiction, including the subdivision platting process, of the City of Lewisville extends to the I-35E Tract, but will be subject to the Supremacy Clause in the Constitutions of the United States of American and the State of Texas to the properties owned by the federal or state government.

L. Storm Drainage (including flood plain regulations)

The City's regulations relating to flood plain development and storm water drainage will apply.

M. Capital Improvements

In so far as the I-35E Tract consists of a body of water owned by the United States of America, the travel lanes and service roads of I-35E, and a public park operated by the City of Highland Village, the construction of capital improvements to serve existing developed properties is not required.

N. Miscellaneous

General municipal administrative and code enforcement services of the City of Lewisville will be provided.

O. Copperas Branch Park

Pursuant to agreement with the City of Highland Village, and notwithstanding anything to the contrary contained in this Service Plan, for so long as Highland Village owns and operates Copperas Branch Park pursuant to its lease with the federal government, Highland Village shall provide, and will be solely responsible for providing water, sanitary sewer, solid waste collection (so long as the solid waste collection does not conflict with any existing City of Lewisville solid waste franchise agreement), and other public utility and municipal services to that portion of Copperas Branch Park located within the I-35E Tract.

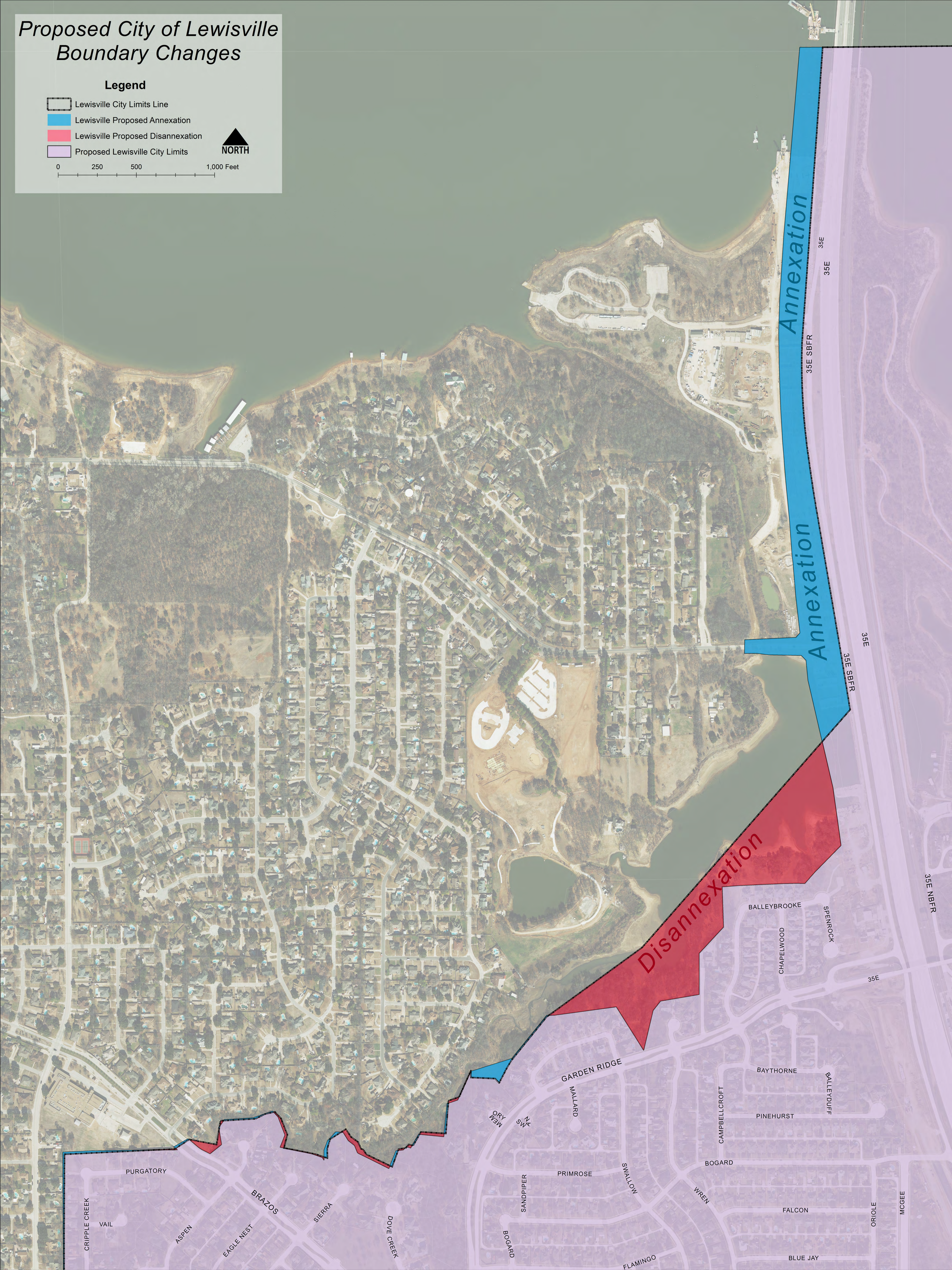
Proposed City of Lewisville Boundary Changes

Legend

- Lewisville City Limits Line
- Lewisville Proposed Annexation
- Lewisville Proposed Disannexation
- Proposed Lewisville City Limits

NORTH

0 250 500 1,000 Feet



MEMORANDUM

TO: Donna Barron, City Manager

FROM: Eric Ferris, Deputy City Manager

DATE: October 13, 2016

SUBJECT: **Public Hearing: Consideration of a Boundary Adjustment Agreement Between the City of Lewisville and the City of Highland Village Which Adjusts Their Common Boundary Lines and Releases Certain Parcels of Land.**

BACKGROUND

With the widening of I-35, the existing city limit line for Lewisville and Highland Village needs to be adjusted. At the City Council workshop session on April 18, 2016, staff presented the new boundary limits for both cities. The Texas Local Government Code allows adjacent municipalities which desire to make mutually agreeable changes in their boundaries of areas that are less than 1,000 feet in width to do so by agreement. Through this agreement, Lewisville and Highland Village agree to establish new boundary lines over the land described in the exhibits attached to the agreement.

On October 3, 2016, City Council approved a resolution approving the boundary adjustment agreement, setting two public hearings and directing staff to prepare a service plan. Both public hearings are scheduled for October 17, 2016, with the second public hearing immediately following the first public hearing. A service plan has been prepared and added to the boundary adjustment agreement as Exhibit D.

ANALYSIS

The existing Lewisville city limit line is aligned along the old/former western right-of-way line of I-35 (mainly north of Garden Ridge Boulevard). The City of Lewisville currently has enforcement and control of both northbound and southbound lanes of I-35 in this area. Therefore, to be consistent with this approach, it is necessary to approve a boundary adjustment keeping the new western right-of-way line as the new Lewisville city limit line.

At the April 18, 2016 City Council workshop session, Council directed staff to proceed with a boundary adjustment agreement that would incorporate the new western right-of-way line as the new Lewisville city limit line (area north of Garden Ridge Boulevard). In addition, Lewisville would release its current jurisdiction aligned over the Copperas Branch fork of Lake Lewisville to the City of Highland Village (see attached map). In this area, the City of Lewisville's northern city limit line would be adjusted to follow the United States Army Corps of Engineers southern property line along that portion of Lake Lewisville. In other words, the City of Highland Village

would have that portion of Lake Lewisville (Copperas Branch fork) within their city limits.

Also, part of the I-35E project includes construction of a bike and pedestrian trail bridge across Lake Lewisville (Copperas Branch fork) which will connect to the City of Highland Village's existing public trail system and to the east toward the DCTA train station. The Texas Department of Transportation ("TxDOT") has expressed a desire that the Trail Bridge be located within the jurisdiction of only one of the Cities in order to facilitate future maintenance of the Trail Bridge when construction is completed. The Cities desire to modify their mutual boundary so that the entirety of Lake Lewisville (Copperas Branch fork) is located within Highland Village's incorporated limits.

All of the land affected by the boundary adjustments described above is uninhabited and owned by either the United States of America or the State of Texas such that there will be no impact on residents of either City nor any loss of ad valorem or sales tax base by either City.

Please see the attached highlighted map for further clarification of proposed changes.

RECOMMENDATION

It is City staff's recommendation that the City Council conduct the public hearings as set forth in the caption above.

STATE OF TEXAS §
§ **BOUNDARY ADJUSTMENT AGREEMENT**
COUNTY OF DENTON §

This **Boundary Adjustment Agreement** ("Agreement") is made by and between the **City of Highland Village** ("Highland Village") and the **City of Lewisville** ("Lewisville"), both being Texas home rule municipalities (collectively referred to as "Cities"), acting by and through their authorized representatives.

Recitals:

WHEREAS, a portion of Highland Village's eastern boundary is located along the western boundary of the existing southbound lanes of Interstate 35E ("I-35E"), which boundary is also contiguous to the boundary line of Lewisville's incorporated limits; and

WHEREAS, the new southbound I-35E bridge over Lewisville Lake is being constructed within Highland Village's incorporated limits; and

WHEREAS, absent some adjustment in the boundaries of the Cities along the I-35E corridor, Highland Village will have traffic enforcement jurisdiction on the new southbound lanes of I-35E while Lewisville has traffic enforcement jurisdiction on what will become only northbound lanes of I-35E; and

WHEREAS, the Cities desire to modify their mutual boundary so that Lewisville will have primary traffic enforcement jurisdiction of all lanes of I-35E upon completion of construction of the new southbound lanes; and

WHEREAS, part of the I-35E project includes construction of a bike and pedestrian trail bridge ("the Trail Bridge") across the body of water located on the south of Highland Village Road and west of I-35E commonly known as "Copperas Lake" which will connect to Highland Village's existing public trail system; and

WHEREAS, the incorporated limits of the Cities presently bisect Copperas Lake; and

WHEREAS, the Texas Department of Transportation ("TxDOT") has expressed a desire that the Trail Bridge be located within the jurisdiction of only one of the Cities in order to facilitate future maintenance of the Trail Bridge when construction is completed; and

WHEREAS, the Cities desire to modify their mutual boundary so that the entirety of Copperas Lake is located within Highland Village's incorporated limits; and

WHEREAS, all of the land affected by the boundary adjustments described above is uninhabited and owned by either the United States of America or the State of Texas such that there will be no impact on residents of either City nor any loss of ad valorem or sales tax base by either City; and

WHEREAS, the Cities desire to enter into an agreement providing for the adjustment of their boundaries pursuant to Tex. Loc. Govt. Code §43.031, as amended; and

WHEREAS, the boundary adjustment proposed by this Agreement is exempt from the requirements of Tex. Loc. Govt. Code §43.052; and

NOW THEREFORE, in exchange for the mutual covenants set forth herein and other valuable consideration, the sufficiency and receipt of which are hereby acknowledged, the Cities agree as follows:

Article I
Statement of Intent

It is the intent of the Cities to modify their respective boundaries in accordance with this Agreement.

Article II
Release of Territory

To accomplish the objective set forth in Article I:

(a) Highland Village hereby grants, releases, and apportions unto Lewisville for inclusion within Lewisville's incorporated limits the property which is more particularly described and identified in Exhibit "A" attached hereto and incorporated herein by reference ("the I-35E Tract").

(b) Lewisville hereby grants, releases, and apportions unto Highland Village for inclusion within Highland Village's incorporated limits the property which is more particularly described and identified in Exhibit "B" attached hereto and incorporated herein by reference ("the Copperas Lake Tract").

Article III
Waiver of Extraterritorial Jurisdiction

(a) Highland Village does hereby waive all of its extraterritorial jurisdiction rights, if any, existing by reason of the I-35E Tract in favor of Lewisville. It is expressly agreed and understood that this waiver shall operate only in favor of Lewisville, and shall not constitute a waiver of any right, including extraterritorial jurisdiction rights, which Highland Village may be able to assert against any other municipality.

(b) Lewisville does hereby waive all of its extraterritorial jurisdiction rights, if any, existing by reason of the Copperas Lake Tract in favor of Highland Village. It is expressly agreed and understood that this waiver shall operate only in favor of Highland Village, and shall not constitute a waiver of any right, including extraterritorial jurisdiction rights, which Lewisville may be able to assert against any other municipality.

Article IV
Service Plans

(a) Upon ratification and adoption of this Agreement by an ordinance adopted by the City Council of the City of Highland Village, Highland Village does hereby agree to immediately begin implementation into the affected area of the service plan attached hereto and made a part of this Agreement as Exhibit "C" with respect to the Copperas Lake Tract.

(b) Upon ratification and adoption of this Agreement by an ordinance adopted by the City Council of the City of Lewisville, Lewisville does hereby agree to immediately begin implementation into the affected area of the service plan attached hereto and made a part of this Agreement as Exhibit "D" with respect to the I-35E Tract.

Article V
Severability

Should any provision of this Agreement be declared void by a court of competent jurisdiction, the remaining provisions of this Agreement shall remain in full force and effect.

Article VI
Effective Date

The Cities agree that the boundary adjustment set forth in this Agreement shall take effect only upon ratification and adoption by the governing bodies of each City.

(signature pages to follow)

SIGNED AND AGREED this _____ day of _____, 2016.

City of Highland Village, Texas

By: _____
Michael Leavitt, City Manager

ATTEST:

_____
Angela Miller, City Secretary

APPROVED AS TO FORM AND LEGALITY:

_____
Kevin B. Laughlin, City Attorney

ACKNOWLEDGMENT

STATE OF TEXAS §
§
COUNTY OF DENTON §

This instrument was acknowledged before me on the _____ day of _____, 2016, by Michael Leavitt, City Manager of the City of Highland Village, a Texas home rule municipality for and on behalf of said municipality.

_____
Notary Public, State of Texas

My Commission expires: _____

SIGNED AND AGREED this _____ day of _____, 2016.

CITY OF LEWISVILLE, TEXAS

By: _____
Donna Barron, City Manager

ATTEST:

_____
Julie Heinze, City Secretary

APPROVED AS TO FORM:

_____
Lizbeth Plaster, City Attorney

THE STATE OF TEXAS §
§
COUNTY OF DENTON §

This instrument was acknowledged before me on the ____ day of _____, 2016, by Donna Barron, as City Manager of the City of Lewisville, a Texas home rule municipality, on behalf of said municipality.

_____
Notary Public, State of Texas

My Commission Expires: _____

EXHIBIT "A"
DESCRIPTION OF I-35E TRACT

BEING A TRACT OF LAND OUT OF THE W.P. PEARCE SURVEY, ABSTRACT NO. 1015, AND THE STEPHEN BURNLEY SURVEY, ABSTRACT NO. 116, DENTON COUNTY, TEXAS, AS SHOWN ON THE ATTACHED EXHIBIT A, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

IT IS THE INTENT TO DESCRIBE A TRACT OF LAND BEING BOUNDED ON THE NORTH BY THE SURVEY LINE BETWEEN THE STEPHEN BURNLEY SURVEY, ABSTRACT NO. 116, AND THE WILLIS HAMMONDS SURVEY, ABSTRACT NO. 550, BEING BOUNDED ON THE EAST BY TO OLD RIGHT OF WAY LINE FOR IH 35E, BEING BOUNDED ON THE SOUTH BY CITY LIMIT LINE BETWEEN THE CITIES OF HIGHLAND VILLAGE AND LEWISVILLE, PER RESOLUTION #95-857, 2075-12-95(R) AND BEING BOUNDED ON THE WEST BY THE WEST LINE OF THE NEW RIGHT OF WAY FOR IH-35E PER THE TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) RIGHT OF WAY PLANS FOR IH-35E, DENTON COUNTY, PROJECT NO. 0196-02-110, DATED FEBRUARY 22, 2011:

The POINT OF BEGINNING is at the intersection of the north line of the Right of Way for Highland Village Road and the west line of the new Right of Way for IH-35E per said TxDOT plans;

THENCE North 09°06'29" West, with said Right of Way line, a distance of 325.00 feet to a point;

THENCE North 06°47'15" West, with said Right of Way line, a distance of 104.70 feet to a point at the beginning of a tangent curve to the right;

THENCE, with said Right of Way line, along a curve to the right, having a radius of 11798.00 feet, through a central angle of 09°08'16", an arc distance of 1881.58 feet, and having a chord which bears North 02°13'07" West, a distance of 1879.59 feet to a point;

THENCE North 05°53'04" East, with said Right of Way line, a distance of 600.35 feet to a point;

THENCE North 04°17'16" East, with said Right of Way line, a distance of 161.60 feet to a point, said point being an existing north line of the City Limit for the City of Highland Village, and being the line common to the Burnley and Hammonds Surveys;

THENCE North 89°44'34" East, with said City Limit line, a distance of 150.74 feet to a point, said point being on the west line of the old Right of Way line of IH-35E;

THENCE South 05°18'44" East, with said Right of Way line, a distance of 276.55 feet to a point;

THENCE South 04°25'19" West, with said Right of Way line, a distance of 611.13 feet to a point at the beginning of a non-tangent curve to the left;

THENCE with said Right of Way line, along a curve to the left, having a radius of 5047.15 feet, through a central angle of 14°01'24" an arc distance of 1235.30 feet, and having a chord which bears South 02°12'08" East, a distance of 1232.22 feet to a point;

THENCE South 09°12'50" East, with said Right of Way line, a distance of 986.24 feet to a point;

THENCE South 40°03'10" West, with said Right of Way line, a distance of 66.99 feet to a point;

THENCE South 09°12'50" East, with said Right of Way line, a distance of 30.00 feet to a point;

THENCE South 45°11'50" East, with said Right of Way line, a distance of 70.00 feet to a point;

THENCE South 00°07'50" East, with said Right of Way line, a distance of 260.47 feet to a point, said point being on the south line of the City Limit for the City of Highland Village per Resolution No. 95-857, 2075-12-95(R);

THENCE South 36°57'45" West, with said City Limit Line, a distance of 189.44 feet to a point, said point being on the west line of the Right of Way for IH-35E, per said TxDOT Right of Way plans;

THENCE North 09°06'29" West, with said Right of Way line, a distance of 400.25 feet to a point on the south line of the Right of Way for Highland Village Road;

THENCE North 31°21'43" West, crossing Highland Village Road, a distance of 204.12 feet to the POINT OF BEGINNING, and containing approximately 17.22 acres of land.

NOTES:

COE = United States Corps of Engineers

No field survey was performed for this survey. All bearings, distances, and monument calls are based on recorded plat and deed information.

In the event of the creation of changes in the west Right of Way for IH-35E in this area, the City limit line between Lewisville and Highland Village will be based on the most current changes and will be the same as the newly created Right of Way line.

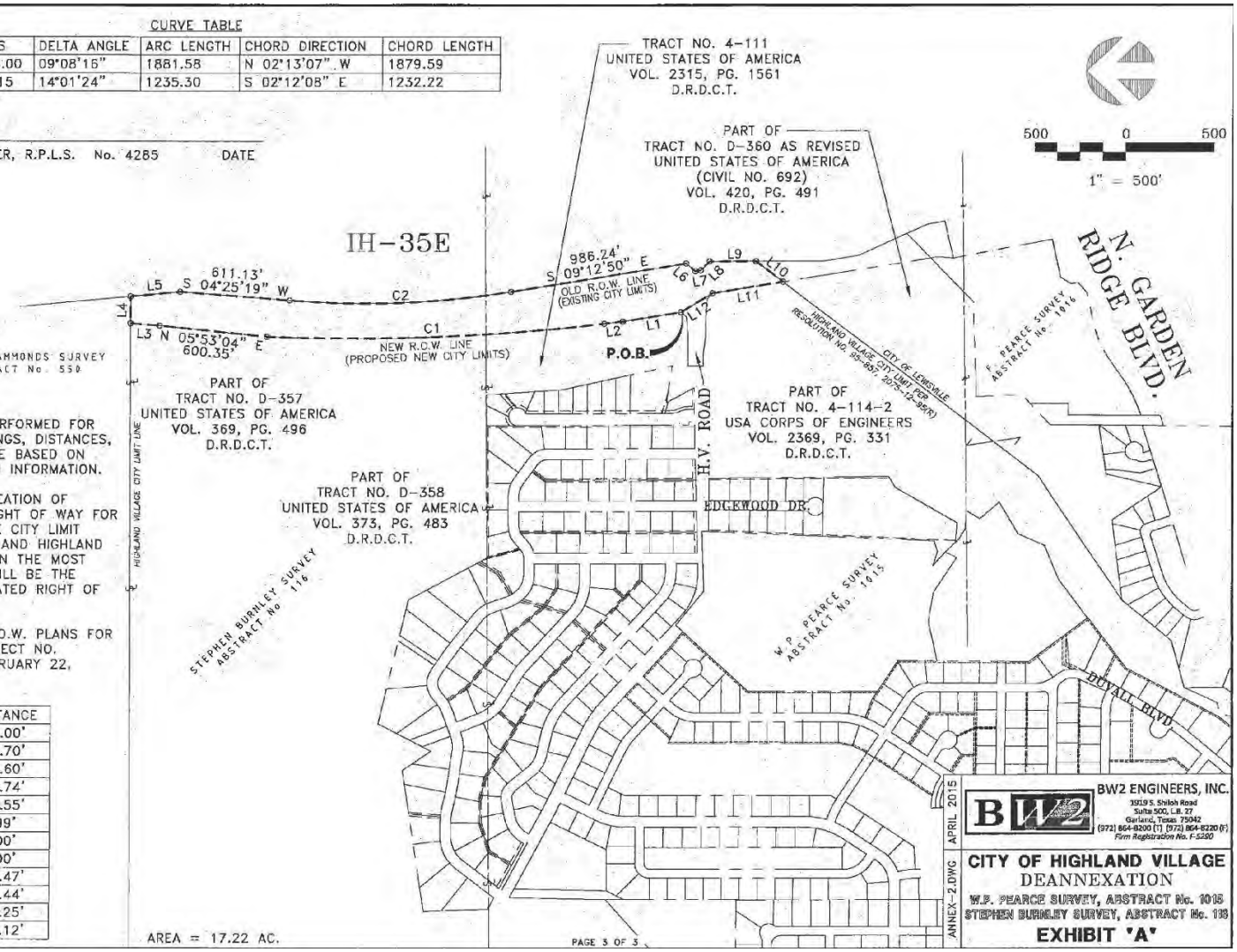
_____ _____

John F. Wilder, RPLS 4285 DATE

CURVE TABLE

NUMBER	RADIUS	DELTA ANGLE	ARC LENGTH	CHORD DIRECTION	CHORD LENGTH
C1	11798.00	09°08'16"	1881.58	N 02°13'07" W	1879.59
C2	5047.15	14°01'24"	1235.30	S 02°12'08" E	1232.22

JOHN F. WILDER, R.P.L.S. No. 4285 DATE



NOTES:

1. NO FIELD SURVEY WAS PERFORMED FOR THIS SURVEY. ALL BEARINGS, DISTANCES, AND MONUMENT CALLS ARE BASED ON RECORDED PLAT AND DEED INFORMATION.
2. IN THE EVENT OF THE CREATION OF CHANGES IN THE WEST RIGHT OF WAY FOR IH-35E IN THIS AREA, THE CITY LIMIT LINE BETWEEN LEWISVILLE AND HIGHLAND VILLAGE WILL BE BASED ON THE MOST CURRENT CHANGES AND WILL BE THE SAME AS THE NEWLY CREATED RIGHT OF WAY LINE.
3. NEW R.O.W. PER TxDOT R.O.W. PLANS FOR IH-35E DENTON CO., PROJECT NO. 0196-02-110, DATED FEBRUARY 22, 2011.

LINE TABLE

NUMBER	DIRECTION	DISTANCE
L1	N 09°06'29" W	325.00'
L2	N 06°47'15" W	104.70'
L3	N 04°17'16" E	161.60'
L4	N 89°44'34" E	150.74'
L5	S 05°18'44" E	276.55'
L6	S 40°03'10" W	66.99'
L7	S 09°12'50" E	30.00'
L8	S 45°11'50" E	70.00'
L9	S 00°07'50" E	260.47'
L10	S 36°57'45" W	189.44'
L11	N 09°06'29" W	400.25'
L12	N 31°21'43" W	204.12'

AREA = 17.22 AC.

PAGE 3 OF 3

BW2 ENGINEERS, INC.
3919 S. Shiloh Road
Suite 500, LB. 27
Garland, Texas 75042
(972) 864-9200 (T) (972) 864-9220 (F)
Firm Registration No. F-5280

APRIL 2015

ANNEX-2.DWG

CITY OF HIGHLAND VILLAGE
DEANNEXATION
W.P. PEARCE SURVEY, ABSTRACT No. 1015
STEPHEN BURNLEY SURVEY, ABSTRACT No. 116
EXHIBIT "A"

EXHIBIT "A" TO CITY OF HIGHLAND VILLAGE/ CITY OF LEWISVILLE BOUNDARY ADJUSTMENT AGREEMENT – PAGE 3

EXHIBIT "B"
DESCRIPTION OF COPPERAS LAKE TRACT

DESCRIPTION

BEING A TRACT OF LAND OUT OF THE FRANCIS PEARCE SURVEY, ABSTRACT NO. 1016, AND THE W.PL PEARCE SURVEY, ABSTRACT NO. 1019, DENTON COUNTY, TEXAS, AS SHOWN ON THE ATTACHED EXHIBIT A, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

IT IS THE INTENT TO DESCRIBE A TRACT OF LAND BEING BOUNDED ON THE NORTHWEST BY THE CITY LIMIT LINE FOR THE CITY OF HIGHLAND VILLAGE PER HIGHLAND VILLAGE RESOLUTION NO. 95-857 (RESOLUTION NO. 2075-12-95 (R)), BEING BOUNDED ON THE EAST BY THE WEST LINE OF THE RIGHT OF WAY FOR IH 35E, PER THE TEXAS DEPARTMENT OF TRANSPORTATION RIGHT OF WAY PLANS FOR IH 35E, DENTON COUNTY, PROJECT NO. 0196-02-110, DATED FEBRUARY 22, 2011, AND BEING BOUNDED ON THE SOUTHEAST BY 1) THE NORTH LINE OF HIGHLAND LAKES, PHASE II, AN ADDITION TO THE CITY OF LEWISVILLE, TEXAS AS RECORDED IN CABINET O, SLIDE 97 OF THE DEED RECORDS OF DENTON COUNTY, TEXAS (DRDCT), 2) THE NORTH LINE AND WEST LINE OF A TRACT OF LAND AS DEEDED TO THE CITY OF LEWISVILLE AND RECORDED IN VOLUME 2215, PAGE 523, DRDCT, 3) THE NORTH LINE OF MEADOW LAKE 4, SECTION 2, AN ADDITION TO THE CITY OF LEWISVILLE AS RECORDED IN CABINET F, SLIDE 278, DRDCT:

The POINT OF BEGINNING is a 5/8 inch iron rod found for the northeast corner of said Highland Lakes, Phase II, being on the west line of said Right of Way for IH 35E,

THENCE South 44°59'47" West, departing said Right of Way line with a north line of Highland Lakes, Phase II, a distance of 343.67 feet to a Corps of Engineers monument;

THENCE South 87°56'39" West, continue with said north line, a distance of 529.91 feet to a Corps of Engineers monument;

THENCE South 02°15'33" East, with a west line of Highland Lakes, Phase II, a distance of 260.12 feet to a point;

THENCE South 46°25'45" West, with a north line of Highland Lakes, Phase II, a distance of 63.37 feet to a point being a northwest line of Highland Lakes, Phase II, and being the northeast corner of said City of Lewisville tract;

Thence South 46°20'49" West, with the north line of the City of Lewisville tract, a distance of 167.72 feet to the COE monument No. D 360-5;

THENCE South 00°39'52" West, with the west line of City of Lewisville tract, a distance of 269.90 feet to COE monument No. D 360-6/D 361-I, said point being the northeast corner of said Meadow Lake 4;

THENCE South 81°48'11" West, with the north line of Meadow Lake 4, a distance of 275.00 feet to a COE monument;

THENCE South 13°17'21" West, continue with said north line, a distance of 314.09 feet to a point;

THENCE North 33°51'46" West, continue with said north line, a distance of 328.00 feet to a COE monument;

THENCE South 82°55'14" West, continue with said north line, passing at 436.00 feet a COE monument, in all, distance of 450.00 feet to a 5/8 inch iron rod found for the northwest corner of Meadow Lake 4, said point being on the Highland Village City Limit line per Resolution No. 95-857;

THENCE North 56°12'55" East, with said City Limit line, a distance of 833.00 feet to a point;

THENCE North 36°57'45" East, continue with said line, a distance of 1799.93 feet to a point on the west line of the Right of Way for IH 35E;

THENCE South 09°06'29" East, with said Right of Way line, a distance of 832.64 feet to the POINT OF BEGINNING, and containing approximately 19.96 acres of land.

NOTES:

COE = United States Corps of Engineers

No field survey was performed for this survey. All bearings, distances, and monument calls are based on recorded plat and deed information.

In the event of the creation of changes in the west Right of Way for IH-35E in this area, the City limit line between Lewisville and Highland Village will be based on the most current changes and will be the same as the newly created Right of Way line.

_____ _____

John F. Wilder, RPLS 4285 DATE

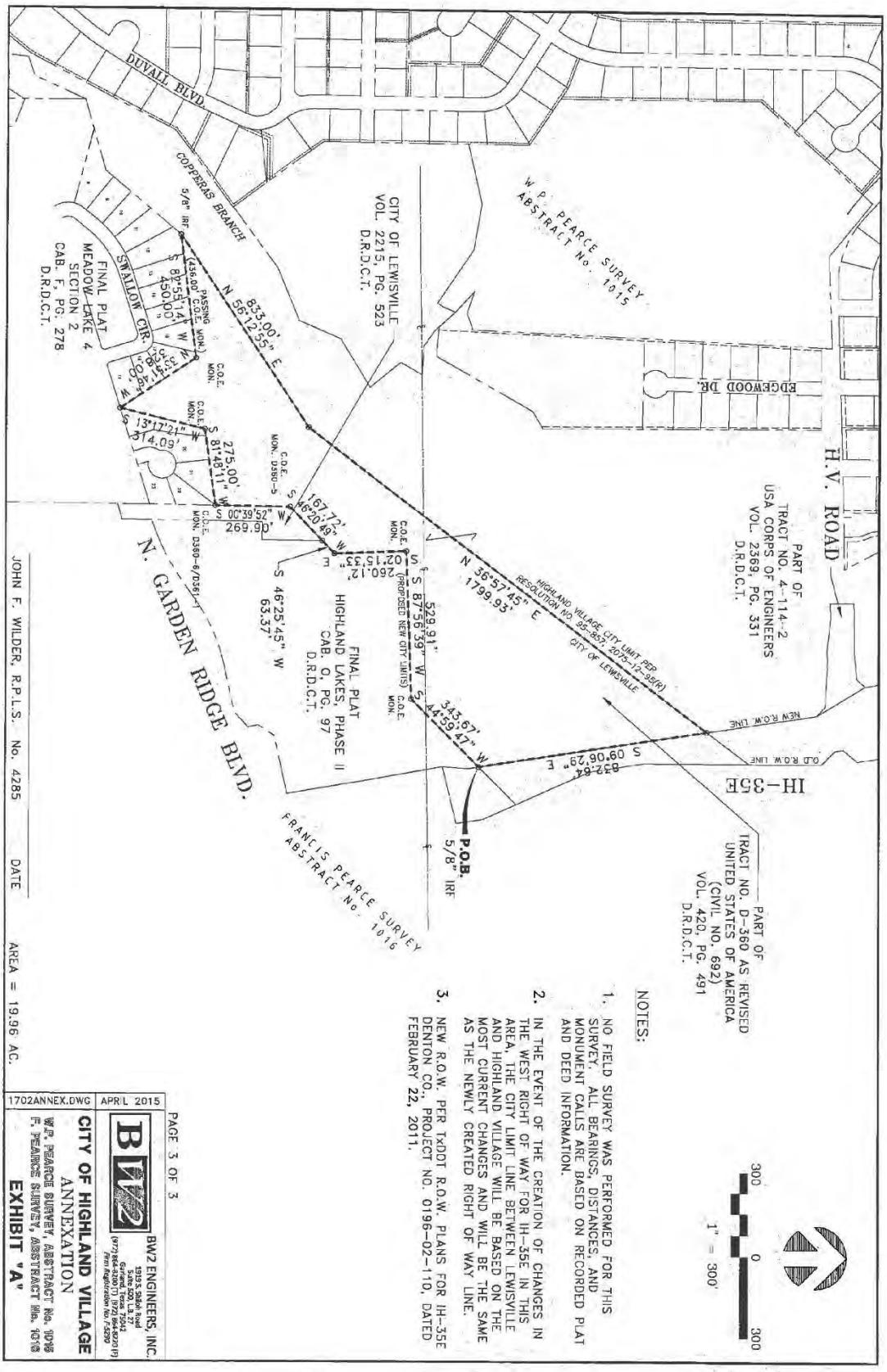


EXHIBIT "B" TO CITY OF HIGHLAND VILLAGE/ CITY OF LEWISVILLE BOUNDARY ADJUSTMENT AGREEMENT – PAGE 3

EXHIBIT C
HIGHLAND VILLAGE SERVICE PLAN

As required by Texas Local Government Code Section 43.065, following is the Service Plan for the property more particularly described and identified as the "Copperas Lake Tract."

As the result of a series of negotiations, the Cities of Highland Village and Lewisville have agreed to a boundary adjustment covering the property described and identified as the Copperas Lake Tract in the Boundary Adjustment Agreement.

The following Municipal Services will be provided by Highland Village to the area within the Copperas Lake Tract upon the effective date of the City of Highland Village ordinance approving and ratifying this Agreement:

A. Police Protection

Police enforcement and protection services are to be provided by the extension of patrol into Copperas Lake Tract and by response from the Highland Village Police Department to individual requests.

B. Fire Protection (including emergency ambulance)

Fire protection personnel and equipment, and emergency medical personnel and equipment will be provided.

C. Solid Waste Collection

In so far as the Copperas Lake Tract is owned by the United States solid waste collection services are anticipated to be necessary. If needed, Highland Village will provide it.

D. Water Service

In so far as the Copperas Lake Tract is owned by the United States of America and constitutes a portion of Lewisville Lake, no extension of water service is anticipated to be necessary. If needed, Highland Village will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

E. Sanitary Sewer Service

In so far as the Copperas Lake Tract is owned by the United States of America and constitutes a portion of Lewisville Lake, no extension of sanitary sewer service is anticipated to be necessary. If needed, Highland Village will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

F. Maintenance of Roads and Streets

The Copperas Lake Tract is a body of water with construction of no roads or streets anticipated.

G. Parks and Recreation

Not applicable since there are no residents to serve within the Copperas Lake Tract.

H. Street Lighting

Not applicable since there are no streets to be served or to be constructed.

I. Traffic Engineering

Not applicable since there are no streets to be served or to be constructed.

K. Planning and Zoning

The planning and zoning jurisdiction, including the subdivision platting process, of the City of Highland Village extends to the Copperas Lake Tract, but will be subject to the Supremacy Clause in the Constitutions of the United States of American and the State of Texas for so long as the property is owned by the federal government.

L. Storm Drainage (including flood plain regulations)

The City's regulations relating to flood plain development and storm water drainage will apply.

M. Capital Improvements

In so far as the Copperas Lake Tract is a body of water owned by the United States of America with no residents, the construction of capital improvements to serve existing developed properties is not required.

N. Miscellaneous

General municipal administrative and code enforcement services of the City of Highland Village will be provided.

EXHIBIT D
LEWISVILLE SERVICE PLAN

As required by Texas Local Government Code Section 43.065, following is the Service Plan for the property more particularly described and identified as the "I-35E Tract."

As the result of a series of negotiations, the Cities of Highland Village and Lewisville have agreed to a boundary adjustment covering the property described and identified as the I-35E Tract in the Boundary Adjustment Agreement.

The following Municipal Services will be provided by Lewisville to the area within the Copperas Lake Tract upon the effective date of the Lewisville ordinance approving and ratifying this Agreement:

A. Police Protection

Police enforcement and protection services are to be provided by the extension of patrol into the I-35E Tract and by response from the Lewisville Police Department to individual requests.

B. Fire Protection (including emergency ambulance)

Fire protection personnel and equipment, and emergency medical personnel and equipment will be provided.

C. Solid Waste Collection

Solid waste collection service is to be provided in accordance with City of Lewisville ordinances, resolutions, and regulations.

D. Water Service

In so far as the property within the I-35E Tract is owned by either the United States of America or the State of Texas, contains no residents, no extension of water service is anticipated to be necessary. If needed, Lewisville will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

E. Sanitary Sewer Service

In so far as the property within the I-35E Tract is owned by either the United States of America or the State of Texas, contains no residents, no extension of sanitary sewer service is anticipated to be necessary. If needed, Lewisville will provide it, with extensions being subject to current ordinances, resolutions, and regulations.

F. Maintenance of Roads and Streets

Not applicable. There are presently no roads or streets owned by the City of Lewisville which serve the I-35E Tract and none are anticipated to be constructed.

G. Parks and Recreation

Not applicable as there will never be any residents within the I-35E Tract to be served.

H. Library Service

Not applicable as there will never be any residents within the I-35E Tract to be served.

I. Street Lighting

Not applicable. There are presently no roads or streets owned by the City of Lewisville which serve the I-35E Tract and none are anticipated to be constructed.

J. Traffic Engineering

Not applicable. There are presently no roads or streets owned by the City of Lewisville which serve the I-35E Tract and none are anticipated to be constructed.

K. Planning and Zoning

The planning and zoning jurisdiction, including the subdivision platting process, of the City of Lewisville extends to the I-35E Tract, but will be subject to the Supremacy Clause in the Constitutions of the United States of American and the State of Texas to the properties owned by the federal or state government.

L. Storm Drainage (including flood plain regulations)

The City's regulations relating to flood plain development and storm water drainage will apply.

M. Capital Improvements

In so far as the I-35E Tract consists of a body of water owned by the United States of America, the travel lanes and service roads of I-35E, and a public park operated by the City of Highland Village, the construction of capital improvements to serve existing developed properties is not required.

N. Miscellaneous

General municipal administrative and code enforcement services of the City of Lewisville will be provided.

O. Copperas Branch Park

Pursuant to agreement with the City of Highland Village, and notwithstanding anything to the contrary contained in this Service Plan, for so long as Highland Village owns and operates Copperas Branch Park pursuant to its lease with the federal government, Highland Village shall provide, and will be solely responsible for providing water, sanitary sewer, solid waste collection (so long as the solid waste collection does not conflict with any existing City of Lewisville solid waste franchise agreement), and other public utility and municipal services to that portion of Copperas Branch Park located within the I-35E Tract.

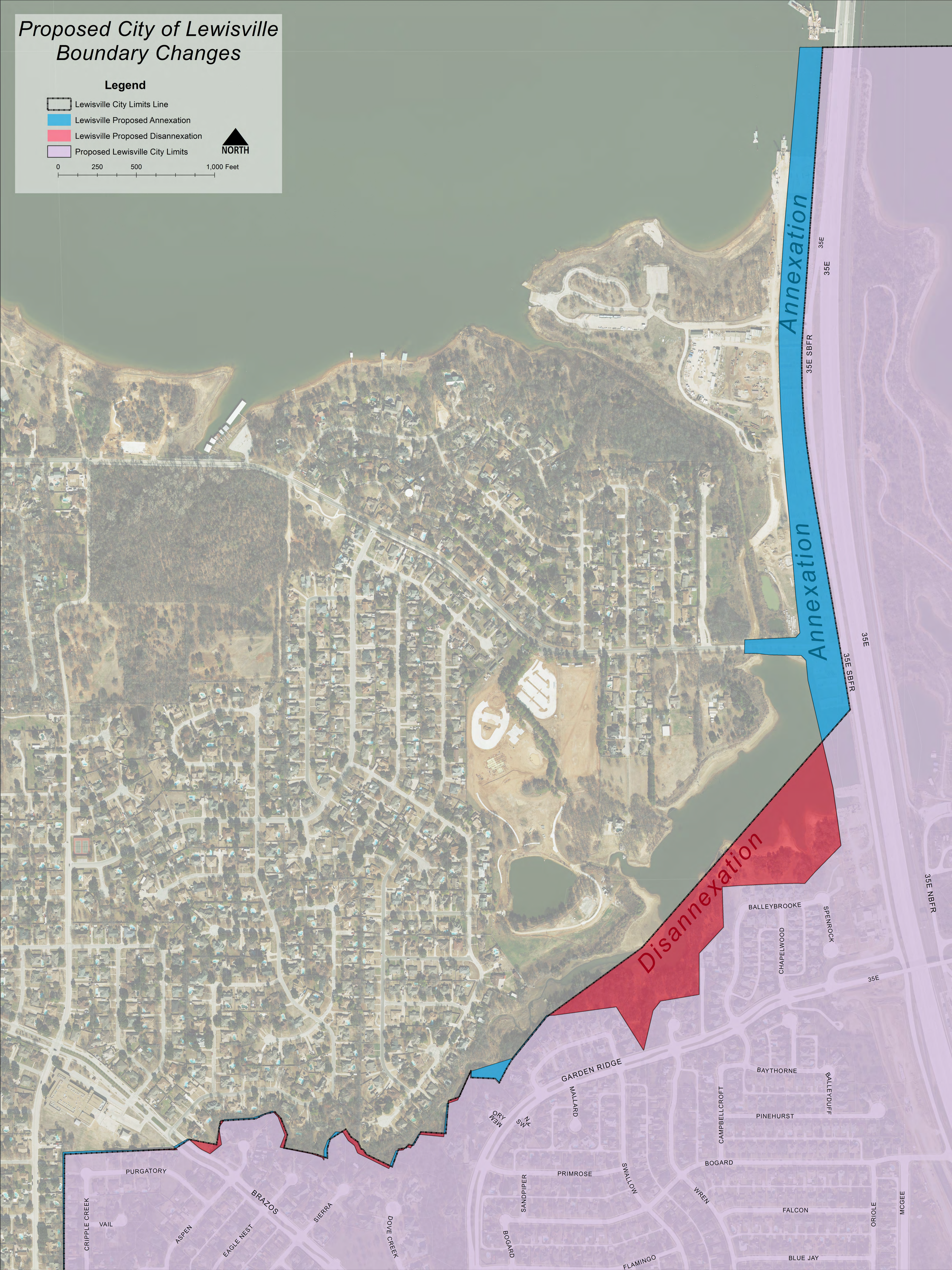
Proposed City of Lewisville Boundary Changes

Legend

- Lewisville City Limits Line
- Lewisville Proposed Annexation
- Lewisville Proposed Disannexation
- Proposed Lewisville City Limits

NORTH

0 250 500 1,000 Feet



MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Office District (OD) to Old Town Mixed Use Two District (OTMU2), on a 0.450-Acre Tract of Land out of the J. W. King Survey, Abstract No. 696; Located on the West Side of Herod Street Approximately 200 Feet North of West Main Street, at 119 Herod Street, as Requested by 119 Herod, LLC, the Property Owner (Case No. PZ-2016-09-22).**

BACKGROUND

The applicant recently purchased the subject property which had been used as a residence by the previous owner until a few years ago. The home was in disrepair and has since been demolished. The applicant is exploring several options for the use of the property. The application indicates a desire to construct an office and/or retail building on the site.

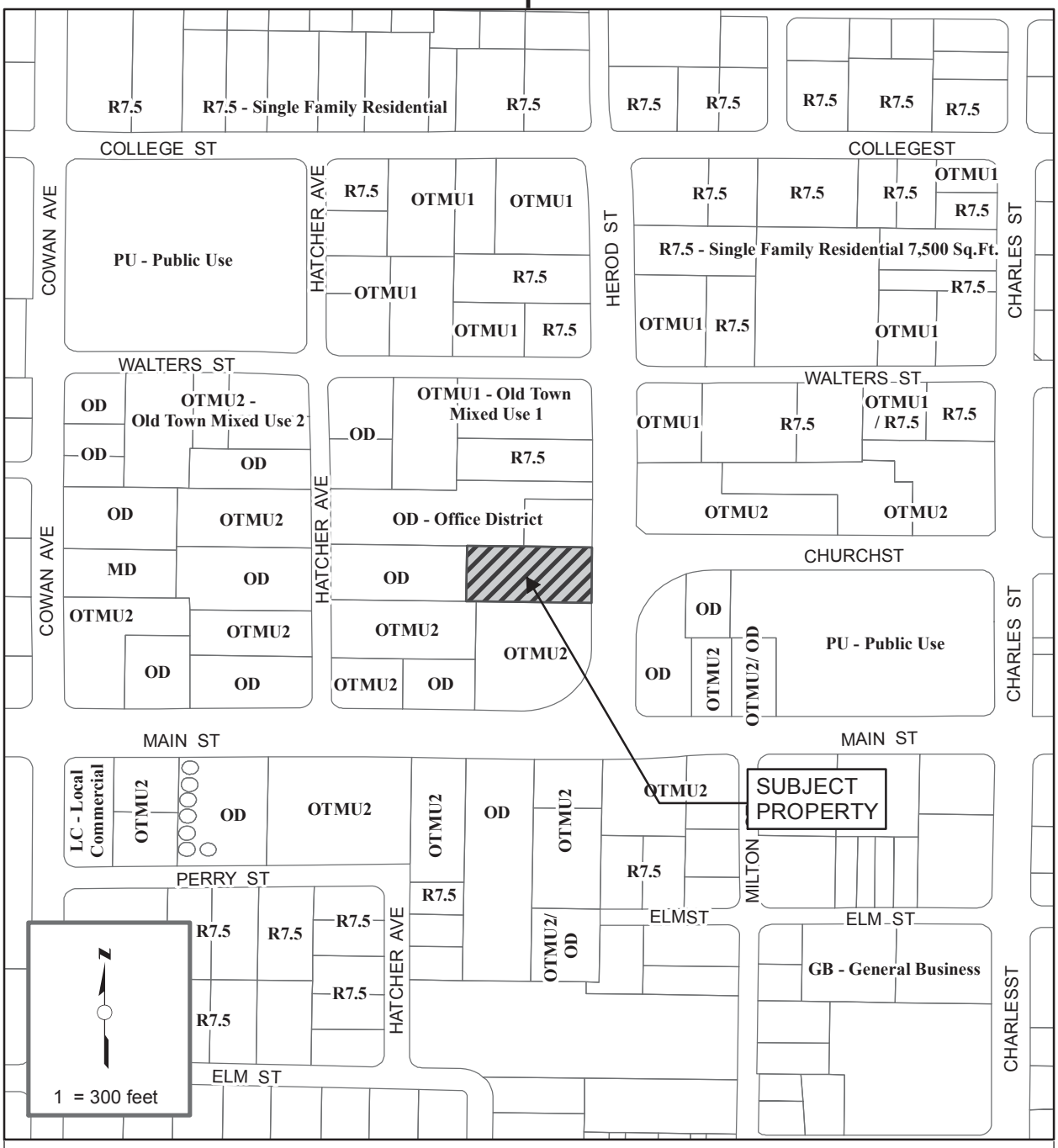
ANALYSIS

The property is located within the Old Town Design District and is southwest of the three new restaurants under construction at West Church Street and Herod Street. The Old Town Master Plan adopted in 2003 recommends that the northern two-thirds of this block be rezoned to Old Town Mixed Use One, while the southern third of the block be rezoned Old Town Mixed Use Two. The idea being that the southern portion fronts onto West Main Street where retail and commercial development is most prevalent. This property is right at the border of this demarcation adjacent to the Bank of the West. With the construction of the restaurant properties, the adjacency of the bank and vicinity to West Main Street, the growing entertainment district and commercial property on West Church Street, staff would recommend approval of this variation from the plan. The OTMU2 is broader in scope, allowing retail and service uses in addition to office uses, while also allowing the residential component that OTMU1 allows. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of September 6, 2016.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed ordinance as set forth in the caption above.

Location Map - 119 Herod



ZONING CASE NO.PZ-2016-09-22

PROPERTY OWNER: 119 HEROD LLC C/O JEFF MILES

APPLICANT: JEFF MILES

PROPERTY LOCATION: 119 HEROD STREET (0.450-ACRES)

CURRENT ZONING: OFFICE DISTRICT (OD)

REQUESTED ZONING: OLD TOWN MIXED USE TWO (OTMU2)

Location Map - 119 Herod

MINUTES
PLANNING AND ZONING COMMISSION
SEPTEMBER 6, 2016

Item 5:

Public Hearing Zoning was the next item on the agenda. There was one item for consideration:

A. **Public Hearing:** Consideration of a Zone Change Request From Office District (OD) to Old Town Mixed Use Two District (OTMU2); on a 0.450-Acres Tract of Land out of the J. W. King Survey, Abstract No. 696; Located at 119 Herod Street, as Requested by 119 Herod, LLC, the Property Owner. (Case No. PZ-2016-09-22).

Staff gave a presentation on the proposed zone change request. The Old Town Master Plan adopted in 2003 recommended that the northern two-thirds of this block be rezoned to Old Town Mixed Use One, while the southern third of the block be rezoned Old Town Mixed Use Two. This property is right at the border of this demarcation adjacent to the Bank of the West. Staff recommended approval of this variation from the plan since it lies at the edge of the growing entertainment and commercial district of Old Town. The OTMU2 District is broader in scope, allowing retail and service uses in addition to office uses, while also allowing the residential component that OTMU1 allows. The public hearing was then opened. Jeff Miles, owner of the property, spoke in favor of the request and was available to answer questions. Kristin Green asked what plans he had for the property. Mr. Miles indicated that he originally planned to build an office building there, but has no final plans as of yet. Mary Ellen Miksa asked if the façade design would be in keeping with the surrounding houses. Mr. Miles indicated that he was not opposed to that and that he wanted the development to fit in with the area. James Davis asked about property boundary issues with the adjacent property owner. Mr. Miles indicated that he would work with the adjacent property owner to resolve her concerns. Staff indicated that any boundary questions would be resolved before City Council approval of the zone change. Kristie Steed, owner of the property on Hatcher Street that backs up to the subject property, also spoke in favor of the zone change request. There being no one else present to speak, the public hearing was then closed. *A motion was made by Kristin Green to recommend approval of the zone change request, seconded by William Meredith. The motion passed unanimously (6-0).* Staff indicated that this item would be going before the City Council on October 3rd for a second public hearing and a final decision.

SECTION 17-19. - "OD" OFFICE DISTRICT REGULATIONS

(a) *Use*.

(1) Professional and administrative offices where only services are provided, no chattels or goods are offered for sale, and no outside storage is provided on the premises. This includes but is not limited to doctors, dentists, attorneys, architects, engineers, insurance, real estate, banks and similar offices.
(2) Business or commercial schools and institutions of education.
(3) Clinics, medical and dental.
(4) Veterinarian or animal clinic, provided the use is operated within an enclosed structure and is not on a lot abutting a single family zoned lot.
(5) Day nurseries.
(6) The incidental retail sale of food, beverages and other convenience items or services is permitted to the occupants, employees and guests, as long as these items are not advertised nor offered for sale to the general public.
(7) Church worship facilities.
(8) Buildings and uses owned or operated by public governmental agencies.
(9) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(10) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, dust noise, vibration or similar nuisance.
(11) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(12) Gas and oil drilling accessory uses (SUP required).
(13) Cemetery, columbarium, mausoleum and accessory uses (SUP required).

(b) *Building and coverage regulations*.

(1) *Building regulations*. The minimum floor area in "OD" office district shall be one thousand (1000) square feet.
(2) *Coverage regulations*. In no case shall any building or building complex cover more than thirty-five percent (35%) of the site area.

(c) *Height*. The maximum height for buildings shall be fifty (50) feet. In no event, however, shall the portion of a building located within one hundred fifty (150) feet of any property zoned for residential purposes exceed the height allowed in that residential zoning district.

(d) *Area*.

(1) *Size of yards*.
a. *Front yard.*
1. There shall be a minimum front yard having a depth of not less than forty (40) feet adjacent to any street with a right-of-way of one hundred (100) feet or more.
2. There shall be a minimum front yard having a depth of not less than thirty (30) feet adjacent to any street with a right-of-way less than one hundred (100) feet.
3. Lots having double frontage, running through from one street to another, shall provide the required setback from both streets.

b. *Side yard*. There shall be a minimum side yard of ten (10) feet on each side of the lot or tract on which any single building or building complex is constructed.

c. *Rear yard*. No rear yard is required except, that a rear yard of not less than twenty-five (25) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. The required rear yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the

screening device when that portion of the building exterior is constructed of the same materials as the screening device.

(2) *Reserved*.

SECTION17-22.7. - "OTMU2" OLD TOWN MIXED USE 2 DISTRICT REGULATIONS

(a) *Use*. A building or premise shall be used only for the following purposes:

(1) Single-family dwellings.
(2) Single-family attached dwellings, provided that no more than nine (9) dwelling units are attached in one continuous row or group, and provided that no dwelling unit is constructed above another dwelling unit.
(3) Two-family dwellings (duplexes).
(4) Multi-family dwellings. Projects shall be a minimum of one (1) acre in land area. More than one lot may be utilized to meet the one-acre requirement as long as the lots are contiguous or directly across street rights-of-way. A minimum of twenty (20) units must be built in the first phase of construction.
(5) Retail establishments including but not limited to: bakeries; book, card, gift and stationary stores; building material sales; clothing; florists; grocery stores; and pet shops or others of a similar nature and subject to the following condition:
   a. Temporary, portable outside display of merchandise is allowed on a daily basis but is limited to the area directly adjacent to the building occupied by the business and no more than five (5) feet from the building. A clear aisle shall be maintained for pedestrian access. Otherwise, no outside display or storage is permitted.
(6) Barber and beauty shops.
(7) Buildings and uses owned or operated by public governmental agencies.
(8) Business or commercial schools.
(9) Church worship facilities.
(10) Clinic, medical and dental, and related professional offices.
(11) Communication towers (SUP required). Towers, antennas and communication dishes located on a building may be extend a maximum of 15 feet above the building, but must be screened from view.
(12) Day nurseries.
(13) Dry cleaning and laundry services.
(14) Gasoline service stations, excluding major motor or transmission repair services (SUP required).
(15) Hotels, motels and inns.
(16) Mortuaries (SUP required).
(17) Professional offices.
(18) Restaurants.
(19) Veterinarian or animal clinic provided that no kennel or exercise runway shall be located outside the building.
(20) Video rental stores and movie theaters.
(21) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, noise, vibration or similar nuisance. Dwelling units of 850 square foot minimum size shall be allowed as an accessory use to retail businesses.
(22) Non-accessory dwelling units of 650 square foot minimum size when located over a retail, restaurant or similar use on the first floor.
(23) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(24) Bed and breakfast (SUP required).
(25) Uses similar to the above mentioned permitted uses; provided activities conducted observe the requirements of all city ordinances.
(26) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(27) Gas and oil drilling accessory uses (SUP required).
(28) Cemetery, columbarium, mausoleum and accessory uses (SUP required).
(29) Brewery, distillery, or winery.
(30) Bar (SUP required).
(31) Hotels, motels and inns with rooms containing a cooktop or oven (SUP required).

(b) Single-family detached and two-family requirements.

(1) *Maximum height*. No building shall exceed forty-five (45) feet or three and one-half (3-1/2) stories in height.
(2) *Minimum dwelling size*. The minimum floor area of any single-family dwelling shall be one thousand seven hundred (1,700) square feet, exclusive of garages, breezeways and porches.
(3) *Front yard*. No front setback is required.
(4) *Side yard*. There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than twenty (20) feet. If a residential garage directly adjoins a rear alley, then the rear yard may be four (4) feet.

(c) *Single-family attached requirements.*

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height.
(2) *Minimum dwelling size*. The minimum floor area of any single-family attached dwelling shall be one thousand two hundred (1,200) square feet.
(3) *Front yard*. No front setback is required.
(4) *Side yard.* There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than six and one half (6.5) feet except if a residential garage directly adjoins a rear alley, then the rear yard may be four (4) feet.

(d) *Multi-family requirements.*

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height excluding parapet walls. Parapet walls shall have a maximum height of eight (8) feet.
(2) *Minimum dwelling size*. The minimum floor area of any multi-family dwelling shall be six hundred fifty (650) square feet, exclusive of garages, breezeways and porches.
(3) *Front yard*. No front setback is required.
(4) *Side yard.* There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than six and one half (6.5) feet except if a residential garage directly adjoins a rear alley, then the rear yard may be zero (0) feet.

(e) *Commercial and institutional building requirements*.

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height excluding parapet walls. Parapet walls shall have a maximum height of eight (8) feet.
(2) *Front yard*. No front setback is required.
(3) *Side yard*. No side yard is required.
(4) *Rear yard*. A rear yard of not less than ten (10) feet in depth shall be provided.

(f) *Other setbacks*.

(1) The old town mixed use 2 district shall not be subject to the following provisions contained elsewhere in this ordinance:
a. "On a corner lot, the width of the yard along the side street shall not be less than any required front yard on the same side of such street between intersecting streets".
b. "…no accessory building shall be…closer than five feet to any rear or side lot line, and, in the case of corner lots, not less than the distance required for buildings from side streets".
c. "In any residential or MF district where 25 percent or more of the frontage upon the same side of a street between intersecting streets is occupied or partially occupied by a building or buildings having front yards of greater depth than is required by this chapter, no other lot upon the same side of such street between such

intersecting streets shall be occupied by a building with a front yard of less than the least depth of any such existing front yards."

(2) There shall be a minimum ten (10) foot setback on the driveway side of a lot when there is not sufficient maneuvering space on site to allow vehicles to exit the lot without backing onto a street identified as a thoroughfare on the Thoroughfare Plan.

This Section (Office Use Only)	
Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE

ZONE CHANGE APPLICATION

Owner/s (name): 119 Herod LLC c/o Jeff Miles, Manager	
Company Name:	
Mailing Address: PO Box 186, Lewisville, TX 75067-0186	
Work #: 972.738.0218	**Cell #:** 214.402.0010
E-Mail: jmiles@milesdevcon.com	
Owner Signature (~~Owner/s Must Sign or Submit~~ Letter of Authorization):	**Date:** 8/17/2016
Printed Name: Jeff Miles, Manager, 119 Herod LLC	

Applicant/Agent (name): Same as owner.	
Company Name:	
Mailing Address:	
Work #:	**Cell #:**
E-Mail:	
Applicant/Agent Signature	**Date:**
Printed Name:	

Current Zoning: OD - Office District **Requested Zoning:** OTMU2 - Old Town Mixed Use 2 **Acres:** 0.450

Legal Description (Lot/ Block/Tract/Abstract): 0.450 Acres out of the J.W. King Survey, Abstract 696.

Address/Location: 119 Herod Street (northwest Corner of W. Church Street and Herod Street)

Application and Sign Fees:

X	Less than 1/2 acre	$ 150.00
	1/2 acre up to 4.99 acres	$ 250.00
	5 acres up to 24.99 acres	$ 400.00

	25 acres up to 49.99 acres	$ 750.00
	50 acres up to 99.99 acres	$1,000.00
	100 acres and more	$1,500.00

Qty: 1	**Zone Change Signs - $35 each.** 1 sign required for each 5 acres (max. 5 per site)	$ $35.00

Sign(s) must be posted a minimum of ten (10) days prior to the Planning & Zoning hearing date.

Amount Due (application & sign fee)	**$** $185.00

LEWISVILLE

REQUIRED:

Fully describe the plans for the property

Office or retail building(s) or combination of both. Exact site configuration is not known yet. The existing building will most likely be removed due to its very poor condition.

NOTE:

Items must be staff approved and deemed complete before they will be placed on an agenda.

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL, AMENDING THE ZONING ORDINANCE BY REZONING APPROXIMATELY 0.450 ACRES OUT OF THE J.W. KING SURVEY, ABSTRACT NO. 696, LOCATED ON THE WEST SIDE OF HEROD STREET APPROXIMATELY 200 FEET NORTH OF WEST MAIN STREET, AT 119 HEROD STREET; FROM OFFICE DISTRICT (OD) ZONING TO OLD TOWN MIXED USE TWO DISTRICT (OTMU2) ZONING; CORRECTING THE OFFICIAL ZONING MAP; PRESERVING ALL OTHER PORTIONS OF THE ZONING ORDINANCE; DETERMINING THAT THE PUBLIC INTERESTS AND GENERAL WELFARE DEMAND THIS ZONING CHANGE AND AMENDMENT THEREIN MADE; PROVIDING FOR A REPEALER, SEVERABILITY, AND A PENALTY; AND DECLARING AN EMERGENCY.

WHEREAS, applications were made to amend the Official Zoning Map of Lewisville, Texas by making applications for same with the Planning and Zoning Commission of the City of Lewisville, Texas, as required by State statutes and the Zoning Ordinances of the City of Lewisville, Texas, said Planning and Zoning Commission has recommended that rezoning of the approximately 0.450-acre property described in the attached Exhibit "A" (the "Property") be **approved**, and all the legal requirements, conditions and prerequisites having been complied with, the case having come before the City Council of the City of Lewisville, Texas, after all legal notices, requirements, conditions and prerequisites having been complied with; and,

WHEREAS, the City Council of the City of Lewisville, Texas, at a public hearing called by the City Council of the City of Lewisville, Texas, did consider the following factors in making a determination as to whether this requested change should be granted or denied: effect on the congestion of the streets; the fire hazards, panics and other dangers possibly present in the securing of safety from same; the effect on the promotion of health and the general welfare; effect on adequate

light and air; the effect on the overcrowding of the land; the effect of the concentration on population; the effect on the transportation, water, sewerage, schools, parks and other public facilities; and,

WHEREAS, the City Council further considered among other things the character of the district and its peculiar suitability for particular uses and with the view to conserve the value of buildings, encourage the most appropriate use of land throughout this City; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that there is a public necessity for the zoning change, that the public interest clearly requires the amendment, that the zoning changes do not unreasonably invade the rights of adjacent property owners; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that the change in zoning lessens the congestion in the streets; helps secure safety from fire, panic and other dangers; promotes health and the general welfare; provides adequate light and air; prevents the overcrowding of land; avoids undue concentration of population; facilitates the adequate provisions of transportation, water, sewerage, schools, parks and other public requirements; and,

WHEREAS, the City Council of the City of Lewisville, Texas, has determined that there is a necessity and need for this change in zoning and has also found and determined that there has been a change in the conditions of the property surrounding and in close proximity to the Property since it was originally classified and, therefore, feels that a change in zoning classification for the Property is needed, is called for, and is in the best interest of the public at large, the citizens of the City of Lewisville, Texas, and helps promote the general health, safety, and welfare of this community.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The Zoning Ordinance of the City of Lewisville, Texas, be, and the same is hereby amended and changed in that the zoning of the Property is hereby changed to **OLD TOWN MIXED USE TWO DISTRICT (OTMU2) ZONING**.

SECTION 2. The City Manager, or her designee, is hereby directed to correct the official zoning map of the City of Lewisville, Texas, to reflect this change in zoning.

SECTION 3. That in all other respects the use of the tract or tracts of land hereinabove described shall be subject to all the applicable regulations contained in said City of Lewisville Zoning Ordinance and all other applicable and pertinent ordinances of the City of Lewisville, Texas.

SECTION 4. That the zoning regulations and districts as herein established have been made in accordance with the comprehensive plan for the purpose of promoting health, safety, and the general welfare of the community. They have been designed with respect to both present conditions and the conditions reasonably anticipated to exist in the foreseeable future, to lessen congestion in the streets; to secure safety from fire, panic, flood and other dangers; provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population; facilitate the adequate provisions of transportation, water, sewage, parks and other public requirements, and to make adequate provisions for the normal business, commercial needs and development of the community. They have been made with reasonable consideration, among other things of the character of the district, and its peculiar suitability for the particular uses and with a view of conserving the value of buildings and encouraging the most appropriate use of land throughout the community.

SECTION 5. This Ordinance shall be cumulative of all other ordinances of the City of Lewisville, Texas, affecting zoning and shall not repeal any of the provisions of said ordinances,

except in those instances where provisions of those ordinances which are in direct conflict with the provisions of this Ordinance.

SECTION 6. That the terms and provisions of this Ordinance shall be deemed to be severable and that if the validity of the zoning affecting any portion of the Property shall be declared to be invalid, the same shall not affect the validity of the zoning of the balance of the tract or tracts of land described herein.

SECTION 7. Any person, firm or corporation who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof in the Municipal Court, shall be subject to a fine of not more than $2,000.00 for each offense, and each and every day such offense is continued shall constitute a new and separate offense.

SECTION 8. The fact that the present Zoning Ordinance and regulations of the City of Lewisville, Texas are inadequate to properly safeguard the health, safety, peace and general welfare of the inhabitants of the City of Lewisville, Texas, creates an emergency for the immediate preservation of the public business, property, health, safety and general welfare of the public which requires that this Ordinance shall become effective from and after the date of its final passage, and it is accordingly so ordained.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Exhibit A
Property Description

EXHIBIT A

PROPERTY DESCRIPTION – 119 HEROD STREET, LEWISVILLE, TX 75057

FIELD NOTE DESCRIPTION:

BEING a 0.450 acre tract of land situated in the J.W. King Survey, Abstract No. 696, in the City of Lewisville, Denton County, Texas, and being that certain tract of land described by deed to Wallace Donald Peterson and wife, Pamela Gail Peterson, a recorded under County Clerk's File No. 94-R0004355, of the Real Property Records of Denton County, Texas (R.P.R.D.C.T.), and being more particularly described as follows:

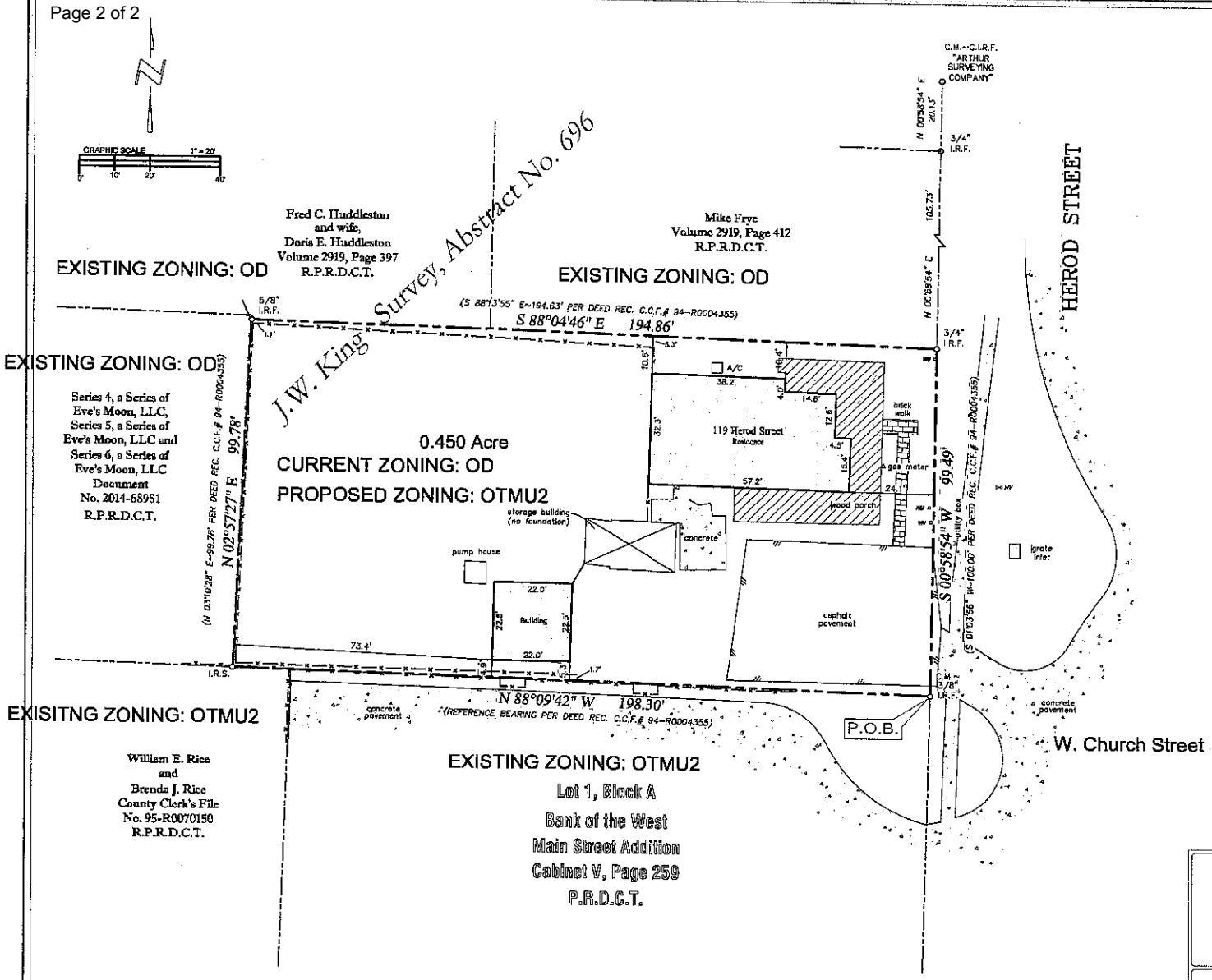
BEGINNING at a 3/8 inch iron rod found for the southeast corner of the herein described tract, same being the northeast corner of Lot 1, Block A of Bank of the West Main Street Addition, an addition to the City of Lewisville, Denton County, Texas, according to the Plat thereof recorded in Cabinet V, Page 259, of the Plat Records of Denton County, Texas, and being in the west line of Herod Street;

THENCE North 88 degrees 09 minutes 42 seconds West, with the north line of said Lot 1, passing en route the northeast corner of that certain tract of land described by deed to William E. Rice and Brenda J. Rice, as recorded under County Clerk's File No. 95-R0070150, R.P.R.D.C.T., continuing on said course for a total distance of 198.30 feet to a ½ inch capped iron rod stamped "ARTHUR SURVEYING COMPANY" set for corner, same being the southeast corner of that certain tract of land described by deed to Series 4, a Series of Eve's Moon, LLC, Series 5, a Series of Eve's Moon, LLC and Series 6, a Series of Eve's Moon, LLC, as recorded in Document No. 2014-68951, R.P.R.D.C.T.;

THENCE North 02 degrees 57 minutes 27 seconds East, with the east line of said Eve's Moon, LLC tract, a distance of 99.78 feet to a 5/8 inch iron rod found for corner, same being in the south line of a tract of land described by deed to Fred C. Huddleston and wife, Doris E. Huddleston, as recorded in Volume 2919, Page 397, R.P.R.D.C.T.;

THENCE South 88 degrees 04 minutes 46 seconds East, with the south line of said Huddleston tract, passing en route the southwest corner of that certain tract of land described by deed to Mike Frye, as recorded in Volume 2919, Page 412, R.P.R.D.C.T., continuing on said course for a total distance of 194.86 feet to a ¼ inch iron rod found for corner, same being in the west line of said Herod Street;

THENCE South 00 degrees 58 minutes 54 seconds West, with the west line of said Herod Street, a distance of 99.49 feet to the **POINT OF BEGINNING** and containing a total of 0.450 acres of land, more or less.



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THENCE South 00 degrees 58 minutes 54 seconds West, with the west line of said Herod Street, a distance of 99.49 feet to the **POINT OF BEGINNING** and containing a total of 0.450 acres of land, more or less.

LEGEND

—X—	FENCE (AT CENTER OF FENCE POST)	W.M.	WATER METER
—OHE—	OVERHEAD POWER	W.V.	WATER VALVE
PP	POWER POLE	I.C. ICV	IRRIGATION CONTROL VALVE
LP	LIGHT POLE	S	TRAFFIC/PARKING SIGN
W	GUY WIRE(S)		
I.R.F.	IRON ROD FOUND		
I.R.S.	IRON ROD SET	T	TELEPHONE MANHOLE
TXDOT MON.	TEXAS DEPARTMENT OF TRANSPORTATION MONUMENT	CATV	CABLE TELEVISION SUB-SURFACE BOX
F.C.P.	FENCE CORNER POST		
I.P.F.	IRON PIPE FOUND		CONCRETE
FH	FIRE HYDRANT		EDGE OF ASPHALT
SS/CO	SANITARY SEWER CLEAN-OUT		COVERED AREA
SEWER	SANITARY SEWER MANHOLE		NOTE: ALL IRON RODS FOUND ARE 1/2" UNLESS OTHERWISE NOTE. ALL IRON RODS SET ARE 1/2" WITH YELLOW CAP STAMPED "ARTHUR SURVEYING COMPANY"

BOUNDARY SURVEY

0.450 acre tract
out of the
J.W. King Survey, Abstract No. 696
City of Lewisville, Denton County, Texas

DRAWN BY: SWIM DATE: 04-21-16 SCALE: 1"= 20' CHECKED BY: DLA ASC NO.: 1604314
Revised 04-28-16

119 Herod Street
Lewisville, Texas

The undersigned have/has received and reviewed a copy of this survey.

X_____

X_____

X_____

Date:_____

FreedomTitle
132 W. Main Street
Lewisville, TX 75057
Ph: 972.436.9141
Fax: 972.434.8712

SURVEYOR'S CERTIFICATION: The undersigned does hereby certify to Jeffrey P. Miles, 119 Herod, LLC and Freedom Title (G.F.# 160334081.V-CH), that this survey was this day made on the ground of the property legally described hereon and is correct and to the best of my knowledge, there are no visible discrepancies, conflicts, shortages in area, boundary line conflicts, encroachments, overlapping of improvements, easements or rights of way except as shown hereon.

FLOOD NOTE: It is my opinion that the property described hereon is not within the 100-year flood zone area according to the Federal Emergency Management Agency Flood Insurance Rate Map Community-Panel No. 480195 0565 G, present effective date of map, April 18, 2011, herein property situated within Zone "X".

Arthur Surveying Co.
Professional Land Surveyors
220 Elm St., # 200 - Lewisville, TX 75057
Ph. 972.221.9439 - TFRN# 10063800
arthursurveying.com Established 1986

STATE OF TEXAS
REGISTERED
DOUGLAS L. ARTHUR
4357
PROFESSIONAL
LAND SURVEYOR

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of a Zone Change Request From Light Industrial District (LI) to Old Town Mixed Use Two District (OTMU2), on 0.2132 Acres Legally Described as Lot 5, Block A, H. D. Williams Addition, Located on the Northeast Corner of North Kealy Avenue and East Walters Street, at 308 N. Kealy Avenue; as Requested by Hector Morales, on Behalf of Amy Sadeghian, Trustee of the Kamy Real Estate Trust, the Property Owner (Case No. PZ-2016-09-23).**

BACKGROUND

The existing residence on this property was built in 1970 and, like other parts of Old Town with residential structures, was rezoned to a commercial designation, even though it was being used as a residence. The applicant is proposing to purchase the property and would like to rezone it to OTMU2 to continue using it as a residence and be able to add a residential storage building onto the property.

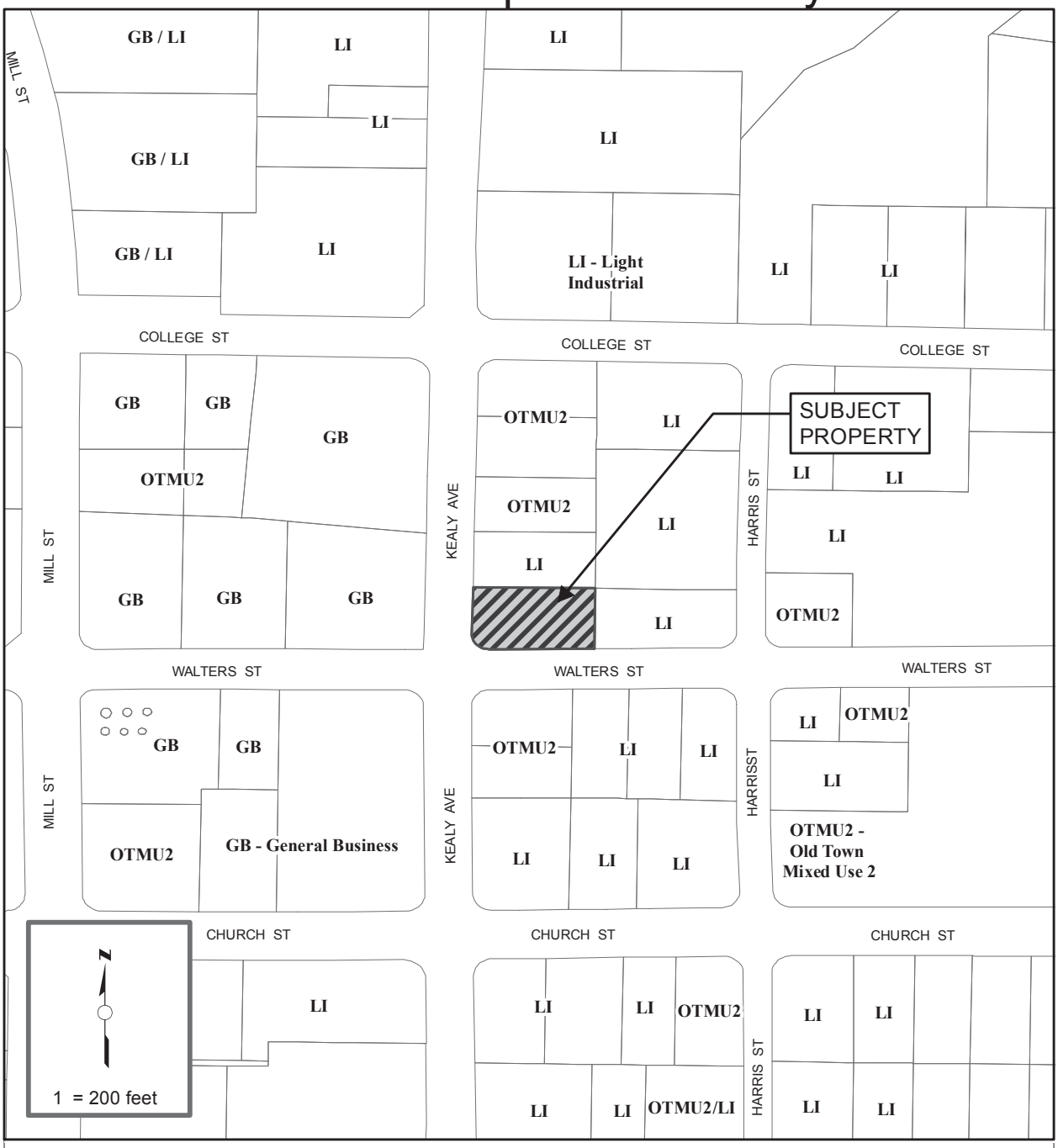
ANALYSIS

The current zoning of the property is Light Industrial (LI), which does not allow a residential use. The existing house is a legal non-conforming structure, which can exist as-is, but any new construction or modification would require the property to comply with the current zoning regulations. The Old Town Mixed Use Two District allows for commercial or residential uses. The proposed zone change will make this property consistent with the existing residential use on the property and is consistent with the zoning recommended for the area. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of October 4, 2016.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed ordinance as set forth in the caption above.

Location Map - 308 N Kealy



ZONING CASE NO.PZ-2016-09-23

PROPERTY OWNER: AMY J. SADEGHIAN, TRUSTEE OF THE KAMY REAL ESTATE TRUST

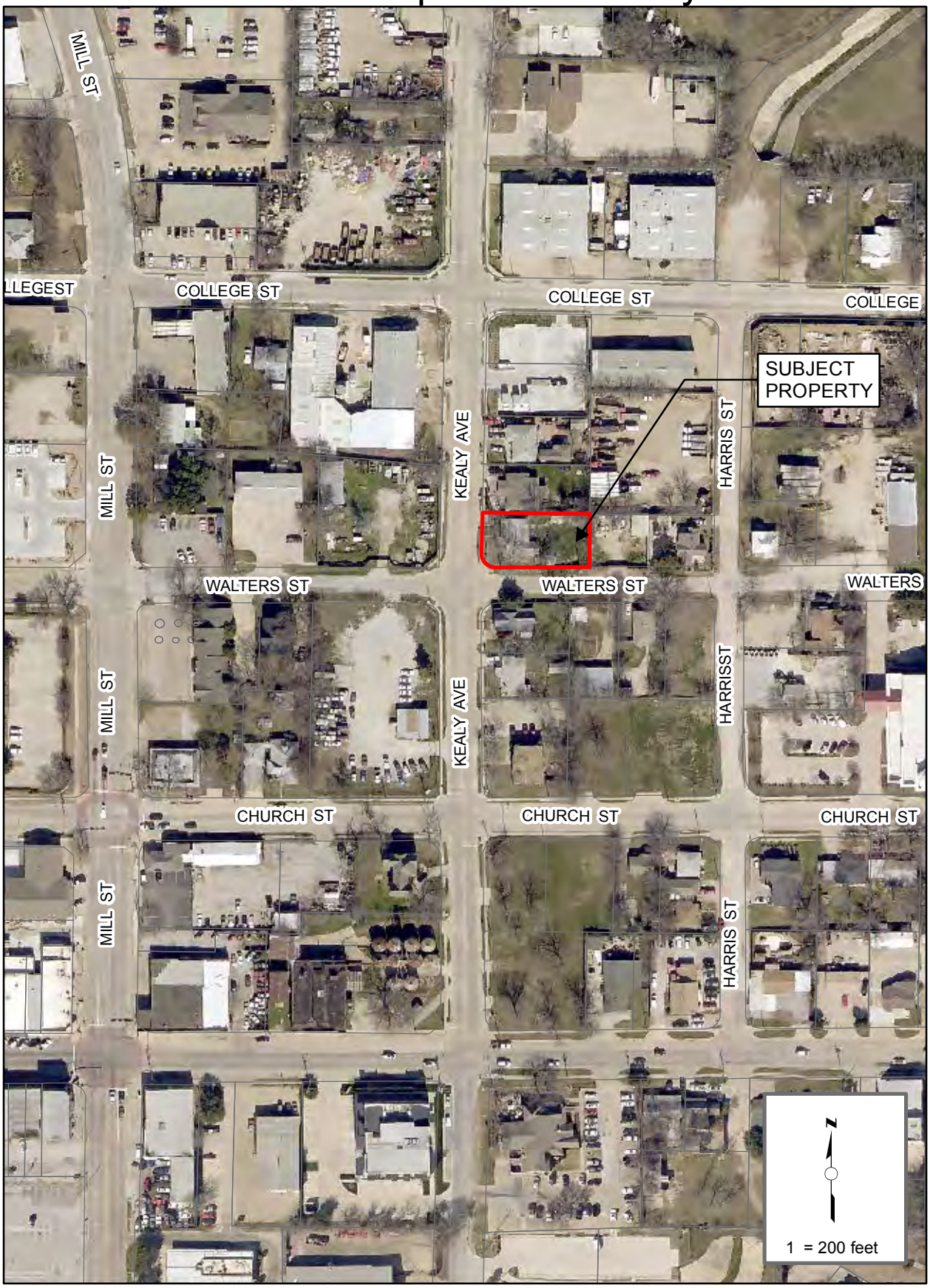
APPLICANT: HECTOR MORALES

PROPERTY LOCATION: 308 N. KEALY AVENUE (0.2132-ACRES)

CURRENT ZONING: LIGHT INDUSTRIAL DISTRICT (LI)

REQUESTED ZONING: OLD TOWN MIXED USE TWO DISTRICT (OTMU2)

Aerial Map - 308 N Kealy



MINUTES
PLANNING AND ZONING COMMISSION
OCTOBER 4, 2016

Item 4:

Public Hearing – Zoning and Special Use Permits were the next item on the agenda. There were three items for consideration:

A. **Public Hearing:** Consideration of a Zone Change Request From Light Industrial District (LI) to Old Town Mixed Use Two District (OTMU2), on 0.2132 Acres Legally Described as Lot 5, Block A, H. D. Williams Addition, Located on the Northeast Corner of North Kealy Avenue and East Walters Street, at 308 N. Kealy Avenue, as Requested by Hector Morales, on Behalf of Amy Sadeghian the Property Owner. (Case No. PZ-2016-09-23).

Staff gave an overview of the proposed zone change request and confirmed that the requested zoning complies with the Old Town Master Plan. The public hearing was then opened by Chairman Davis. There being no public comment, the public hearing was then closed. *A motion was made by William Meridith to recommend approval of the zone change request, seconded by Mary Ellen Miksa. The motion passed unanimously (6-0).* Staff indicated that this item would be going before the City Council on October 17th for a second public hearing and a final decision.

SECTION 17-23. - "LI" LIGHT INDUSTRIAL DISTRICT REGULATIONS

(a) *Use*. Buildings and premises may be used for retail, wholesale, office and service uses and campus style light manufacturing and industrial uses provided there is no dust, fumes, gas, noxious odor, smoke, glare, or other atmospheric influence beyond the boundaries of the property on which such use is located, and which produces no noise exceeding in intensity at the boundary of the property the average intensity of noise of street traffic at that point, and no more than ten percent (10%) of the total lot is used for outside storage, and further provided that such use does not create fire or explosive hazards on adjacent property.

(1) Any use permitted in districts "LC" and "GB" as regulated in said districts.
(2) Apparel and other products assembled from finished textiles.
(3) Bottling works.
(4) Warehouse distribution facilities.
(5) Airport/Heliport (SUP required).
(6) Auto repair shops including body shops (SUP required).
(7) Church worship facilities.
(8) Buildings and uses owned or operated by public governmental agencies.
(9) Cemetery, mausoleum, crematorium & accessory uses (SUP required).
(10) Cosmetic manufacturer.
(11) Drugs and pharmaceutical products manufacturing.
(12) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(13) Electronic products manufacturing.
(14) Fur good manufacture, but not including tanning or dyeing (SUP required).
(15) Gas and oil drilling accessory uses (SUP required).
(16) Glass products, from previously manufactured glass.
(17) Heavy equipment – outdoor rental/sales/display/service (SUP required).
(18) Household appliance products assembly and manufacture from prefabricated parts.
(19) Industrial and manufacturing plants including the processing or assembling of parts for production of finished equipment.
(20) Musical instruments assembly and manufacture.
(21) Paint, shellac and varnish manufacture (SUP required).
(22) Plastic products manufacture, but not including the processing of raw materials.
(23) Racing facilities (SUP required).
(24) Recreational Vehicle (RV) Park. (Private) (SUP required).
(25) Self storage/mini warehouse facility (SUP required).
(26) Shooting Range (indoor or outdoor) (SUP required.).
(27) Sporting and athletic equipment manufacture.
(28) Testing and research laboratories.
(29) Auction yard (vehicle) (SUP required).
(30) Communication towers (SUP required).
(31) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(32) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, noise, vibration or similar nuisance. Open storage shall be considered an accessory use but no more than ten percent (10%) of the platted lot may be used for outside storage, including access and maneuvering areas for moving the stored items.
(33) Cemetery, columbarium, mausoleum and accessory uses (SUP required).
(34) Other uses similar to the above listed uses are allowed by special use permit (SUP) only, except that the following uses are specifically prohibited:
    a. Acetylene gas manufacture or storage.
    b. Acid manufacture.
    c. Alcohol manufacture.
    d. Ammonia, bleaching powder or chlorine manufacture.
    e. Arsenal.
    f. Asphalt manufacture or refining.
    g. Blast furnace.
    h. Bag cleaning, unless clearly accessory to the manufacture of bags.

i. Boiler works.
j. Brick, tile, pottery or terra cotta manufacture other than the manufacture of handcraft or concrete products.
k. Reserved.
l. Celluloid manufacture or treatment.
m. Cement, lime, gypsum, or plaster of paris manufacture.
n. Central mixing plant for cement.
o. Coke ovens.
p. Cotton gins.
q. Cottonseed oil manufacture.
r. Creosote manufacture or treatment.
s. Disinfectants manufacture.
t. Distillation of bones, coal or wood.
u. Dyestuff manufacture.
v. Exterminator and insect poison manufacture.
w. Emery cloth and sandpaper manufacture.
x. Explosives or fireworks manufacture or storage.
y. Fat rendering.
z. Fertilizer manufacture.
aa. Fish smoking and curing.
bb. Forge plant.
cc. Garbage, offal or dead animals reduction or dumping.
dd. Gas manufacture or storage, for heating or illuminating purposes.
ee. Glue, size or gelatine manufacture.
ff. Hatchery.
gg. Iron, steel, brass or copper foundry or fabrication plant.
hh. Junk, iron or rag storage or baling.
ii. Match manufacture.
jj. Lampblack manufacture.
kk. Oilcloth or linoleum manufacture.
ll. Oiled rubber goods manufacture.
mm. Ore reduction.
nn. Oil or turpentine manufacture.
oo. Paper and pulp manufacture.
pp. Petroleum or its products, refining or wholesale storage of.
qq. Pickle manufacturing.
rr. Planing mills.
ss. Potash works.
tt. Pyroxline manufacture.
uu. Rock crusher.
vv. Rolling mill.
ww. Rubber or gutta-percha manufacture or treatment but not the making of articles out of rubber.
xx. Sauerkraut manufacture.
yy. Salt works.
zz. Shoe polish manufacture.
aaa. Smelting of tin, copper, zinc, or iron ores.
bbb. Soap manufacture other than liquid soap.
ccc. Soda and compound manufacture.
ddd. Stock yard or slaughter of animals or fowls.
eee. Stone mill or quarry.
fff. Storage yard.
ggg. Stove polish manufacture.
hhh. Tallow grease or lard manufacture or refining from or of animal fat.
iii. Tanning, curing or storage of raw hides or skins.
jjj. Tar distillation or manufacture.
kkk. Tar roofing or water-proofing manufacture.
lll. Tobacco (chewing) manufacture or treatment.
mmm. Vinegar manufacture.

nnn. Wool pulling or scouring.
ooo. Yeast plant.

(b) *Height*. No building shall exceed in height the width of the street right-of-way on which it faces plus the depth of the front yard. In no event, however, shall the portion of a building located within one hundred fifty (150) feet of any property zoned for residential purposes exceed the height allowed in that residential zoning district.

(c) *Area*.

(1) *Size of yards*.

a. *Front yard*. There shall be a front yard having a minimum depth of twenty-five (25) feet. No parking, storage or similar use shall be allowed in required front yards in district "LI", except that automobile parking (including automobile dealer display parking) will be permitted in such yards if separated by at least twenty-five (25) feet from any residential district.

b. *Side yard*. A side yard of not less than fifteen (15) feet in width shall be provided on the side of a lot adjoining a side street. A side yard of not less than ten (10) feet in width shall be provided on the side of a lot adjoining a residential district. The required side yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the screening device when that portion of the building exterior is constructed of the same materials as the screening device. No parking, storage or similar use shall be allowed in any required side yard or in any side street yard adjoining a residential district.

c. *Rear yard.* No rear yard is required except that a rear yard of not less than fifty (50) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. No parking, storage or similar use shall be allowed in required rear yards in district "LI" within twenty-five (25) feet of the rear property line.

(2) *Reserved*.

(d) *Outside storage regulations*. In all zoning districts where outside storage yards are allowed, such storage yards shall be screened from view in accordance with the standards outlined in the city's general development ordinance. This provision applies to all outside storage which began after the original date of passage of this provision (April 4, 1994). Any variance request involving the requirements or standards relating to such required screening devices shall be considered by the city council in accordance with the city's general development ordinance. Areas which are used for infrequent and temporary storage for a period of thirty (30) days or less per year shall not be deemed as "storage yards".

SECTION17-22.7. - "OTMU2" OLD TOWN MIXED USE 2 DISTRICT REGULATIONS

(a) *Use*. A building or premise shall be used only for the following purposes:

(1) Single-family dwellings.
(2) Single-family attached dwellings, provided that no more than nine (9) dwelling units are attached in one continuous row or group, and provided that no dwelling unit is constructed above another dwelling unit.
(3) Two-family dwellings (duplexes).
(4) Multi-family dwellings. Projects shall be a minimum of one (1) acre in land area. More than one lot may be utilized to meet the one-acre requirement as long as the lots are contiguous or directly across street rights-of-way. A minimum of twenty (20) units must be built in the first phase of construction.
(5) Retail establishments including but not limited to: bakeries; book, card, gift and stationary stores; building material sales; clothing; florists; grocery stores; and pet shops or others of a similar nature and subject to the following condition:
   a. Temporary, portable outside display of merchandise is allowed on a daily basis but is limited to the area directly adjacent to the building occupied by the business and no more than five (5) feet from the building. A clear aisle shall be maintained for pedestrian access. Otherwise, no outside display or storage is permitted.
(6) Barber and beauty shops.
(7) Buildings and uses owned or operated by public governmental agencies.
(8) Business or commercial schools.
(9) Church worship facilities.
(10) Clinic, medical and dental, and related professional offices.
(11) Communication towers (SUP required). Towers, antennas and communication dishes located on a building may be extend a maximum of 15 feet above the building, but must be screened from view.
(12) Day nurseries.
(13) Dry cleaning and laundry services.
(14) Gasoline service stations, excluding major motor or transmission repair services (SUP required).
(15) Hotels, motels and inns.
(16) Mortuaries (SUP required).
(17) Professional offices.
(18) Restaurants.
(19) Veterinarian or animal clinic provided that no kennel or exercise runway shall be located outside the building.
(20) Video rental stores and movie theaters.
(21) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, noise, vibration or similar nuisance. Dwelling units of 850 square foot minimum size shall be allowed as an accessory use to retail businesses.
(22) Non-accessory dwelling units of 650 square foot minimum size when located over a retail, restaurant or similar use on the first floor.
(23) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(24) Bed and breakfast (SUP required).
(25) Uses similar to the above mentioned permitted uses; provided activities conducted observe the requirements of all city ordinances.
(26) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(27) Gas and oil drilling accessory uses (SUP required).
(28) Cemetery, columbarium, mausoleum and accessory uses (SUP required).
(29) Brewery, distillery, or winery.
(30) Bar (SUP required).
(31) Hotels, motels and inns with rooms containing a cooktop or oven (SUP required).

(b) Single-family detached and two-family requirements.

(1) *Maximum height*. No building shall exceed forty-five (45) feet or three and one-half (3-1/2) stories in height.
(2) *Minimum dwelling size*. The minimum floor area of any single-family dwelling shall be one thousand seven hundred (1,700) square feet, exclusive of garages, breezeways and porches.
(3) *Front yard*. No front setback is required.
(4) *Side yard*. There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than twenty (20) feet. If a residential garage directly adjoins a rear alley, then the rear yard may be four (4) feet.

(c) *Single-family attached requirements.*

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height.
(2) *Minimum dwelling size*. The minimum floor area of any single-family attached dwelling shall be one thousand two hundred (1,200) square feet.
(3) *Front yard*. No front setback is required.
(4) *Side yard.* There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than six and one half (6.5) feet except if a residential garage directly adjoins a rear alley, then the rear yard may be four (4) feet.

(d) *Multi-family requirements.*

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height excluding parapet walls. Parapet walls shall have a maximum height of eight (8) feet.
(2) *Minimum dwelling size*. The minimum floor area of any multi-family dwelling shall be six hundred fifty (650) square feet, exclusive of garages, breezeways and porches.
(3) *Front yard*. No front setback is required.
(4) *Side yard.* There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than six and one half (6.5) feet except if a residential garage directly adjoins a rear alley, then the rear yard may be zero (0) feet.

(e) *Commercial and institutional building requirements*.

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height excluding parapet walls. Parapet walls shall have a maximum height of eight (8) feet.
(2) *Front yard*. No front setback is required.
(3) *Side yard*. No side yard is required.
(4) *Rear yard*. A rear yard of not less than ten (10) feet in depth shall be provided.

(f) *Other setbacks*.

(1) The old town mixed use 2 district shall not be subject to the following provisions contained elsewhere in this ordinance:
a. "On a corner lot, the width of the yard along the side street shall not be less than any required front yard on the same side of such street between intersecting streets".
b. "…no accessory building shall be…closer than five feet to any rear or side lot line, and, in the case of corner lots, not less than the distance required for buildings from side streets".
c. "In any residential or MF district where 25 percent or more of the frontage upon the same side of a street between intersecting streets is occupied or partially occupied by a building or buildings having front yards of greater depth than is required by this chapter, no other lot upon the same side of such street between such

intersecting streets shall be occupied by a building with a front yard of less than the least depth of any such existing front yards."

(2) There shall be a minimum ten (10) foot setback on the driveway side of a lot when there is not sufficient maneuvering space on site to allow vehicles to exit the lot without backing onto a street identified as a thoroughfare on the Thoroughfare Plan.

Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE

Zone Change Application

Owner/s (name):	Khosrow Sadeghian, Amy Sadeghian
Company Name:	Kamy Investments
Mailing Address:	P.O. Box 50593, Denton, Tx. 76206
Work #: 940-536-1275	Cell #: 972-365-3630
E-Mail:	sadeghian@hotmail.com
Owner Signature	Date: 9-2-16
Printed Name:	Khosrow Sadeghian, Amy Sadeghian

Applicant/Agent (name):	Hector Morales
Company Name:	
Mailing Address:	308 N. Kealy Ave
Work #: 972-482-7950	Cell #: 214-868-5388
E-Mail:	moralesjunior90@gmail.com
Applicant/Agent Signature	Date: 8/31/16
Printed Name:	Hector Morales Jr.

Current Zoning: L.I. Requested Zoning: OTMU2 Acres: 0.2132

Legal Description (Lot/ Block/Tract/Abstract): Williams H.D. Blk A Lots, Abst. 698 Addition.

Address/Location: 308 N. Kealy Ave

Application and Sign Fees:

	Less than 1/2 acre	$ 150.00
	1/2 acre up to 4.99 acres	$ 250.00
	5 acres up to 24.99 acres	$ 400.00

	25 acres up to 49.99 acres	$ 750.00
	50 acres up to 99.99 acres	$1,000.00
	100 acres and more	$1,500.00

Qty: 1	**Zone Change Signs - $35 each.** 1 sign required for each 5 acres (max. 5 per site)	$ 35

Amount Due (application & sign fee)	$ 35

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL, AMENDING THE ZONING ORDINANCE BY REZONING APPROXIMATELY 0.2132 ACRES LEGALLY DESCRIBED AS LOT 5, BLOCK A, H.D. WILLIAMS ADDITION, LOCATED ON THE NORTHEAST CORNER OF NORTH KEALY AVENUE AND EAST WALTERS STREET, AT 308 NORTH KEALY AVENUE; FROM LIGHT INDUSTRIAL DISTRICT (LI) ZONING TO OLD TOWN MIXED USE TWO DISTRICT (OTMU2) ZONING; CORRECTING THE OFFICIAL ZONING MAP; PRESERVING ALL OTHER PORTIONS OF THE ZONING ORDINANCE; DETERMINING THAT THE PUBLIC INTERESTS AND GENERAL WELFARE DEMAND THIS ZONING CHANGE AND AMENDMENT THEREIN MADE; PROVIDING FOR A REPEALER, SEVERABILITY, AND A PENALTY; AND DECLARING AN EMERGENCY.

WHEREAS, applications were made to amend the Official Zoning Map of Lewisville, Texas by making applications for same with the Planning and Zoning Commission of the City of Lewisville, Texas, as required by State statutes and the Zoning Ordinances of the City of Lewisville, Texas, said Planning and Zoning Commission has recommended that rezoning of the approximately 0.2132-acre property described in the attached Exhibit "A" (the "Property") be **approved**, and all the legal requirements, conditions and prerequisites having been complied with, the case having come before the City Council of the City of Lewisville, Texas, after all legal notices, requirements, conditions and prerequisites having been complied with; and,

WHEREAS, the City Council of the City of Lewisville, Texas, at a public hearing called by the City Council of the City of Lewisville, Texas, did consider the following factors in making a determination as to whether this requested change should be granted or denied: effect on the congestion of the streets; the fire hazards, panics and other dangers possibly present in the securing

of safety from same; the effect on the promotion of health and the general welfare; effect on adequate light and air; the effect on the overcrowding of the land; the effect of the concentration on population; the effect on the transportation, water, sewerage, schools, parks and other public facilities; and,

WHEREAS, the City Council further considered among other things the character of the district and its peculiar suitability for particular uses and with the view to conserve the value of buildings, encourage the most appropriate use of land throughout this City; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that there is a public necessity for the zoning change, that the public interest clearly requires the amendment, that the zoning changes do not unreasonably invade the rights of adjacent property owners; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that the change in zoning lessens the congestion in the streets; helps secure safety from fire, panic and other dangers; promotes health and the general welfare; provides adequate light and air; prevents the overcrowding of land; avoids undue concentration of population; facilitates the adequate provisions of transportation, water, sewerage, schools, parks and other public requirements; and,

WHEREAS, the City Council of the City of Lewisville, Texas, has determined that there is a necessity and need for this change in zoning and has also found and determined that there has been a change in the conditions of the property surrounding and in close proximity to the Property since it was originally classified and, therefore, feels that a change in zoning classification for the Property is needed, is called for, and is in the best interest of the public at large, the citizens of the City of Lewisville, Texas, and helps promote the general health, safety, and welfare of this community.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The Zoning Ordinance of the City of Lewisville, Texas, be, and the same is hereby amended and changed in that the zoning of the Property is hereby changed to **OLD TOWN MIXED USE TWO DISTRICT (OTMU2) ZONING**.

SECTION 2. The City Manager, or her designee, is hereby directed to correct the official zoning map of the City of Lewisville, Texas, to reflect this change in zoning.

SECTION 3. That in all other respects the use of the tract or tracts of land hereinabove described shall be subject to all the applicable regulations contained in said City of Lewisville Zoning Ordinance and all other applicable and pertinent ordinances of the City of Lewisville, Texas.

SECTION 4. That the zoning regulations and districts as herein established have been made in accordance with the comprehensive plan for the purpose of promoting health, safety, and the general welfare of the community. They have been designed with respect to both present conditions and the conditions reasonably anticipated to exist in the foreseeable future, to lessen congestion in the streets; to secure safety from fire, panic, flood and other dangers; provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population; facilitate the adequate provisions of transportation, water, sewage, parks and other public requirements, and to make adequate provisions for the normal business, commercial needs and development of the community. They have been made with reasonable consideration, among other things of the character of the district, and its peculiar suitability for the particular uses and with a view of conserving the value of buildings and encouraging the most appropriate use of land throughout the community.

SECTION 5. This Ordinance shall be cumulative of all other ordinances of the City of Lewisville, Texas, affecting zoning and shall not repeal any of the provisions of said ordinances, except in those instances where provisions of those ordinances which are in direct conflict with the provisions of this Ordinance.

SECTION 6. That the terms and provisions of this Ordinance shall be deemed to be severable and that if the validity of the zoning affecting any portion of the Property shall be declared to be invalid, the same shall not affect the validity of the zoning of the balance of the tract or tracts of land described herein.

SECTION 7. Any person, firm or corporation who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof in the Municipal Court, shall be subject to a fine of not more than $2,000.00 for each offense, and each and every day such offense is continued shall constitute a new and separate offense.

SECTION 8. The fact that the present Zoning Ordinance and regulations of the City of Lewisville, Texas are inadequate to properly safeguard the health, safety, peace and general welfare of the inhabitants of the City of Lewisville, Texas, creates an emergency for the immediate preservation of the public business, property, health, safety and general welfare of the public which requires that this Ordinance shall become effective from and after the date of its final passage, and it is accordingly so ordained.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

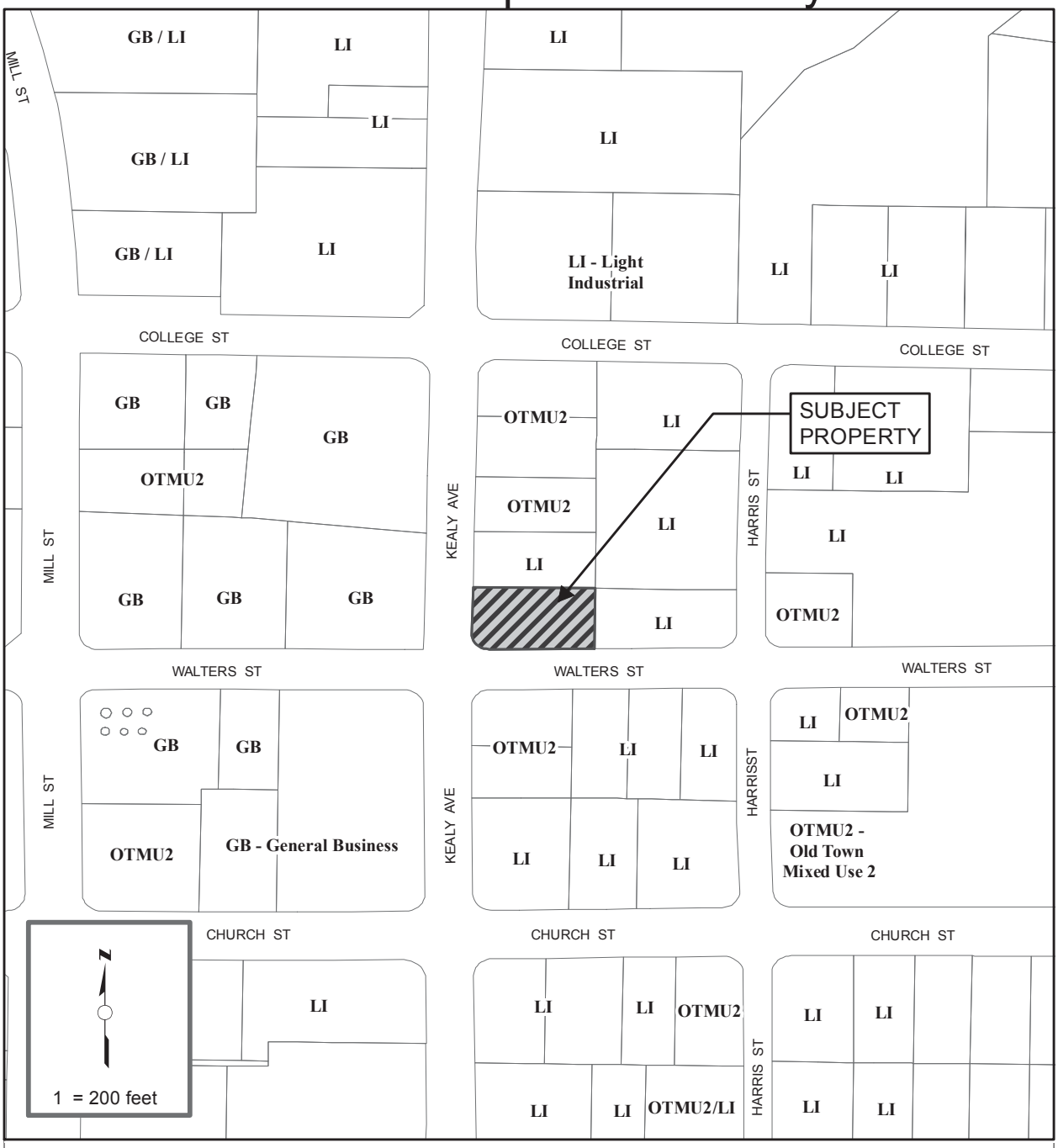
APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Exhibit A
Property Description

EXHIBIT A - Lot 5, Block A, H.D. Williams Addition

Location Map - 308 N Kealy



ZONING CASE NO.PZ-2016-09-23

PROPERTY OWNER: AMY J. SADEGHIAN, TRUSTEE OF THE KAMY REAL ESTATE TRUST

APPLICANT: HECTOR MORALES

PROPERTY LOCATION: 308 N. KEALY AVENUE (0.2132-ACRES)

CURRENT ZONING: LIGHT INDUSTRIAL DISTRICT (LI)

REQUESTED ZONING: OLD TOWN MIXED USE TWO DISTRICT (OTMU2)

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Light Industrial District (LI) to Old Town Mixed Use Two District (OTMU2) on 0.517 Acres Legally Described as a Portion of Lot 7, and all of Lots 8, 9 and 10, Block 7, Kealy Addition, Located on the Northwest Corner of East Church Street and Harris Street, at 219 and 231 East Church Street; as Requested by Robert Gavitt, on Behalf of Les Moore Construction Inc., the Property Owner (Case No. PZ-2016-09-24).**

BACKGROUND

The approximately 0.517-acre property is located on the northwest corner of Harris Street and East Church Street. The property is currently vacant. The applicant has expressed an interest in development of the property for a Domino's Pizza restaurant which would include a limited seating area.

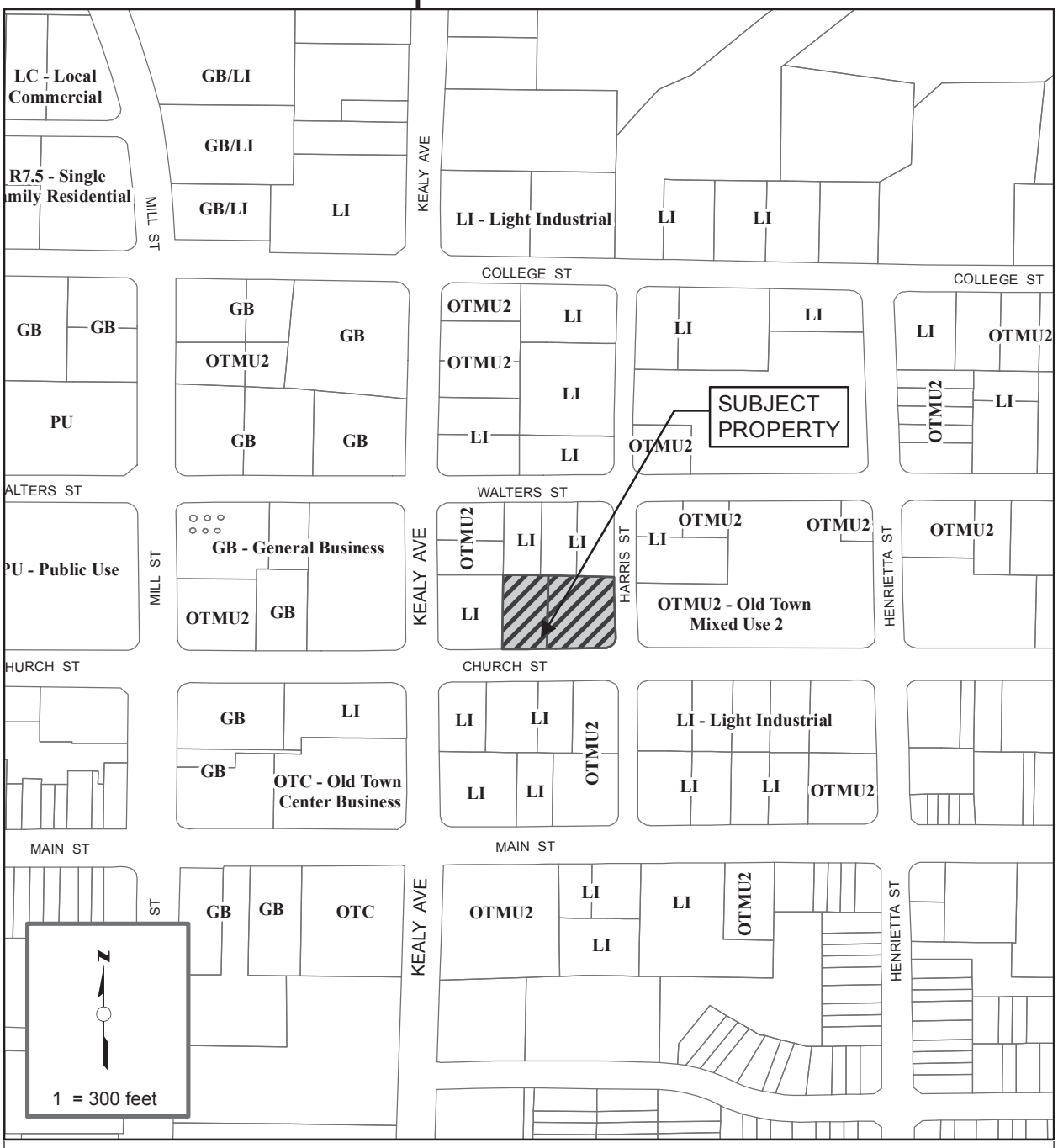
ANALYSIS

The property is located within the Old Town Design District two blocks east of City Hall. The current zoning would allow for the proposed use, however, the proposed zoning provides more flexible setbacks for development of the property. The Old Town Master Plan recommends Old Town Mixed Use Two District (OTMU2) zoning for this entire block. The OTMU2 District allows retail, restaurant, service and office uses in addition to residential uses. The Planning and Zoning Commission recommended unanimous approval (5-0) of the zone change request at their meeting of September 20, 2016.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed ordinance as set forth in the caption above.

Location Map - 231 & 219 E. Church



ZONING CASE NO.PZ-2016-09-24

PROPERTY OWNER: LESLIE MOORE, LES MOORE CONSTRUCTION, INC.

APPLICANT: ROBERT GAVITT

PROPERTY LOCATION: 231 E. CHURCH ST & 219 E. CHURCH ST (0.517-ACRES)

CURRENT ZONING: LIGHT INDUSTRIAL (LI)

REQUESTED ZONING: OLD TOWN MIXED USE TWO (OTMU2)

Aerial Map - 231 & 219 E. Church

MINUTES
PLANNING AND ZONING COMMISSION
SEPTEMBER 20, 2016

Item 4:

Public Hearing – Zoning and Special Use Permits were the next item on the agenda. There were three items for consideration:

A. **Public Hearing:** Consideration of a Zone Change Request From Light Industrial District (LI) to Old Town Mixed Use Two District (OTMU2), on 0.517 Acres in the Kealy Addition, Being Part of Lot 7, and all of Lots 8, 9 and 10, Block 7; Further Identified as 231 E. Church Street and 219 E. Church Street; as Requested by Robert Gavitt, on Behalf of Les Moore Construction Inc., the Property Owner. (Case No. PZ-2016-09-24).

Staff gave an overview of the proposed zone change request and confirmed that the requested zoning complies with the Old Town Master Plan. The public hearing was then opened by Chairman Davis. There being no public comment, the public hearing was then closed. *A motion was made by Kristin Green to recommend approval of the zone change request, seconded by Alvin Turner. The motion passed unanimously (5-0).* Staff indicated that this item would be going before the City Council on October 17th for a second public hearing and a final decision.

SECTION 17-23. - "LI" LIGHT INDUSTRIAL DISTRICT REGULATIONS

(a) *Use*. Buildings and premises may be used for retail, wholesale, office and service uses and campus style light manufacturing and industrial uses provided there is no dust, fumes, gas, noxious odor, smoke, glare, or other atmospheric influence beyond the boundaries of the property on which such use is located, and which produces no noise exceeding in intensity at the boundary of the property the average intensity of noise of street traffic at that point, and no more than ten percent (10%) of the total lot is used for outside storage, and further provided that such use does not create fire or explosive hazards on adjacent property.

(1) Any use permitted in districts "LC" and "GB" as regulated in said districts.
(2) Apparel and other products assembled from finished textiles.
(3) Bottling works.
(4) Warehouse distribution facilities.
(5) Airport/Heliport (SUP required).
(6) Auto repair shops including body shops (SUP required).
(7) Church worship facilities.
(8) Buildings and uses owned or operated by public governmental agencies.
(9) Cemetery, mausoleum, crematorium & accessory uses (SUP required).
(10) Cosmetic manufacturer.
(11) Drugs and pharmaceutical products manufacturing.
(12) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(13) Electronic products manufacturing.
(14) Fur good manufacture, but not including tanning or dyeing (SUP required).
(15) Gas and oil drilling accessory uses (SUP required).
(16) Glass products, from previously manufactured glass.
(17) Heavy equipment – outdoor rental/sales/display/service (SUP required).
(18) Household appliance products assembly and manufacture from prefabricated parts.
(19) Industrial and manufacturing plants including the processing or assembling of parts for production of finished equipment.
(20) Musical instruments assembly and manufacture.
(21) Paint, shellac and varnish manufacture (SUP required).
(22) Plastic products manufacture, but not including the processing of raw materials.
(23) Racing facilities (SUP required).
(24) Recreational Vehicle (RV) Park. (Private) (SUP required).
(25) Self storage/mini warehouse facility (SUP required).
(26) Shooting Range (indoor or outdoor) (SUP required.).
(27) Sporting and athletic equipment manufacture.
(28) Testing and research laboratories.
(29) Auction yard (vehicle) (SUP required).
(30) Communication towers (SUP required).
(31) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(32) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, noise, vibration or similar nuisance. Open storage shall be considered an accessory use but no more than ten percent (10%) of the platted lot may be used for outside storage, including access and maneuvering areas for moving the stored items.
(33) Cemetery, columbarium, mausoleum and accessory uses (SUP required).
(34) Other uses similar to the above listed uses are allowed by special use permit (SUP) only, except that the following uses are specifically prohibited:
    a. Acetylene gas manufacture or storage.
    b. Acid manufacture.
    c. Alcohol manufacture.
    d. Ammonia, bleaching powder or chlorine manufacture.
    e. Arsenal.
    f. Asphalt manufacture or refining.
    g. Blast furnace.
    h. Bag cleaning, unless clearly accessory to the manufacture of bags.

i. Boiler works.
j. Brick, tile, pottery or terra cotta manufacture other than the manufacture of handcraft or concrete products.
k. Reserved.
l. Celluloid manufacture or treatment.
m. Cement, lime, gypsum, or plaster of paris manufacture.
n. Central mixing plant for cement.
o. Coke ovens.
p. Cotton gins.
q. Cottonseed oil manufacture.
r. Creosote manufacture or treatment.
s. Disinfectants manufacture.
t. Distillation of bones, coal or wood.
u. Dyestuff manufacture.
v. Exterminator and insect poison manufacture.
w. Emery cloth and sandpaper manufacture.
x. Explosives or fireworks manufacture or storage.
y. Fat rendering.
z. Fertilizer manufacture.
aa. Fish smoking and curing.
bb. Forge plant.
cc. Garbage, offal or dead animals reduction or dumping.
dd. Gas manufacture or storage, for heating or illuminating purposes.
ee. Glue, size or gelatine manufacture.
ff. Hatchery.
gg. Iron, steel, brass or copper foundry or fabrication plant.
hh. Junk, iron or rag storage or baling.
ii. Match manufacture.
jj. Lampblack manufacture.
kk. Oilcloth or linoleum manufacture.
ll. Oiled rubber goods manufacture.
mm. Ore reduction.
nn. Oil or turpentine manufacture.
oo. Paper and pulp manufacture.
pp. Petroleum or its products, refining or wholesale storage of.
qq. Pickle manufacturing.
rr. Planing mills.
ss. Potash works.
tt. Pyroxline manufacture.
uu. Rock crusher.
vv. Rolling mill.
ww. Rubber or gutta-percha manufacture or treatment but not the making of articles out of rubber.
xx. Sauerkraut manufacture.
yy. Salt works.
zz. Shoe polish manufacture.
aaa. Smelting of tin, copper, zinc, or iron ores.
bbb. Soap manufacture other than liquid soap.
ccc. Soda and compound manufacture.
ddd. Stock yard or slaughter of animals or fowls.
eee. Stone mill or quarry.
fff. Storage yard.
ggg. Stove polish manufacture.
hhh. Tallow grease or lard manufacture or refining from or of animal fat.
iii. Tanning, curing or storage of raw hides or skins.
jjj. Tar distillation or manufacture.
kkk. Tar roofing or water-proofing manufacture.
lll. Tobacco (chewing) manufacture or treatment.
mmm. Vinegar manufacture.

nnn. Wool pulling or scouring.
ooo. Yeast plant.

(b) *Height*. No building shall exceed in height the width of the street right-of-way on which it faces plus the depth of the front yard. In no event, however, shall the portion of a building located within one hundred fifty (150) feet of any property zoned for residential purposes exceed the height allowed in that residential zoning district.

(c) *Area*.

(1) *Size of yards*.

a. *Front yard*. There shall be a front yard having a minimum depth of twenty-five (25) feet. No parking, storage or similar use shall be allowed in required front yards in district "LI", except that automobile parking (including automobile dealer display parking) will be permitted in such yards if separated by at least twenty-five (25) feet from any residential district.

b. *Side yard*. A side yard of not less than fifteen (15) feet in width shall be provided on the side of a lot adjoining a side street. A side yard of not less than ten (10) feet in width shall be provided on the side of a lot adjoining a residential district. The required side yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the screening device when that portion of the building exterior is constructed of the same materials as the screening device. No parking, storage or similar use shall be allowed in any required side yard or in any side street yard adjoining a residential district.

c. *Rear yard.* No rear yard is required except that a rear yard of not less than fifty (50) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. No parking, storage or similar use shall be allowed in required rear yards in district "LI" within twenty-five (25) feet of the rear property line.

(2) *Reserved*.

(d) *Outside storage regulations*. In all zoning districts where outside storage yards are allowed, such storage yards shall be screened from view in accordance with the standards outlined in the city's general development ordinance. This provision applies to all outside storage which began after the original date of passage of this provision (April 4, 1994). Any variance request involving the requirements or standards relating to such required screening devices shall be considered by the city council in accordance with the city's general development ordinance. Areas which are used for infrequent and temporary storage for a period of thirty (30) days or less per year shall not be deemed as "storage yards".

SECTION17-22.7. - "OTMU2" OLD TOWN MIXED USE 2 DISTRICT REGULATIONS

(a) *Use*. A building or premise shall be used only for the following purposes:

(1) Single-family dwellings.
(2) Single-family attached dwellings, provided that no more than nine (9) dwelling units are attached in one continuous row or group, and provided that no dwelling unit is constructed above another dwelling unit.
(3) Two-family dwellings (duplexes).
(4) Multi-family dwellings. Projects shall be a minimum of one (1) acre in land area. More than one lot may be utilized to meet the one-acre requirement as long as the lots are contiguous or directly across street rights-of-way. A minimum of twenty (20) units must be built in the first phase of construction.
(5) Retail establishments including but not limited to: bakeries; book, card, gift and stationary stores; building material sales; clothing; florists; grocery stores; and pet shops or others of a similar nature and subject to the following condition:
   a. Temporary, portable outside display of merchandise is allowed on a daily basis but is limited to the area directly adjacent to the building occupied by the business and no more than five (5) feet from the building. A clear aisle shall be maintained for pedestrian access. Otherwise, no outside display or storage is permitted.
(6) Barber and beauty shops.
(7) Buildings and uses owned or operated by public governmental agencies.
(8) Business or commercial schools.
(9) Church worship facilities.
(10) Clinic, medical and dental, and related professional offices.
(11) Communication towers (SUP required). Towers, antennas and communication dishes located on a building may be extend a maximum of 15 feet above the building, but must be screened from view.
(12) Day nurseries.
(13) Dry cleaning and laundry services.
(14) Gasoline service stations, excluding major motor or transmission repair services (SUP required).
(15) Hotels, motels and inns.
(16) Mortuaries (SUP required).
(17) Professional offices.
(18) Restaurants.
(19) Veterinarian or animal clinic provided that no kennel or exercise runway shall be located outside the building.
(20) Video rental stores and movie theaters.
(21) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, noise, vibration or similar nuisance. Dwelling units of 850 square foot minimum size shall be allowed as an accessory use to retail businesses.
(22) Non-accessory dwelling units of 650 square foot minimum size when located over a retail, restaurant or similar use on the first floor.
(23) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(24) Bed and breakfast (SUP required).
(25) Uses similar to the above mentioned permitted uses; provided activities conducted observe the requirements of all city ordinances.
(26) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(27) Gas and oil drilling accessory uses (SUP required).
(28) Cemetery, columbarium, mausoleum and accessory uses (SUP required).
(29) Brewery, distillery, or winery.
(30) Bar (SUP required).
(31) Hotels, motels and inns with rooms containing a cooktop or oven (SUP required).

(b) Single-family detached and two-family requirements.

(1) *Maximum height*. No building shall exceed forty-five (45) feet or three and one-half (3-1/2) stories in height.
(2) *Minimum dwelling size*. The minimum floor area of any single-family dwelling shall be one thousand seven hundred (1,700) square feet, exclusive of garages, breezeways and porches.
(3) *Front yard*. No front setback is required.
(4) *Side yard*. There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than twenty (20) feet. If a residential garage directly adjoins a rear alley, then the rear yard may be four (4) feet.

(c) *Single-family attached requirements.*

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height.
(2) *Minimum dwelling size*. The minimum floor area of any single-family attached dwelling shall be one thousand two hundred (1,200) square feet.
(3) *Front yard*. No front setback is required.
(4) *Side yard.* There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than six and one half (6.5) feet except if a residential garage directly adjoins a rear alley, then the rear yard may be four (4) feet.

(d) *Multi-family requirements.*

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height excluding parapet walls. Parapet walls shall have a maximum height of eight (8) feet.
(2) *Minimum dwelling size*. The minimum floor area of any multi-family dwelling shall be six hundred fifty (650) square feet, exclusive of garages, breezeways and porches.
(3) *Front yard*. No front setback is required.
(4) *Side yard.* There shall be a side yard on each side of the lot having a width of not less than five (5) feet.
(5) *Rear yard*. There shall be a rear yard having a depth of not less than six and one half (6.5) feet except if a residential garage directly adjoins a rear alley, then the rear yard may be zero (0) feet.

(e) *Commercial and institutional building requirements*.

(1) *Maximum height*. No building shall exceed seventy-five (75) feet in height excluding parapet walls. Parapet walls shall have a maximum height of eight (8) feet.
(2) *Front yard*. No front setback is required.
(3) *Side yard*. No side yard is required.
(4) *Rear yard*. A rear yard of not less than ten (10) feet in depth shall be provided.

(f) *Other setbacks*.

(1) The old town mixed use 2 district shall not be subject to the following provisions contained elsewhere in this ordinance:
a. "On a corner lot, the width of the yard along the side street shall not be less than any required front yard on the same side of such street between intersecting streets".
b. "…no accessory building shall be…closer than five feet to any rear or side lot line, and, in the case of corner lots, not less than the distance required for buildings from side streets".
c. "In any residential or MF district where 25 percent or more of the frontage upon the same side of a street between intersecting streets is occupied or partially occupied by a building or buildings having front yards of greater depth than is required by this chapter, no other lot upon the same side of such street between such

intersecting streets shall be occupied by a building with a front yard of less than the least depth of any such existing front yards."

(2) There shall be a minimum ten (10) foot setback on the driveway side of a lot when there is not sufficient maneuvering space on site to allow vehicles to exit the lot without backing onto a street identified as a thoroughfare on the Thoroughfare Plan.

This Section (Office Use Only)	
Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE
Deep Roots. Broad Wings. Bright Future

ZONE CHANGE APPLICATION

Owner/s (name):	Leslie Moore
Company Name:	Les Moore Construction, Inc.
Mailing Address:	112 Henrietta Suite A Lewisville, TX 75057
Work #: 972-436-9077	Cell #: 972-841-9078
E-Mail:	les@moreconstructiontx.com
Owner Signature (Owner/s Must Sign or Submit Letter of Authorization):	Date: 8/26/16
Printed Name:	Leslie G. Moore

Applicant/Agent (name):	ROBERT GAVITT
Company Name:	TBD
Mailing Address:	2800 SCENIC DR FLOWER MOUND TX 75022
Work #: 972-219-1717	Cell #: 214-808-0420
E-Mail:	RGAVITT @ VERIZON.NET
Applicant/Agent Signature	Date:
Printed Name:	ROBERT GAVITT

Current Zoning: LI Requested Zoning: OTMU2 Acres: .50

Legal Description (Lot/ Block/Tract/Abstract): LOT 7,8 BLOCK 7 KEALY ADDITION
LOT 9 BLOCK 7 KEALY ADDITION

Address/Location: 231 E. CHURCH & 219 E. CHURCH

Application and Sign Fees:

	Less than 1/2 acre	$ 150.00
✓	1/2 acre up to 4.99 acres	$ 250.00
	5 acres up to 24.99 acres	$ 400.00

	25 acres up to 49.99 acres	$ 750.00
	50 acres up to 99.99 acres	$1,000.00
	100 acres and more	$1,500.00

Qty: 1	Zone Change Signs - $35 each. 1 sign required for each 5 acres (max. 5 per site)	$ 35

Sign(s) must be posted a minimum of ten (10) days prior to the Planning & Zoning hearing date.

Amount Due (application & sign fee)	$ ~~285~~ 35

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

REQUIRED:

Fully describe the plans for the property

I PLAN TO BUILD A SINGLE TENANT BUILDING TO HOUSE A DOMINO'S PIZZA STORE. IT WILL BE 2000-2400 SQUARE FEET AND HAVE LIMITED SEATING.

NOTE:

Items must be staff approved and deemed complete before they will be placed on an agenda.

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL, AMENDING THE ZONING ORDINANCE BY REZONING APPROXIMATELY 0.517 ACRES LEGALLY DESCRIBED AS A PORTION OF LOT 7 AND ALL OF LOTS 8, 9 AND 10, BLOCK 7, KEALY ADDITION, LOCATED ON THE NORTHWEST CORNER OF EAST CHURCH STREET AND HARRIS STREET, AT 219 AND 231 EAST CHURCH STREET; FROM LIGHT INDUSTRIAL DISTRICT (LI) ZONING TO OLD TOWN MIXED USE TWO DISTRICT (OTMU2) ZONING; CORRECTING THE OFFICIAL ZONING MAP; PRESERVING ALL OTHER PORTIONS OF THE ZONING ORDINANCE; DETERMINING THAT THE PUBLIC INTERESTS AND GENERAL WELFARE DEMAND THIS ZONING CHANGE AND AMENDMENT THEREIN MADE; PROVIDING FOR A REPEALER, SEVERABILITY, AND A PENALTY; AND DECLARING AN EMERGENCY.

WHEREAS, applications were made to amend the Official Zoning Map of Lewisville, Texas by making applications for same with the Planning and Zoning Commission of the City of Lewisville, Texas, as required by State statutes and the Zoning Ordinances of the City of Lewisville, Texas, said Planning and Zoning Commission has recommended that rezoning of the approximately 0.517-acre property described in the attached Exhibit "A" (the "Property") be **approved**, and all the legal requirements, conditions and prerequisites having been complied with, the case having come before the City Council of the City of Lewisville, Texas, after all legal notices, requirements, conditions and prerequisites having been complied with; and,

WHEREAS, the City Council of the City of Lewisville, Texas, at a public hearing called by the City Council of the City of Lewisville, Texas, did consider the following factors in making a determination as to whether this requested change should be granted or denied: effect on the congestion of the streets; the fire hazards, panics and other dangers possibly present in the securing

of safety from same; the effect on the promotion of health and the general welfare; effect on adequate light and air; the effect on the overcrowding of the land; the effect of the concentration on population; the effect on the transportation, water, sewerage, schools, parks and other public facilities; and,

WHEREAS, the City Council further considered among other things the character of the district and its peculiar suitability for particular uses and with the view to conserve the value of buildings, encourage the most appropriate use of land throughout this City; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that there is a public necessity for the zoning change, that the public interest clearly requires the amendment, that the zoning changes do not unreasonably invade the rights of adjacent property owners; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that the change in zoning lessens the congestion in the streets; helps secure safety from fire, panic and other dangers; promotes health and the general welfare; provides adequate light and air; prevents the overcrowding of land; avoids undue concentration of population; facilitates the adequate provisions of transportation, water, sewerage, schools, parks and other public requirements; and,

WHEREAS, the City Council of the City of Lewisville, Texas, has determined that there is a necessity and need for this change in zoning and has also found and determined that there has been a change in the conditions of the property surrounding and in close proximity to the Property since it was originally classified and, therefore, feels that a change in zoning classification for the Property is needed, is called for, and is in the best interest of the public at large, the citizens of the City of Lewisville, Texas, and helps promote the general health, safety, and welfare of this community.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The Zoning Ordinance of the City of Lewisville, Texas, be, and the same is hereby amended and changed in that the zoning of the Property is hereby changed to **OLD TOWN MIXED USE TWO DISTRICT (OTMU2) ZONING**.

SECTION 2. The City Manager, or her designee, is hereby directed to correct the official zoning map of the City of Lewisville, Texas, to reflect this change in zoning.

SECTION 3. That in all other respects the use of the tract or tracts of land hereinabove described shall be subject to all the applicable regulations contained in said City of Lewisville Zoning Ordinance and all other applicable and pertinent ordinances of the City of Lewisville, Texas.

SECTION 4. That the zoning regulations and districts as herein established have been made in accordance with the comprehensive plan for the purpose of promoting health, safety, and the general welfare of the community. They have been designed with respect to both present conditions and the conditions reasonably anticipated to exist in the foreseeable future, to lessen congestion in the streets; to secure safety from fire, panic, flood and other dangers; provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population; facilitate the adequate provisions of transportation, water, sewage, parks and other public requirements, and to make adequate provisions for the normal business, commercial needs and development of the community. They have been made with reasonable consideration, among other things of the character of the district, and its peculiar suitability for the particular uses and with a view of conserving the value of buildings and encouraging the most appropriate use of land throughout the community.

SECTION 5. This Ordinance shall be cumulative of all other ordinances of the City of Lewisville, Texas, affecting zoning and shall not repeal any of the provisions of said ordinances, except in those instances where provisions of those ordinances which are in direct conflict with the provisions of this Ordinance.

SECTION 6. That the terms and provisions of this Ordinance shall be deemed to be severable and that if the validity of the zoning affecting any portion of the Property shall be declared to be invalid, the same shall not affect the validity of the zoning of the balance of the tract or tracts of land described herein.

SECTION 7. Any person, firm or corporation who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof in the Municipal Court, shall be subject to a fine of not more than $2,000.00 for each offense, and each and every day such offense is continued shall constitute a new and separate offense.

SECTION 8. The fact that the present Zoning Ordinance and regulations of the City of Lewisville, Texas are inadequate to properly safeguard the health, safety, peace and general welfare of the inhabitants of the City of Lewisville, Texas, creates an emergency for the immediate preservation of the public business, property, health, safety and general welfare of the public which requires that this Ordinance shall become effective from and after the date of its final passage, and it is accordingly so ordained.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Exhibit A
Property Description

EXHIBIT A

BEING all that certain lot, tract or parcel of land situated in the A.G. King Survey, Abstract Number 698, and being part of Lot 7, and all of Lots 8, 9 and 10, Block VII, Kealy Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Volume 1, Page 5, Plat Records, Denton County, Texas, and being that same tract of land described by deed to Les Moore Construction, LLC. Recorded under Instrument Number 2010-7789, Official Public Records, Denton County, Texas (O.P.R.D.C.T.), and being more particularly described as follows;

BEGINNING at a 1/2 inch iron rod found for corner being the southwest corner of the herein described tract, same being the southeast corner of a tract of land described by deed to Bradley Dee Compton and Alysee Babbette Compton, recorded under Instrument Number 2007-48623, O.P.R.D.C.T., same point being in the north right-of-way line of Church Street;

THENCE North 00 degrees 09 minutes 15 seconds East, with the east line of said Compton tract, a distance of 132.28 feet to a 1/2 inch iron rod found for corner being the southeast corner of a tract of land described by deed to Series 1, a Series of Life Style, LLC., recorded under Instrument Number 2015-91270, O.P.R.D.C.T., and being the southwest corner of a tract of land described by deed to John Andrew Orrin Hewitt, recorded under Instrument Number 93-38385, O.P.R.D.C.T., same point being the northeast corner of said Compton tract;

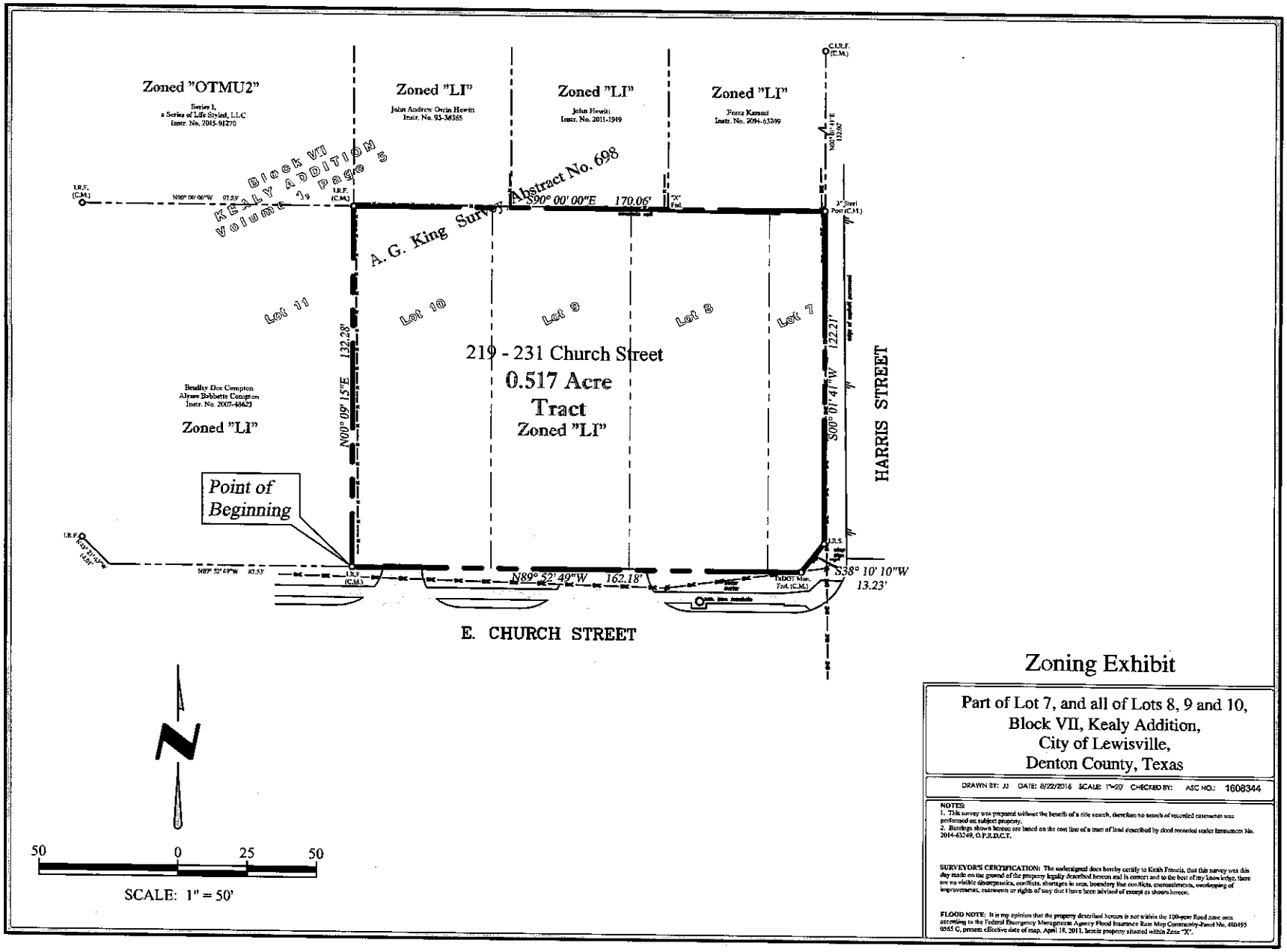
THENCE South 90 degrees 00 minutes 00 seconds East, passing the southeast corner of said Hewitt tract, continuing on for a total distance of 170.06 feet to a 3 inch steel post found for corner being the southeast corner of a tract of land described by deed to Faraz Karami, recorded under Instrument number 2014-63249, O.P.R.D.C.T., same point being in the west right-of-way line of Harris Street;

THENCE South 00 degrees 01 minutes 41 seconds West, with said west line of Harris Street, a distance of 122.21 feet to a 1/2 inch iron rod with yellow cap stamped *"ARTHUR SURVEYING COMPANY"* set for corner being the most northerly corner of a right-of-way dedication to the City of Lewisville, recorded under Instrument Number 95-5399, O.P.R.D.C.T.;

THENCE South 38 degrees 10 minutes 10 seconds West, with said right-of-way tract, a distance of 13.23 feet to a TxDOT Monument Found for corner being the southwest corner of said right-of-way tract, same point being in said north right-of-way line of Church Street;

THENCE North 89 degrees 52 minutes 49 seconds West, with said north right-of-way line of Church Street, a distance of 162.18 feet to the **POINT OF BEGINNING** and containing 0.517 acre of land, more or less.

Attachment to
Ordinance No. _____
Exhibit "A"
Page 2 of 2



Zoning Exhibit

Part of Lot 7, and all of Lots 8, 9 and 10,
Block VII, Kealy Addition,
City of Lewisville,
Denton County, Texas

DRAWN BY: JJ DATE: 8/22/2016 SCALE: 1"=20' CHECKED BY: ASC NO.: 1608344

NOTES:
1. This survey was prepared without the benefit of a title search, therefore no search of recorded easements was performed on subject property.
2. Bearings shown hereon are based on the east line of a tract of land described by deed recorded under Instrument No. 2014-63249, O.P.R.D.C.T.

SURVEYOR'S CERTIFICATION: The undersigned does hereby certify to Keith Francis, that this survey was this day made on the ground of the property legally described hereon and is correct and to the best of my knowledge, there are no visible discrepancies, conflicts, shortages in area, boundary line conflicts, encroachments, overlapping of improvements, easements or rights of way that I have been advised of except as shown hereon.

FLOOD NOTE: It is my opinion that the property described hereon is not within the 100-year flood zone area according to the Federal Emergency Management Agency Flood Insurance Rate Map Community-Panel No. 480195 0565 G, present effective date of map, April 18, 2011, herein property situated within Zone "X".

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Office District (OD) to Single Family Residential District (R-7.5); on a 0.309 Acres Legally Described as Lot 3, Block E, Hivue Addition; Located on the North Side of Millican Drive Approximately 150 East of North Stemmons Freeway, at 721 Millican Drive; as Requested by Joseph Ungeheier, the Property Owner (Case No. PZ-2016-10-26).**

BACKGROUND

The existing residence on this property was built in 1960 and the site was originally zoned Single-Family Residential (R-7.5). The property later gained a corner clip of General Business (GB) from a City-initiated zone change along the I-35E corridor. In 2000, the property was rezoned to Office District (OD) but was never redeveloped into an office use. Mr. Ungeheier purchased the property approximately two years ago and is currently using the property as a residence.

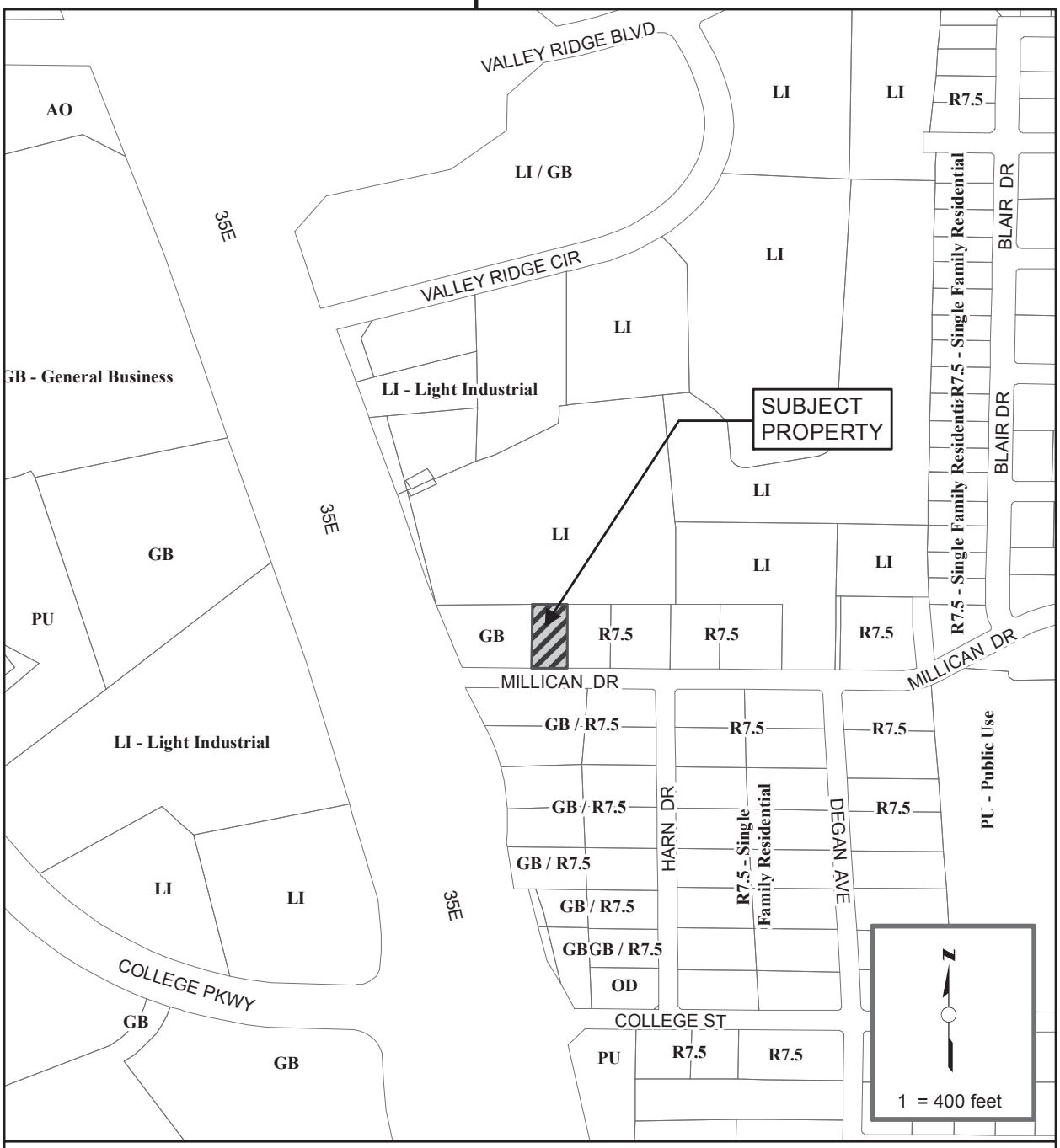
ANALYSIS

The current zoning of the property is Office District (OD), which does not allow a residential use. The existing house is a legal non-conforming use, which can exist as-is, but any new construction or modification would require the property to comply with the current zoning regulations. The request for Single-Family R-7.5 is simply restoring the original zoning to the property and would allow the owner to make residential improvements to the property as allowed by city ordinances. The proposed zone change will make this property consistent with the existing residential use on the property and is consistent with the zoning and land uses in the area. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of October 4, 2016.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed ordinance as set forth in the caption above.

Location Map - 721 Millican Dr.



ZONING CASE NO.PZ-2016-10-26

PROPERTY OWNER: JOSEPH UNGEHEIER

APPLICANT: JOSEPH UNGEHEIER

PROPERTY LOCATION: 721 MILLICAN DRIVE (0.309-ACRES)

CURRENT ZONING: OFFICE DISTRICT (OD)

REQUESTED ZONING: SINGLE FAMILY RESIDENTIAL DISTRICT (R-7.5)

Aerial Map - 721 Millican Dr.

MINUTES
PLANNING AND ZONING COMMISSION
OCTOBER 4, 2016

Item 1:

The Lewisville Planning and Zoning Commission meeting was called to order at 6:30 p.m. Members present: William Meredith, James Davis, MaryEllen Miksa, Kristin Green, Alvin Turner and Steve Byars. Member John Lyng was absent.

Staff members present: Richard Luedke, Planning Manager; Mary Paron-Boswell, Sr. Planner; June Sin, Planner and Theresa Ernest, Planning Technician.

Item 4:

B. **Public Hearing:** Consideration of a Zone Change Request From Office District (OD) to Single Family Residential (R-7.5); on a 0.309 Acre Tract Further Identified as Hivue Addition, Lot 3, Block E; Located at 721 Millican Drive; as Requested by Joseph Ungeheier, the Property Owner. (Case No. PZ-2016-09-26).

Staff gave an overview of the proposed zone change request, providing the history of the property and confirmed its intended residential use. Staff recommended approval. The public hearing was then opened by Chairman Davis. There being no public comment, the public hearing was then closed. *A motion was made by Steve Byars to recommend approval of the zone change request, seconded by Alvin Turner. The motion passed unanimously (6-0).* Staff indicated that this item would be going before the City Council on October 17th for a second public hearing and a final decision.

SECTION 17-19. - "OD" OFFICE DISTRICT REGULATIONS

(a) *Use*.

(1) Professional and administrative offices where only services are provided, no chattels or goods are offered for sale, and no outside storage is provided on the premises. This includes but is not limited to doctors, dentists, attorneys, architects, engineers, insurance, real estate, banks and similar offices.
(2) Business or commercial schools and institutions of education.
(3) Clinics, medical and dental.
(4) Veterinarian or animal clinic, provided the use is operated within an enclosed structure and is not on a lot abutting a single family zoned lot.
(5) Day nurseries.
(6) The incidental retail sale of food, beverages and other convenience items or services is permitted to the occupants, employees and guests, as long as these items are not advertised nor offered for sale to the general public.
(7) Church worship facilities.
(8) Buildings and uses owned or operated by public governmental agencies.
(9) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(10) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, dust noise, vibration or similar nuisance.
(11) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(12) Gas and oil drilling accessory uses (SUP required).
(13) Cemetery, columbarium, mausoleum and accessory uses (SUP required).

(b) *Building and coverage regulations*.

(1) *Building regulations*. The minimum floor area in "OD" office district shall be one thousand (1000) square feet.
(2) *Coverage regulations*. In no case shall any building or building complex cover more than thirty-five percent (35%) of the site area.

(c) *Height*. The maximum height for buildings shall be fifty (50) feet. In no event, however, shall the portion of a building located within one hundred fifty (150) feet of any property zoned for residential purposes exceed the height allowed in that residential zoning district.

(d) *Area*.

(1) *Size of yards*.
a. *Front yard.*
1. There shall be a minimum front yard having a depth of not less than forty (40) feet adjacent to any street with a right-of-way of one hundred (100) feet or more.
2. There shall be a minimum front yard having a depth of not less than thirty (30) feet adjacent to any street with a right-of-way less than one hundred (100) feet.
3. Lots having double frontage, running through from one street to another, shall provide the required setback from both streets.

b. *Side yard*. There shall be a minimum side yard of ten (10) feet on each side of the lot or tract on which any single building or building complex is constructed.

c. *Rear yard*. No rear yard is required except, that a rear yard of not less than twenty-five (25) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. The required rear yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the

screening device when that portion of the building exterior is constructed of the same materials as the screening device.

(2) *Reserved*.

SECTION 17-10. - "R-7.5" SINGLE FAMILY RESIDENTIAL DISTRICT REGULATIONS

(a) *Use*. A building or premise shall be used only for the following purposes:

(1) Single-family dwellings.
(2) Church worship facilities.
(3) Buildings and uses owned or operated by public governmental agencies.
(4) Country clubs or golf courses, but not including miniature golf courses, driving ranges or similar forms of commercial amusement (indoor or outdoor).
(5) Farms, nurseries or truck gardens, limited to the propagation and cultivation of plants, provided no retail or wholesale business is conducted on the premises, and provided further that no poultry or livestock other than household pets shall not be located closer to any property line than allowed by city's animal control ordinances.
(6) Real estate sales offices during the development of residential subdivisions, but not to exceed two (2) years.
(7) Schools, private, with full curriculum accredited by the State of Texas equivalent to that of a public elementary or high school.
(8) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(9) Accessory buildings and uses, customarily incidental to the above uses and located on the same lot therewith, not involving the conduct of a retail business except as provided herein and for home occupations as defined by this ordinance.
(10) A detached private garage with or without storeroom and/or utility room shall be permitted as an accessory building if it meets all requirements of a residential accessory building.
(11) A carport shall be permitted as an accessory building if it meets all requirements of a residential accessory building.
(12) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(13) Gas and oil drilling accessory uses (SUP required).
(14) Cemetery, columbarium, mausoleum and accessory uses (SUP required).

(b) *Height*. No building shall exceed thirty-five (35) feet or two and one-half (2-1/2) stories in height.

(c) *Area*.

(1) *Size of yards.*

a. *Front yard.* There shall be a front yard having a depth of not less than thirty (30) feet, except where entrance to the garage is provided from an alley in the rear of the house, in which case the minimum front yard may be twenty-five (25) feet. Where lots have double frontage, running through from one street to another, the required front yard shall be provided on both streets.

b. *Side yard.* There shall be a side yard on each side of the lot having a width of not less than ten percent (10%) of the lot width. A side yard adjacent to a side street shall not be less than fifteen (15) feet. No side yard for allowable non-residential uses shall be less than twenty-five (25) feet. In no case shall the minimum side yard setback be less than six and one-half (6.5) feet.

c. *Rear yard.* There shall be a rear yard having a depth of not less than twenty (20) feet if there is no rear entry from an alley, and a depth of not less than twenty-five (25) feet if there is rear entry from an alley.

(2) *Size of lot.*

a. *Lot area.* No building shall be constructed on any lot of less than seven thousand five hundred (7,500) square feet.

b. *Lot width*. The minimum width of the lot shall not be less than sixty-five (65) feet at the required front and rear building setback lines. The minimum width at the front property line shall be forty (40) feet, or a minimum of fifty (50) feet if there is a driveway in the front.

c. [Exception] Where a lot having less area, width and/or depth than herein required existed in separate ownership upon the effective date of this ordinance, the above regulations shall not prohibit the erection of a one-family dwelling thereon.

(3) *Minimum dwelling size.* The minimum floor area of any dwelling shall be one thousand seven hundred (1,700) square feet, exclusive of garages, breezeways and porches.

(4) *Lot coverage.* In no case shall more than forty percent (40%) of the total lot area be covered by the combined area of the main buildings and accessory buildings.

This Section (Office Use Only)	
Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE
Deep Roots, Broad Wings, Bright Future.

ZONE CHANGE APPLICATION

Owner/s (name): Joseph Ungeheier	
Company Name:	
Mailing Address: 721 Millican Dr	
Work #:	Cell #: 951-587-5930
E-Mail: Josephungeheier@gmail.com	
Owner Signature (Owner/s Must Sign or Submit Letter of Authorization):	Date: 9/15/16
Printed Name: Joseph Ungeheier	

Applicant/Agent (name): Same as Property Owner	
Company Name:	
Mailing Address:	
Work #:	Cell #:
E-Mail: Joseph.ungeheier@stacktest.com	
Applicant/Agent Signature	Date:
Printed Name:	

Current Zoning: OD Requested Zoning: R7.5 Residential Acres: 0.1619

Legal Description (Lot/ Block/Tract/Abstract): 721 Millican Dr., Lot 3, Block E of Hivue Addition

Address/Location:

Application and Sign Fees:

X	Less than 1/2 acre	$ 150.00
	1/2 acre up to 4.99 acres	$ 250.00
	5 acres up to 24.99 acres	$ 400.00

	25 acres up to 49.99 acres	$ 750.00
	50 acres up to 99.99 acres	$1,000.00
	100 acres and more	$1,500.00

Qty: 1	**Zone Change Signs - $35 each.** 1 sign required for each 5 acres (max. 5 per site)	$

Sign(s) must be posted a minimum of ten (10) days prior to the Planning & Zoning hearing date.

Amount Due (application & sign fee)	$ 185.00

Property Rezoning Request

721 Millican Drive, Lewisville TX 75057

I have a home, 721 Millican Dr., which is having some water run off issues. I have talked with Jeff Kelly, Assistant City Engineer, about these issues. I have shown him some videos of what is happening on my property and a plan of corrective action to redirect water flow from the street through my property to stop it from flowing into my home. After reviewing my issues, Mr. Kelly then referred me to George Babineaux, Assistant Building Official, to submit a building permit to aid in redirecting this water flow through my property. However, My property is zoned "Office District" for some reason and George informed me that in order to issue the permit, my house needs to be rezoned from "Office District" back to "Residential". Mr. Babineaux instructed me to contact Richard Luedke with the Planning and Zoning Commission to get this done so I can complete my plans to keep city run off water from further damaging my property. I have submitted my rezoning application, hung my notifications, paid my fee, and I respectfully request that my property be rezoned so I can implement my plans to protect my home. Thank you for your time.

Sincerely,

Joseph Ungeheier

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL, AMENDING THE ZONING ORDINANCE BY REZONING APPROXIMATELY 0.309 ACRES LEGALLY DESCRIBED AS LOT 3, BLOCK E, HIVUE ADDITION, LOCATED ON THE NORTH SIDE OF MILLICAN DRIVE APPROXIMATELY 150 FEET EAST OF NORTH STEMMONS FREEWAY, AT 721 MILLICAN DRIVE; FROM OFFICE DISTRICT (OD) ZONING TO SINGLE FAMILY RESIDENTIAL DISTRICT (R-7.5) ZONING; CORRECTING THE OFFICIAL ZONING MAP; PRESERVING ALL OTHER PORTIONS OF THE ZONING ORDINANCE; DETERMINING THAT THE PUBLIC INTERESTS AND GENERAL WELFARE DEMAND THIS ZONING CHANGE AND AMENDMENT THEREIN MADE; PROVIDING FOR A REPEALER, SEVERABILITY, AND A PENALTY; AND DECLARING AN EMERGENCY.

WHEREAS, applications were made to amend the Official Zoning Map of Lewisville, Texas by making applications for same with the Planning and Zoning Commission of the City of Lewisville, Texas, as required by State statutes and the Zoning Ordinances of the City of Lewisville, Texas, said Planning and Zoning Commission has recommended that rezoning of the approximately 0.309-acre property described in the attached Exhibit "A" (the "Property") be **approved**, and all the legal requirements, conditions and prerequisites having been complied with, the case having come before the City Council of the City of Lewisville, Texas, after all legal notices, requirements, conditions and prerequisites having been complied with; and,

WHEREAS, the City Council of the City of Lewisville, Texas, at a public hearing called by the City Council of the City of Lewisville, Texas, did consider the following factors in making a determination as to whether this requested change should be granted or denied: effect on the congestion of the streets; the fire hazards, panics and other dangers possibly present in the securing

of safety from same; the effect on the promotion of health and the general welfare; effect on adequate light and air; the effect on the overcrowding of the land; the effect of the concentration on population; the effect on the transportation, water, sewerage, schools, parks and other public facilities; and,

WHEREAS, the City Council further considered among other things the character of the district and its peculiar suitability for particular uses and with the view to conserve the value of buildings, encourage the most appropriate use of land throughout this City; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that there is a public necessity for the zoning change, that the public interest clearly requires the amendment, that the zoning changes do not unreasonably invade the rights of adjacent property owners; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that the change in zoning lessens the congestion in the streets; helps secure safety from fire, panic and other dangers; promotes health and the general welfare; provides adequate light and air; prevents the overcrowding of land; avoids undue concentration of population; facilitates the adequate provisions of transportation, water, sewerage, schools, parks and other public requirements; and,

WHEREAS, the City Council of the City of Lewisville, Texas, has determined that there is a necessity and need for this change in zoning and has also found and determined that there has been a change in the conditions of the property surrounding and in close proximity to the Property since it was originally classified and, therefore, feels that a change in zoning classification for the Property is needed, is called for, and is in the best interest of the public at large, the citizens of the City of Lewisville, Texas, and helps promote the general health, safety, and welfare of this community.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The Zoning Ordinance of the City of Lewisville, Texas, be, and the same is hereby amended and changed in that the zoning of the Property is hereby changed to **SINGLE FAMILY RESIDENTIAL DISTRICT (R-7.5) ZONING**.

SECTION 2. The City Manager, or her designee, is hereby directed to correct the official zoning map of the City of Lewisville, Texas, to reflect this change in zoning.

SECTION 3. That in all other respects the use of the tract or tracts of land hereinabove described shall be subject to all the applicable regulations contained in said City of Lewisville Zoning Ordinance and all other applicable and pertinent ordinances of the City of Lewisville, Texas.

SECTION 4. That the zoning regulations and districts as herein established have been made in accordance with the comprehensive plan for the purpose of promoting health, safety, and the general welfare of the community. They have been designed with respect to both present conditions and the conditions reasonably anticipated to exist in the foreseeable future, to lessen congestion in the streets; to secure safety from fire, panic, flood and other dangers; provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population; facilitate the adequate provisions of transportation, water, sewage, parks and other public requirements, and to make adequate provisions for the normal business, commercial needs and development of the community. They have been made with reasonable consideration, among other things of the character of the district, and its peculiar suitability for the particular uses and with a view of conserving the value of buildings and encouraging the most appropriate use of land throughout the community.

SECTION 5. This Ordinance shall be cumulative of all other ordinances of the City of Lewisville, Texas, affecting zoning and shall not repeal any of the provisions of said ordinances, except in those instances where provisions of those ordinances which are in direct conflict with the provisions of this Ordinance.

SECTION 6. That the terms and provisions of this Ordinance shall be deemed to be severable and that if the validity of the zoning affecting any portion of the Property shall be declared to be invalid, the same shall not affect the validity of the zoning of the balance of the tract or tracts of land described herein.

SECTION 7. Any person, firm or corporation who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof in the Municipal Court, shall be subject to a fine of not more than $2,000.00 for each offense, and each and every day such offense is continued shall constitute a new and separate offense.

SECTION 8. The fact that the present Zoning Ordinance and regulations of the City of Lewisville, Texas are inadequate to properly safeguard the health, safety, peace and general welfare of the inhabitants of the City of Lewisville, Texas, creates an emergency for the immediate preservation of the public business, property, health, safety and general welfare of the public which requires that this Ordinance shall become effective from and after the date of its final passage, and it is accordingly so ordained.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

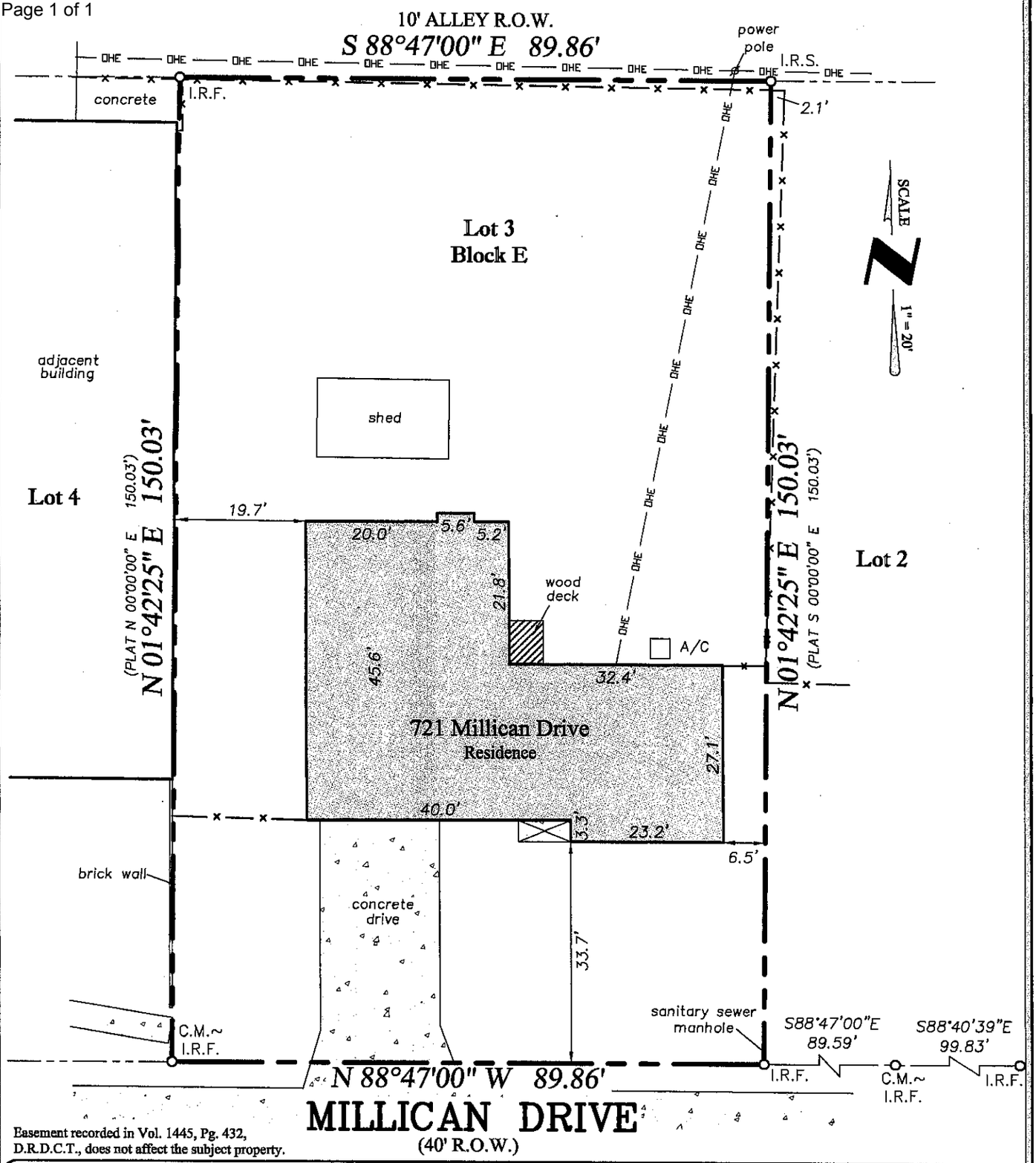
_____
Lizbeth Plaster, CITY ATTORNEY

Exhibit A
Property Description

Attachment to
Ordinance No. _____
Exhibit "A"
Page 1 of 1

721 Millican Drive

EXHIBIT A



Easement recorded in Vol. 1445, Pg. 432, D.R.D.C.T., does not affect the subject property.

PROPERTY DESCRIPTION: Lot 3, in Block "E", of Hivue Addition, to the City of Lewisville, Texas, according to the Plat thereof recorded in Volume 413, Page 1, of the plat Records of Denton County, Texas.

The undersigned have/has received and reviewed a copy of this survey.

x _____

x _____

Date: _____

Date:	9/11/14
ASC No.	1409118
Drawn/Chk	TER/DLA
Client	Alamo Title Company
G.F. No.	ATD-23-6000231400339TR

LEGEND - C.M.= Controlling Monument; I.R.F.= Iron Rod Found ; I.P.F.= Iron Pipe Found ; F.C.P.= Fence Corner Post. OHE=Overhead Electric. I.R.S.= Iron Rod Set 1/2" diameter with yellow cap stamped "Arthur Surveying Company". All found iron rods are 1/2" diameter unless otherwise noted. —— x —— (fence / ℄ fence post) —— OHE —— (overhead power)

FLOOD NOTE: It is my opinion that the property described hereon is not within the 100-year flood zone area according to the Federal Emergency Management Agency Flood Insurance Rate Map Community-Panel No. 480195 0545 G, present effective date of map, April 18, 2011, herein property situated within Zone "X".

721 Millican Drive
Lewisville, Texas

SURVEYORS CERTIFICATION:
The undersigned does hereby certify that this survey was this day made on the ground of the property legally described hereon and is correct, and to the best of my knowledge, there are no visible discrepancies, conflicts, shortages in area, boundary line conflicts, encroachments, overlapping of improvements, easements or rights of way that I have been advised of except as shown hereon. The bearings shown hereon are based on the above referenced recorded map or plat unless otherwise noted.

STATE OF TEXAS
REGISTERED
DOUGLAS L. ARTHUR
4357
PROFESSIONAL
LAND SURVEYOR

ALAMO TITLE COMPANY
4900 Long Prairie Road, Ste. 200
Flower Mound, Texas 75028
Ph. 972-956-8459
Fax 972-956-8590

Arthur Surveying Co.
Professional Land Surveyors
220 Elm St., # 200 - Lewisville, TX 75057
Ph. 972.221.9439 - TFRN# 10063800
arthursurveying.com Established 1986

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Agricultural Open-Space District (AO), Light Industrial District (LI) and Specific Use – Landfill Operations District (SU – Landfill Operations) to Specific Use – Landfill Operations and Accessory Uses District (SU – Landfill Operations and Accessory Uses); With Seven Associated Variances, on Approximately 470 Acres Situated in the P.O. Leary Survey, Abstract No. 974; A.J. Chowning Survey, Abstract No. 1638; P. Higgins Survey, Abstract No. 525; H. Harper Survey, Abstract No. 605; and the S. M. Hayden Survey, Abstract No. 537; Generally Located at the Southern Terminus of Huffines Boulevard and South of the Future Extension of East Corporate Drive, at 580 Huffines Boulevard; as Requested by Jason Edwards of Weaver Consultants Group, LLC on Behalf of the City of Farmers Branch and Camelot Landfill TC, LP, the Property Owners (Case No. PZ-2016-09-27).**

BACKGROUND

The City of Lewisville objected to Farmers Branch's original TCEQ permit amendment to expand the lateral and vertical limits of the Camelot Landfill. But on January 6, 2016, the two cities signed an agreement whereby Lewisville agreed to withdraw its objections and forgo seeking a contested case hearing if Farmers Branch met certain conditions and timelines (the "Settlement Agreement"). Such conditions included limiting the increased elevation of the landfill (623 feet for pre-Subtitle D area and 675 feet for Subtitle D area), adding new monitoring wells, compliance with agreed upon landscaping requirements, payment of host fees and equalization fees, deed restricting their property to prevent subsequent expansions, dedication of certain land for Lewisville right-of-way and/or easements, escrow of right-of-way funds for the construction of Corporate Drive and its intersection with Huffines Boulevard, and required submittal of an application for SU zoning (which also triggered a new plat and engineering site plan). Concurrent with this zoning request, Lewisville City Council will also be considering the first amendment to the Settlement Agreement to allow a deferral of escrow funds for the construction of Huffines Boulevard, a delayed dedication of Huffines Boulevard right-of-way, and offering of certain landfill services to Lewisville Residents in lieu of tree mitigation fees.

The Camelot Landfill has been owned by the City of Farmers Branch since 1978. In 2009 the City of Farmers Branch went through the platting and rezoning process in order to add facilities to allow recovery of methane gas typically associated with landfills. This new request adds approximately 120 additional acres to the existing Camelot Landfill property. The majority of this 120 acres is property that was once owned by the City of Highland Park for use as a future landfill, and was purchased by the City of Farmers Branch in 1999. This

new zone change also includes the current entrance/haul road from the intersection of Huffines Boulevard and Stonewall Drive south into the landfill itself. A new Engineering Site Plan is required to be attached as an exhibit to the Specific Use zoning request. The Planning and Zoning Commission recommended unanimous approval (6-0) of the zone change request at their meeting of October 4, 2016.

Seven variances associated with the engineering site plan are requested and listed below. Six of the seven variances are carried over from the previous engineering site plan. Many of the variances will allow the landfill to continue to operate as it has thus far; however, some are temporary in nature which will cease prior to the Corporate Drive extension being completed in this area.

ANALYSIS

The zone change request for Specific Use District incorporates the submittal of an engineering site plan to show the various uses, setbacks and other zoning and development criteria proposed for the site. Staff has reviewed the engineering site plan, which is attached to the zone change request. The new components of the site plan include the incorporation of approximately 120 acres of land into the current platted lot, which corresponds to the amended landfill permit the City of Farmers Branch submitted to the Texas Commission on Environmental Quality (TCEQ). While the site plan identifies the existing 350-acre platted lot expanding by approximately 120 acres, the actual proposed waste footprint area is expanding approximately 38 acres. The application also incorporates the new maximum height of the landfill not to exceed an elevation of 675 feet (623 feet for pre-Subtitle D area and 675 feet for Subtitle D area), which is approximately 152 feet higher than the current elevation of 523 feet allowed. This increase will extend the lifespan of the landfill approximately 40 years.

The site plan identifies both short term and long term plans for the site. Short term activities generally coincide with the Corporate Drive extension, estimated to be completed by 2021. This includes platting the property into four lots with Lot 4 being reserved for the future extension of Huffines Boulevard. Right-of-way for the extension of Corporate Drive that abuts the northern boundary of Lot 1A has already been dedicated to the City by separate instrument. Schematic plans for the Corporate Drive extension are currently under review. Additional monitoring wells will be installed within one year of the TCEQ permit being approved. Once the water and sewer lines along Corporate Drive are constructed and usable, the new entrance facilities and office/maintenance buildings will be required to connect. For the most part, the landfill will continue to operate as normal. Current temporary buildings will continue to have gravel access; however, the permanent facilities will be required to have paved parking and maneuvering. Plans also include the creation of a permanent citizen convenience center and the relocation of the scalehouse, employee breakroom, office and maintenance facility as well as the possible creation of a site for mulching or composting of woody material. Other long term plans include a trail easement around the landfill as required by the settlement agreement.

Drawing 24 is an illustration of how the site currently exists and how the proposed expansion will impact the site. The additional 102 acres on the north side of the current

landfill creates a buffer that is approximately 1,000 feet deep from the future Corporate Drive right-of-way. This area is proposed to remain natural except for the two areas identified as #2 and #3 on Drawing 24. A wood waste processing area is identified as #2 on Drawing 24. Area #3 will contain the landfill support facility area and will eventually house the office, maintenance facilities and equipment storage as well as a convenience center where residents can drop off waste. A small portion of the new 120 acres will be incorporated into the new waste footprint as illustrated by #3 on Drawing 24. The remainder of the site will remain in its naturally wooded state, maintaining a natural buffer. The current entrance into the landfill is off of Huffines Boulevard which currently ends at Stonewall Drive. The new final plat for the site identifies the creation of three new lots (Lots 2, 3 and 4). There are currently no final plans for Lots 2 and 3; however, Lot 4 is proposed to be converted into right-of-way, extending Huffines Boulevard from its current location south, tying into the extension of Corporate Drive. Prior to Corporate Drive being accepted, the scalehouse would be removed from its current temporary location to a permanent facility that will be located on Lot 1A.

Variances

a. To allow overhead electrical lines to the existing methane gas facility and proposed temporary employee breakroom

Section 6-101(b) Underground Utilities

Underground utilities are required when new services are to be installed. In this instance, underground lines in a landfill are not practical since the waste in the landfill would have to be disturbed in order to install, maintain and repair the line if necessary. Staff recommends approval of the variance.

b. To allow metal or wood sided buildings for the existing methane gas facility, proposed temporary employee breakroom and existing temporary equipment storage building

Section 6-181(d)(2) Exterior Finish Requirements

The Ordinance requires the total of all exterior walls consist of not less than 80 percent masonry veneer. The buildings will be temporary in nature and located internal to the site. They will be over five hundred (500 feet) from the property line and will only be utilized until the construction of the future entrance facilities are completed. Staff recommends approval of the variance.

c. To allow the existing portable restrooms to remain in lieu of connecting to sanitary sewer until construction of the proposed entrance facilities and office /maintenance building are complete

Section 6-101(b) Underground Utilities

Underground utilities are required when new services are to be installed. In this instance, underground lines in a landfill are not practical since the waste in the landfill would have to be disturbed in order to install maintain and repair the lines if necessary. In addition, the work and workers move around the 350-acre site as disposal cells are created and filled; therefore, restroom facilities must be located close to the job sites. Staff has no objection to the use of portable restrooms for the existing temporary buildings; however, they must connect to sanitary sewer once the proposed new facilities are constructed.

d. To allow portable buildings without fixed foundations

Section 4-28 Temporary Structures and Uses

Temporary buildings are not allowed by city code. In this instance, the temporary buildings without fixed foundations are necessary to the operation of the landfill and will be abandoned upon completion of the proposed entrance and maintenance facilities. Staff recommends approval of the variance.

e. To waive the interior landscaping and irrigation for temporary and permanent parking areas

Section 6-123(d) Multi-Family and non-residential landscaping requirements

Parking areas are required to have interior landscaping. In lieu of meeting the interior landscaping and irrigation requirements, the City of Farmers Branch will install enhanced landscaping near the intersection of Corporate Drive and Huffines Boulevard once completed. Staff recommends approval of the variance.

f. To allow a dead end water line that exceeds 600 linear feet until the construction of Corporate Drive

Section 6-98(d)(2) – Fire Protection Distribution Systems Commercial Areas

This section does not allow dead end water lines over 600 feet. The water line will serve the future proposed scale house and maintenance building that will be built during the construction of Corporate Drive. The length of time that there will be a dead end water line to serve the future scale house and maintenance building will be less than one year. Once the water line along Corporate Drive is built it will provide a second point of connection and loop the water line. The current temporary buildings will continue to be served with well water and with no connection to the City water system. Staff recommends approval of the variance.

g. To allow gravel access to the temporary buildings and to the bay doors of the proposed maintenance building

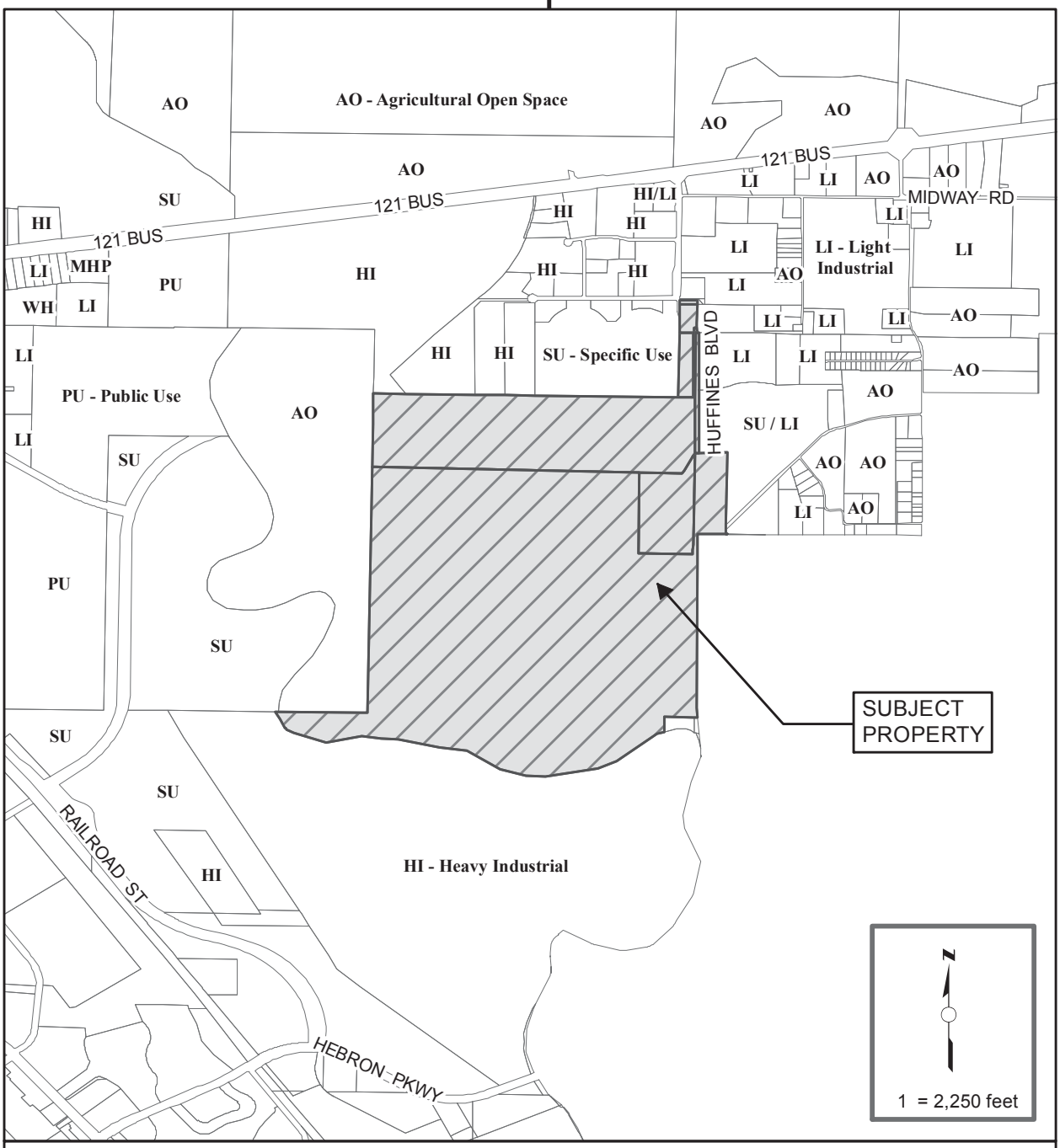
Section 6-161 – Off Street Parking and Loading Requirements General Provisions

This section of the ordinance requires that all areas used for vehicle maneuvering and parking shall be paved with concrete or asphalt. The owner will provide concrete pavement for access to the future scale house, convenience center and office portion of the maintenance facility. These facilities will be built just prior to the completion of Corporate Drive. The owner is requesting that gravel access be allowed for the maintenance door bays to allow access for heavy equipment without tires to minimize the future pavement maintenance costs. The owner is also requesting gravel access to be allowed to the landfill and the temporary buildings. The areas that will be paved in the future will provide paved access for emergency vehicles and parking for employees. Staff recommends approval of the variance.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed ordinance as set forth in the caption above.

Location Map - Camelot



ZONING CASE NO.PZ-2016-10-27

PROPERTY OWNER: CITY OF FAMERS BRANCH/ CAMELOT LANDFILL TX, LP

APPLICANT: JASON EDWARDS, WEAVER CONSULTS GROUP, LLC

PROPERTY LOCATION: 580 HUFFINES BOULEVARD (APPROX. 470 ACRES)

CURRENT ZONING: AGRICULTURAL OPEN SPACE (AO) / LIGHT INDUSTRIAL (LI) & SPECIFIC USE (SU)

REQUESTED ZONING: SPECIFIC USE (SU) – LANDFILL AND ACCESSORY USES

Aerial Map - Camelot

MINUTES
PLANNING AND ZONING COMMISSION
OCTOBER 4, 2016

Item 1:

The Lewisville Planning and Zoning Commission meeting was called to order at 6:30 p.m. Members present: William Meredith, James Davis, MaryEllen Miksa, Kristin Green, Alvin Turner and Steve Byars. Member John Lyng was absent.

Staff members present: Richard Luedke, Planning Manager; Mary Paron-Boswell, Sr. Planner; June Sin, Planner and Theresa Ernest, Planning Technician.

Item 4:

Public Hearing – Zoning and Special Use Permits were the next item on the agenda. There were three items for consideration:

C. **Public Hearing:** Consideration of a Zone Change Request From Agricultural Open (AO) / Light Industrial (LI) and Specific Use (SU) to Specific Use (SU) – Landfill and Accessory Uses; on Approximately 470 Acres Situated in the P.O. Leary Survey, Abstract no. 974; A.J. Chowning Survey, Abstract No. 1638; P. Higgins Survey, Abstract No. 525; H. Harper Survey, Abstract No. 605; S. M. Hayden Survey, Abstract No. 537; Generally Located at the Southern Terminus of Huffines Boulevard and South of the Future Extension of East Corporate Drive, at 580 Huffines Boulevard; as Requested by Jason Edwards of Weaver Consultants Group, LLC on Behalf of City of Farmers Branch and Camelot Landfill TC, LP, the Property Owners. (Case No. PZ-2016-09-27).

Staff gave a presentation on the proposed zone change request to expand the landfill site by 120 acres and increase the vertical height of the landfill to an elevation of 675 feet. Staff further explained the proposed improvements to the site, such as a right-of-way dedication, facility relocation and a future composting site. Commissioner Kristin Green asked if the TCEQ permit has been approved. Staff replied that City Council zoning approval was needed before TCEQ could approve the permit. The public hearing was then opened by Chairman Davis. Shane Davis, Environmental Services Manager, City of Farmer's Branch, gave a presentation, explaining the increased lifespan of the landfill due to the proposed expansion along with details related to proposed support facilities associated with the landfill. Jason Edwards, Weaver Consultants, also spoke, providing more information on the required TCEQ boundary and the 38-acre increase in the footprint of the landfill and the gradual increase of the landfill's height. There being no one else to speak, the public hearing was then closed. Chairman Davis asked if the methane collection site would be moving along with the other facilities once the Corporate Drive expansion began. Shane Davis answered that the facility would not move as it is already located in a suitable place. *A motion was made by Kristin Green to recommend approval of the zone change request, seconded by William Meredith. The motion passed unanimously (6-0).* Staff indicated that this item would be going before the City Council on October 17th for a second public hearing and a final decision.

SECTION 17-6. - "AO" AGRICULTURE – OPEN SPACE DISTRICT REGULATIONS

(a) *Use*. A building or premise shall be used only for the following purposes:

(1) All general and special agricultural, farming, ranching, stock and poultry raising, dairy and other related uses so long as same does not cause a hazard to health by reason of unsanitary conditions; and are not offensive by reason of odors, dust, fumes, noise or vibration; and are not otherwise detrimental to the public welfare; and in all cases poultry or livestock shall be kept as per the city's animal control ordinances.
(2) Public parks and recreation areas.
(3) Single-family dwellings on building lots of one (1) acre or more in areas where such dwellings can be served by city water and/or sanitary sewer services if practical or can be adequately served by water wells and/or septic tanks located on the building lot. The minimum floor area of any dwelling shall be one thousand four hundred (1400) square feet, exclusive of garages, breezeways and porches.
(4) Country clubs or golf courses, but not including miniature golf courses, driving ranges or similar forms of commercial amusement (indoor or outdoor)..
(5) Buildings and uses owned or operated by public governmental agencies.
(6) Church worship facilities.
(7) Schools, private, with full curriculum accredited by the State of Texas equivalent to that of a public elementary or high school.
(8) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(9) Accessory buildings and uses, customarily incidental to the above uses and located on the same lot therewith, not involving the conduct of a retail business except as provided herein and for home occupations as defined by this ordinance.
(10) Accessory dwelling unit (SUP required).
(11) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(12) Gas and oil drilling accessory uses (SUP required).
(13) Cemetery, columbarium, mausoleum and accessory uses (SUP required).

(b) *Height*. No building shall exceed thirty-five (35) feet or two and one-half (2-1/2) stories in height.

(c) *Area*.

(1) *Size of Yards*. All front, side, and rear yards shall have a dimension of not less than one hundred (100) feet.

(2) *Size of Lot*: No lot shall have an area of less than one (1) acre.

(3) *Lot Coverage*. In no case shall more than ten percent (10%) of the total area of the lot be covered by the combined area of the main buildings and accessory buildings.

SECTION 17-23. - "LI" LIGHT INDUSTRIAL DISTRICT REGULATIONS

(a) *Use*. Buildings and premises may be used for retail, wholesale, office and service uses and campus style light manufacturing and industrial uses provided there is no dust, fumes, gas, noxious odor, smoke, glare, or other atmospheric influence beyond the boundaries of the property on which such use is located, and which produces no noise exceeding in intensity at the boundary of the property the average intensity of noise of street traffic at that point, and no more than ten percent (10%) of the total lot is used for outside storage, and further provided that such use does not create fire or explosive hazards on adjacent property.

(1) Any use permitted in districts "LC" and "GB" as regulated in said districts.
(2) Apparel and other products assembled from finished textiles.
(3) Bottling works.
(4) Warehouse distribution facilities.
(5) Airport/Heliport (SUP required).
(6) Auto repair shops including body shops (SUP required).
(7) Church worship facilities.
(8) Buildings and uses owned or operated by public governmental agencies.
(9) Cemetery, mausoleum, crematorium & accessory uses (SUP required).
(10) Cosmetic manufacturer.
(11) Drugs and pharmaceutical products manufacturing.
(12) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(13) Electronic products manufacturing.
(14) Fur good manufacture, but not including tanning or dyeing (SUP required).
(15) Gas and oil drilling accessory uses (SUP required).
(16) Glass products, from previously manufactured glass.
(17) Heavy equipment – outdoor rental/sales/display/service (SUP required).
(18) Household appliance products assembly and manufacture from prefabricated parts.
(19) Industrial and manufacturing plants including the processing or assembling of parts for production of finished equipment.
(20) Musical instruments assembly and manufacture.
(21) Paint, shellac and varnish manufacture (SUP required).
(22) Plastic products manufacture, but not including the processing of raw materials.
(23) Racing facilities (SUP required).
(24) Recreational Vehicle (RV) Park. (Private) (SUP required).
(25) Self storage/mini warehouse facility (SUP required).
(26) Shooting Range (indoor or outdoor) (SUP required.).
(27) Sporting and athletic equipment manufacture.
(28) Testing and research laboratories.
(29) Auction yard (vehicle) (SUP required).
(30) Communication towers (SUP required).
(31) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(32) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, noise, vibration or similar nuisance. Open storage shall be considered an accessory use but no more than ten percent (10%) of the platted lot may be used for outside storage, including access and maneuvering areas for moving the stored items.
(33) Cemetery, columbarium, mausoleum and accessory uses (SUP required).
(34) Other uses similar to the above listed uses are allowed by special use permit (SUP) only, except that the following uses are specifically prohibited:
    a. Acetylene gas manufacture or storage.
    b. Acid manufacture.
    c. Alcohol manufacture.
    d. Ammonia, bleaching powder or chlorine manufacture.
    e. Arsenal.
    f. Asphalt manufacture or refining.
    g. Blast furnace.
    h. Bag cleaning, unless clearly accessory to the manufacture of bags.

i. Boiler works.
j. Brick, tile, pottery or terra cotta manufacture other than the manufacture of handcraft or concrete products.
k. Reserved.
l. Celluloid manufacture or treatment.
m. Cement, lime, gypsum, or plaster of paris manufacture.
n. Central mixing plant for cement.
o. Coke ovens.
p. Cotton gins.
q. Cottonseed oil manufacture.
r. Creosote manufacture or treatment.
s. Disinfectants manufacture.
t. Distillation of bones, coal or wood.
u. Dyestuff manufacture.
v. Exterminator and insect poison manufacture.
w. Emery cloth and sandpaper manufacture.
x. Explosives or fireworks manufacture or storage.
y. Fat rendering.
z. Fertilizer manufacture.
aa. Fish smoking and curing.
bb. Forge plant.
cc. Garbage, offal or dead animals reduction or dumping.
dd. Gas manufacture or storage, for heating or illuminating purposes.
ee. Glue, size or gelatine manufacture.
ff. Hatchery.
gg. Iron, steel, brass or copper foundry or fabrication plant.
hh. Junk, iron or rag storage or baling.
ii. Match manufacture.
jj. Lampblack manufacture.
kk. Oilcloth or linoleum manufacture.
ll. Oiled rubber goods manufacture.
mm. Ore reduction.
nn. Oil or turpentine manufacture.
oo. Paper and pulp manufacture.
pp. Petroleum or its products, refining or wholesale storage of.
qq. Pickle manufacturing.
rr. Planing mills.
ss. Potash works.
tt. Pyroxline manufacture.
uu. Rock crusher.
vv. Rolling mill.
ww. Rubber or gutta-percha manufacture or treatment but not the making of articles out of rubber.
xx. Sauerkraut manufacture.
yy. Salt works.
zz. Shoe polish manufacture.
aaa. Smelting of tin, copper, zinc, or iron ores.
bbb. Soap manufacture other than liquid soap.
ccc. Soda and compound manufacture.
ddd. Stock yard or slaughter of animals or fowls.
eee. Stone mill or quarry.
fff. Storage yard.
ggg. Stove polish manufacture.
hhh. Tallow grease or lard manufacture or refining from or of animal fat.
iii. Tanning, curing or storage of raw hides or skins.
jjj. Tar distillation or manufacture.
kkk. Tar roofing or water-proofing manufacture.
lll. Tobacco (chewing) manufacture or treatment.
mmm. Vinegar manufacture.

nnn. Wool pulling or scouring.
ooo. Yeast plant.

(b) *Height*. No building shall exceed in height the width of the street right-of-way on which it faces plus the depth of the front yard. In no event, however, shall the portion of a building located within one hundred fifty (150) feet of any property zoned for residential purposes exceed the height allowed in that residential zoning district.

(c) *Area*.

(1) *Size of yards*.

a. *Front yard*. There shall be a front yard having a minimum depth of twenty-five (25) feet. No parking, storage or similar use shall be allowed in required front yards in district "LI", except that automobile parking (including automobile dealer display parking) will be permitted in such yards if separated by at least twenty-five (25) feet from any residential district.

b. *Side yard*. A side yard of not less than fifteen (15) feet in width shall be provided on the side of a lot adjoining a side street. A side yard of not less than ten (10) feet in width shall be provided on the side of a lot adjoining a residential district. The required side yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the screening device when that portion of the building exterior is constructed of the same materials as the screening device. No parking, storage or similar use shall be allowed in any required side yard or in any side street yard adjoining a residential district.

c. *Rear yard.* No rear yard is required except that a rear yard of not less than fifty (50) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. No parking, storage or similar use shall be allowed in required rear yards in district "LI" within twenty-five (25) feet of the rear property line.

(2) *Reserved*.

(d) *Outside storage regulations*. In all zoning districts where outside storage yards are allowed, such storage yards shall be screened from view in accordance with the standards outlined in the city's general development ordinance. This provision applies to all outside storage which began after the original date of passage of this provision (April 4, 1994). Any variance request involving the requirements or standards relating to such required screening devices shall be considered by the city council in accordance with the city's general development ordinance. Areas which are used for infrequent and temporary storage for a period of thirty (30) days or less per year shall not be deemed as "storage yards".

SECTION 17-29. - "SU" SPECIFIC USE DISTRICT REGULATIONS

(a) *Use*. This district is for the purpose of the uses specifically listed and other unusual uses which are limited in number and which are clearly not allowed in any other zoning district. Zoning shall not be allowed under this district as a way of circumventing the standard provisions of this or any other ordinance of the city. Allowable uses shall include:

(1) Criminal or penal institutions.
(2) Landfill operations and accessory uses.
(3) Mining activities and storage, including sand and gravel mining, and stone quarries.

(b) All requests for specific use zoning shall be accompanied by an engineering site plan as outlined in the city's general development ordinance. Variances from the regulations in the city's general development ordinance may be granted at the discretion of the city council.

(c) Any proposed enlargement, structural modification or other significant change to any site which had been granted specific use zoning shall require approval of the city council following a public hearing. Such public hearing shall be conducted after a recommendation is received from the planning and zoning commission. The planning and zoning commission shall consider the request for an amendment after conducting a public hearing in accordance with requirements necessary for any proposed zone change.

(d) The zoning board of adjustment shall not have jurisdiction to hear, review, reverse, or modify any decision, determination, or ruling with respect to the granting, extension, revocation, modification or any other action taken relating to the granting of any specific use zoning.

(e) Building setbacks and heights shall be consistent with other structures in the immediate area, as determined by the city council.

This Section (Office Use Only)	
Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE
Deep Roots, Broad Wings, Bright Future

ZONE CHANGE APPLICATION

Owner/s (name): City of Farmers Branch/Camelot Landfill TX, LP	
Company Name:	
Mailing Address: 13000 William Dodson Parkway, Farmers Branch, TX 75234/P.O. Box 29246, Phoenix, AZ 85038-9246	
Work #: 972-247-3131 / 972-492-3888	Cell #:
E-Mail: charles.cox@farmersbranchtx.gov / bboyer2@republicservices.com	
Owner Signature (Owner/s Must Sign or Submit Letter of Authorization):	Date: 9/16/14
Printed Name: Charles Cox Bryan Boyer	

Applicant/Agent (name): Jason Edwards	
Company Name: Weaver Consultants Group, LLC	
Mailing Address: 6420 Southwest Blvd., Suite 206, Fort Worth, TX 76109	
Work #: 817-735-9770	Cell #:
E-Mail: jedwards@wcgrp.com	
Applicant/Agent Signature	Date: 9/16/14
Printed Name: Jason Edwards	

Current Zoning: AO/LI/SU Requested Zoning: SU Acres: 465.25

Legal Description (Lot/ Block/Tract/Abstract): A0974A P.O. Leary, Tr 1; A1638A A.J. Chowning, Tr 1 and 2; A 0525A P. Higgins, Tr 14; A0947A P.O. Leary, Tr 5

Address/Location: 580 Huffines Boulevard, Lewisville, TX 75056

Application and Sign Fees:

	Less than 1/2 acre	$ 150.00
	1/2 acre up to 4.99 acres	$ 250.00
	5 acres up to 24.99 acres	$ 400.00

	25 acres up to 49.99 acres	$ 750.00
	50 acres up to 99.99 acres	$1,000.00
X	100 acres and more	$1,500.00

Qty: 5	Zone Change Signs - $35 each. 1 sign required for each 5 acres (max. 5 per site)	$ 175

Sign(s) must be posted a minimum of ten (10) days prior to the Planning & Zoning hearing date.

Amount Due (application & sign fee)	$ 1,675

This Section (Office Use Only)	
Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

ZONE CHANGE APPLICATION

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Company Name:	
Mailing Address: 13000 William Dodson Parkway, Farmers Branch, TX 75234/P.O. Box 29246, Phoenix, AZ 85038-9246	
Work #: 972-247-3131 / 972-492-3888	Cell #:
E-Mail: shane.davis@farmersbranchtx.gov / bboyer2@republicservices.com	
Owner Signature (Owner/s Must Sign or Submit Letter of Authorization).	Date:
Printed Name: Shane Davis Bryan Boyer	

Applicant/Agent (name): Jason Edwards	
Company Name: Weaver Consultants Group, LLC	
Mailing Address: 6420 Southwest Blvd., Suite 206, Fort Worth, TX 76109	
Work #: 817-735-9770	Cell #:
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LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

REQUIRED:

Fully describe the plans for the property

See attached narrative.

NOTE:

Items must be staff approved and deemed complete before they will be placed on an agenda.

FARMERS BRANCH

Camelot Landfill Site Rezoning Request

580 Huffines Road
Lewisville Texas
466 Acres

General Location

The existing municipal solid waste landfill owned by the City of Farmers Branch is located at the southern terminus of Huffines Road, approximately 1500 feet south of State Highway 121 Business. The site contains approximately 350 acres of land that extends southward to the centerline of the Elm Fork and is currently permitted for municipal solid waste disposal activities. The site is surrounded by vast wooded areas along the Elm Fork floodplain on its southern and western borders. The northern portion of the site also contains a heavily wooded area. The southeastern border of the site is adjacent to the City of Carrollton (see Exhibit 1).

History

The City of Farmers Branch has owned the site since 1978. The site, commonly referred to as the "Camelot Landfill", was purchased by the City of Farmers Branch for use as a municipal solid waste landfill. The City of Farmers Branch received a permit to operate a solid waste landfill operation on this property in December 1979 from the Texas Natural Resource Conservation Commission (TNRCC), now known as the Texas Commission on Environmental Quality. TNRCC approved an amendment to change the waste footprint configuration in March 1981, resulting in the current permit number of 1312A. In 1980 the City of Farmers Branch began landfill operations at this facility. When the City began operations at Camelot Landfill, the site was not located within the City of Lewisville.

The City of Farmers Branch entered into an agreement with Camelot Landfill TX LP, a wholly owned subsidiary of Republic Services, to operate and maintain the site for the operational life of the permit. The City retained ownership of the land and municipal solid waste permit. Since operations began, the City and/or its contractor has operated the disposal facility in accordance with the facility permit and local, state and federal requirements.

In 2008, the City of Farmers Branch submitted a zoning change application to the City of Lewisville to change the zoning of approximately 350 acres from AO zoning to SU zoning for the landfill gas to energy facility. In order to properly design the new "Gas to Energy" project Lewisville City staff recommended rezoning the entire tract to a more flexible zoning classification, the Special Use (SU) zoning district. Using the SU zoning district, the City of Farmers Branch could establish its own development standards that would better fit the proposed "Gas to Energy" project. The zoning change request was approved by the City of Lewisville.

Reason for Rezoning Request

In March 2012, the City of Farmers Branch submitted a permit amendment application to the Texas Commission on Environmental Quality to increase the permitted disposal

volume both horizontally and vertically for Camelot Landfill. The total area of land in the application is approximately 470 acres. The amendment application was declared technically complete by TCEQ on March 19, 2015. On June 18, 2015 the Texas Legislature passed HB-281, which prohibited TCEQ from approving the City of Farmers Branch municipal solid waste permit amendment application without prior approval from the City of Lewisville. As a result, the cities of Farmers Branch and Lewisville reached an agreement in which the City of Farmers Branch would submit a zoning application request to the City of Lewisville.

Approximately 350 acres of the site is currently zoned **Special Use (SU)** for a municipal solid waste landfill as a result of the 2008 zoning change request. With the current request, the City of Farmers Branch is seeking to amend the zoning of Lot 1A, Lot 2, Lot 3, and Lot 4 which consist of the currently-zoned 350 acre SU area, approximately 18 acres of **Light Industrial (LI)** property, and approximately 102 acres of **Agriculture-Open Space (AO)** to **Special Use** for a municipal solid waste landfill as well as amend the Engineering Site Plan and plat to reflect proposed operational changes at the facility. Currently, the 350 acres with SU zoning are permitted by the State of Texas for municipal solid waste landfill operations. The permit amendment application proposes to add approximately 120 additional acres to the landfill permit, which is comprised of a larger tract of approximately 102 acres and a smaller tract of approximately 18 acre to provide additional disposal capacity as well as area for operational support and potential beneficial reuse activities.

The Camelot Landfill Expansion will add an additional 38 acres to the waste footprint area. The future waste disposal area is located in the northeast portion of the 350 acres currently zoned SU. In addition the City of Farmers Branch proposes to increase the maximum height of the landfill to 675 feet, which is equivalent to the maximum height permitted for the Lewisville Landfill. In addition, the City will construct a new scalehouse and maintenance facility to improve operational efficiency within the site and better working conditions for facility staff. The new facilities will be constructed prior to the completion of Corporate Drive.

For these reasons the **City of Farmers Branch is requesting rezoning of Lots 1A, 2, 3, and 4 (SU, LI, and AO) consisting of approximately 466 acres** to the **Special Use (SU)** zoning district and amending the current engineering site plan to reflect the current conditions as well as future development within the landfill boundary.

As part of the global effort to become more efficient with our limited energy resources, the City of Farmers Branch contracted with Waste Management's renewable energy group to develop and construct a "Gas to Energy Project" that uses methane gas collected from the buried waste material to power large engines to generate electricity onsite. This electricity generated from the project is sold and distributed to the regional electrical power grid system.

If approved by the City of Lewisville and subsequently by the Texas Commission on Environmental Quality, the Camelot Landfill Expansion will continue operations as they

occur today. The projected life of the facility is around 40 years with this expansion assuming waste volumes continue along projected trends and landfill operations and compaction are consistent with current operational standards.

The City of Farmers Branch and its contractor, Camelot Landfill TX LP, will begin assessing the timeliness of constructing the new scalehouse, citizens' convenience center, and office/maintenance facility. However, the new scalehouse and maintenance facilities will be constructed no later than 6 months prior to the completion of the Corporate Drive extension. This has to be done in order for the landfill to operate. The current scalehouse is located north of the future Corporate Drive extension. There must be an operational scalehouse south of Corporate Drive to maintain operations. After the scalehouse is constructed and before the opening of Corporate Drive, right of way for Huffines Boulevard in the area where the existing scalehouse is located will be dedicated to Lewisville by a separate instrument. Landfills weigh the solid waste transport vehicles to determine the amount of material discarded for annual reports as well as to determine the appropriate billing for the waste material. In addition the landfill staff is excited to one day have a place to repair equipment in doors rather than outside in the elements.

Within the landfill, there is a citizens' collection center for residents to use. This avoids residents in personal vehicles backing up in the active disposal area over uneven terrain and next to large solid waste transportation vehicles. As the site develops, the current citizens' collection center will be moved to a location adjacent to the proposed scalehouse. A citizens' collection center is typically a concrete pad adjacent to a excavated ridge of soil where rolloff containers are located. The rolloff containers are typically below the concrete pad making it easier for residents to deposit waste materials.

Zoning Request

The Special Use (SU) zoning district also allows for "Landfill Operations and accessory uses". The primary use of this tract will remain as a Municipal Solid Waste Landfill. The generation of electricity through the use of these proposed gas fueled generators will continue to be an accessory use on the site. Some other accessory uses include leachate storage, stormwater conveyance and detention, water storage, vehicle and equipment servicing, soil stockpiling. In the future, approximately 10 acres in the current AO acreage could be used for mulching or composting of woody material to divert organic material from the active disposal area.

The operation of a solid waste landfill is a very unique land use, and requires some special development standards. Landfills are dynamic. As new disposal areas, or cells, are constructed based on near term disposal capacity needs. Thus, landfill operations must adjust accordingly.

Overhead power lines already exist on site. In the northeast portion of the facility overhead electrical lines provide electricity to the maintenance area. A privately maintained line from this location powers the landfill flare and pumps for the landfill gas condensate and leachate generated by the buried waste material. Overhead electrical lines also carry electricity off site from the methane gas facility operated by Waste Management. The 2008 zoning change request and engineering site plan allowed a variance for the exteriors of the temporary employee breakroom and methane gas facility to be metal or wood-sided. The methane gas facility is constructed with metal siding and is currently operational. The facility will remain on site through the term of the contract. In addition, temporary breakroom and supply storage are wood or metal-sided, temporary, portable buildings. The breakroom and supply storage buildings will exist until the proposed entrance facilities and maintenance/office building are constructed (See Exhibit 2). Construction of these proposed buildings will be completed no later than 6 months prior to the completion of the proposed Corporate Drive extension. Currently, there is not a sewer line to the current maintenance and breakroom area. Therefore, portable restrooms are necessary for landfill staff and visitors. During the construction of the proposed buildings at Camelot Landfill, the utilities associated with the construction of the Corporate Drive extension may not be available. As a result there may be a dead end water line that is longer than 600 linear feet. A connection will be installed by Farmers Branch to connect to the future water line that will lie along the future Corporate Drive Extension. Once the water line for Corporate Drive is constructed and usable, the line will be connected to the existing line for Camelot Landfill. Landfill equipment is designed to move or compact soil and solid waste materials. This machinery is not conducive to traveling on paved roads. The machinery will quickly ruin concrete and asphalt paved roads (See Exhibit 3). Therefore, the roads from the active disposal area to the maintenance facility bay doors should not be paved. For these reasons, the City of Farmers Branch is requesting the following variances to be allowed within the 466 acre tract.

1) To allow overhead electrical lines to existing methane gas facility and temporary employee breakroom.
2) To allow metal or wood-sided buildings for the existing methane gas facility and temporary employee breakroom.
3) To allow existing portable restrooms in lieu of sewer lines until the construction of the proposed entrance facilities and office/maintenance buildings are complete.
4) To allow portable building without fixed foundations.
5) To wave interior landscaping and irrigation for temporary and permanent parking areas.
6) To allow a dead end water line that exceeds 600 linear feet until the construction of Corporate Drive.
7) To allow gravel to access the temporary buildings and to the bay doors of the prosed maintenance building.

Exhibit 1 -- Aerial Photograph of the Site

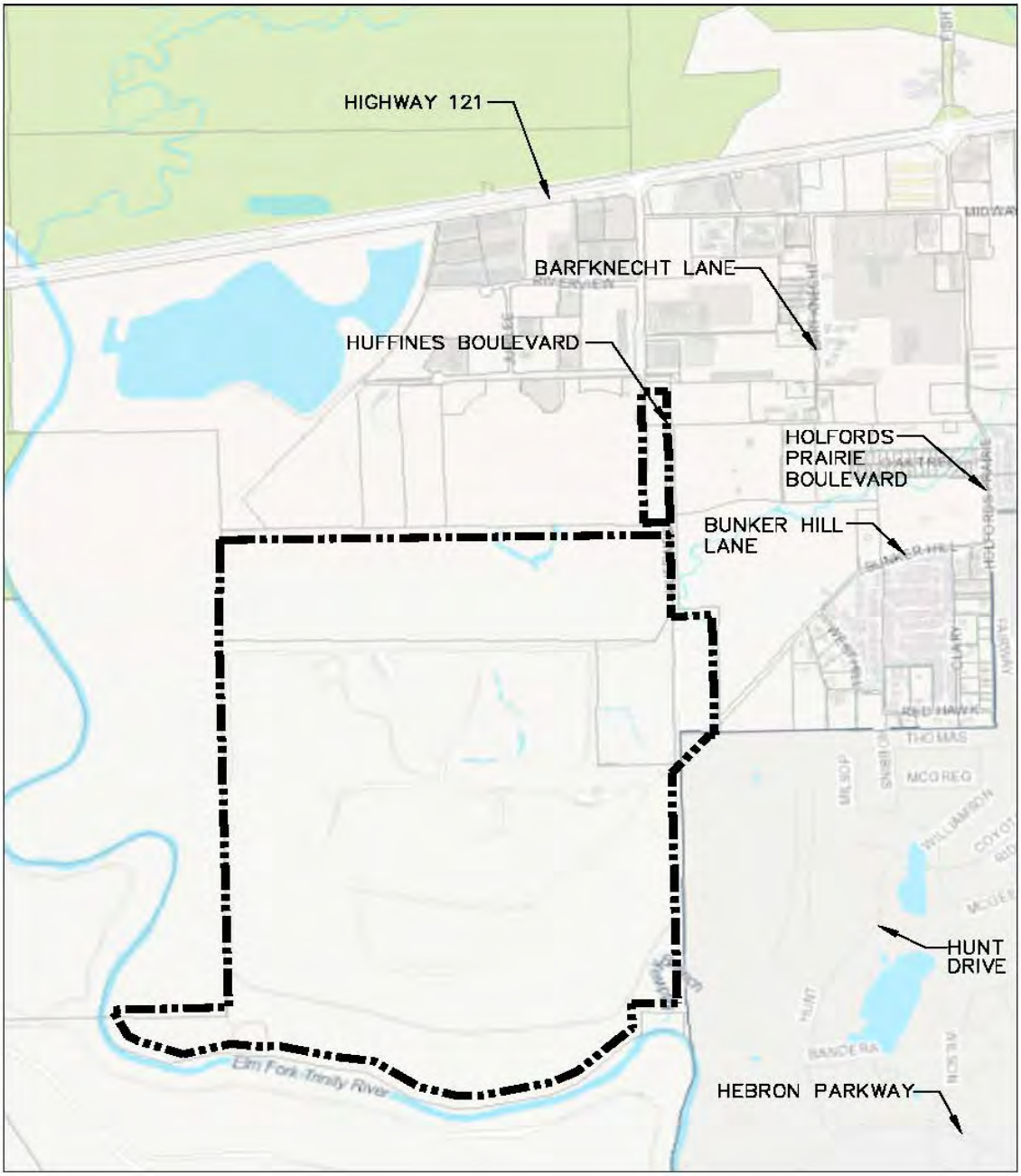


Exhibit 2 – Existing structures located within site

Existing leachate Tank (located on western edge near gas flare complex)

Existing storage areas and buildings on site

Existing scalehouse north of future Corporate Drive.

Exhibit 3 -- Landfill Heavy Equipment

Landfill compactor with compactor “teeth” on metal wheels.

Weaver Consultants Group

September 27, 2016
Project No. 1339-351-11-02-13

City Council
City of Lewisville
151 W. Church Street
Lewisville, Texas 75057

RE: Variance Request
Camelot Landfill

Dear City Council:

The purpose of this letter, submitted on behalf of the City of Farmers Branch, is to request seven variances associated with the proposed engineering site plan for the Camelot Landfill expansion. A brief description of each variance is listed below. Additionally, exhibits showing the location of each requested variance are attached to this letter.

Variance a – To Allow Overhead Electrical Lines to the Existing Methane Gas Facility and Temporary Employee Breakroom

The existing methane gas facility is currently served by an overhead powerline that runs along the western portion of the site, cuts due east across the northern portion of the site, then north along the eastern portion of the site to Huffines Boulevard for a total length of approximately 8,000 feet. Similarly, the existing overhead powerlines serving the temporary employee breakroom area run from the employee breakroom area due east to the eastern portion of the site then north up to Huffines Boulevard. Upon completion of the proposed current facilities, the temporary employee breakroom area will be abandoned and these powerlines will no longer be needed.

Variance b – To Allow Metal or Wood-sided Buildings for the Existing Methane Gas Facility, Temporary Employee Breakroom, and Equipment Storage Building

The temporary employee breakroom building and equipment storage building will be located internal to the site (over 500 feet from the nearest property line) and the location is well screened by the existing landfill, an existing soil berm, and vegetation. Additionally, these temporary buildings will only be utilized until the construction of the future entrance facilities is complete. The methane gas facility is an existing building located on the western side of the site. These temporary buildings are the property of Waste Management Renewable Energy and are used to house equipment used in the process of converting landfill gas to energy that is fed back into the power grid. The temporary buildings are located west of the filled waste disposal area with

heavy vegetation to the north and east, making the possibility of seeing this building from a public street highly unlikely.

Variance c – To Allow Existing Portable Restrooms In Lieu of Sewer Lines until Construction of the Proposed Entrance Facilities and Office/Maintenance Buildings are Complete

This request is to allow the continued use of portable restrooms near the temporary employee breakroom due to the distance to the nearest sanitary sewer line (over 2,000 feet). The portable restrooms will be removed upon occupancy of the future maintenance building and scalehouse.

Variance d – To Allow Portable Buildings Without Fixed Foundations

This variance applies to the temporary employee breakroom buildings until construction of the proposed entrance and maintenance facilities is complete, at which time the portable buildings will be abandoned.

Variance e – To Waive Interior Landscaping and Irrigation for Temporary and Permanent Parking Areas

In lieu of interior landscaping and irrigation for temporary and permanent parking areas, the City of Farmers Branch will install enhanced landscaping near the intersection of Corporate Drive and Huffines Boulevard once completed.

Variance f – To Allow a Dead End Water Line that Exceeds 600 Linear Feet until the Construction of Corporate Drive

A water line to serve the proposed scale house and maintenance building is proposed to be constructed from the current end of Huffines Boulevard to the southern end of the future entrance facilities. Once Corporate Drive is constructed, the water line will be connected to the water line within the Corporate Drive right-of-way, which will create a looped water line.

Variance g – To Allow Gravel Access to the Temporary Buildings and to the Bay Doors of the Proposed Maintenance Building

The heavy equipment that will be serviced in the maintenance building would damage any concrete or asphalt, creating constant maintenance of the access area around the proposed maintenance building. The temporary employee breakroom is located over 3,000 feet from a paved road and will be used until the construction of the proposed entrance and maintenance facilities is complete.

As discussed above, the variances are being requested as part of an engineering site plan for the referenced facility. The purpose of the engineering site plan is to expand the existing landfill, relocate the existing scalehouse, and construct a new office

zoned Specific Use which requires the landfill request a zone change when the site proposes a modification to the engineering site plan. As discussed, we have also attached the variance-processing fee of $350.

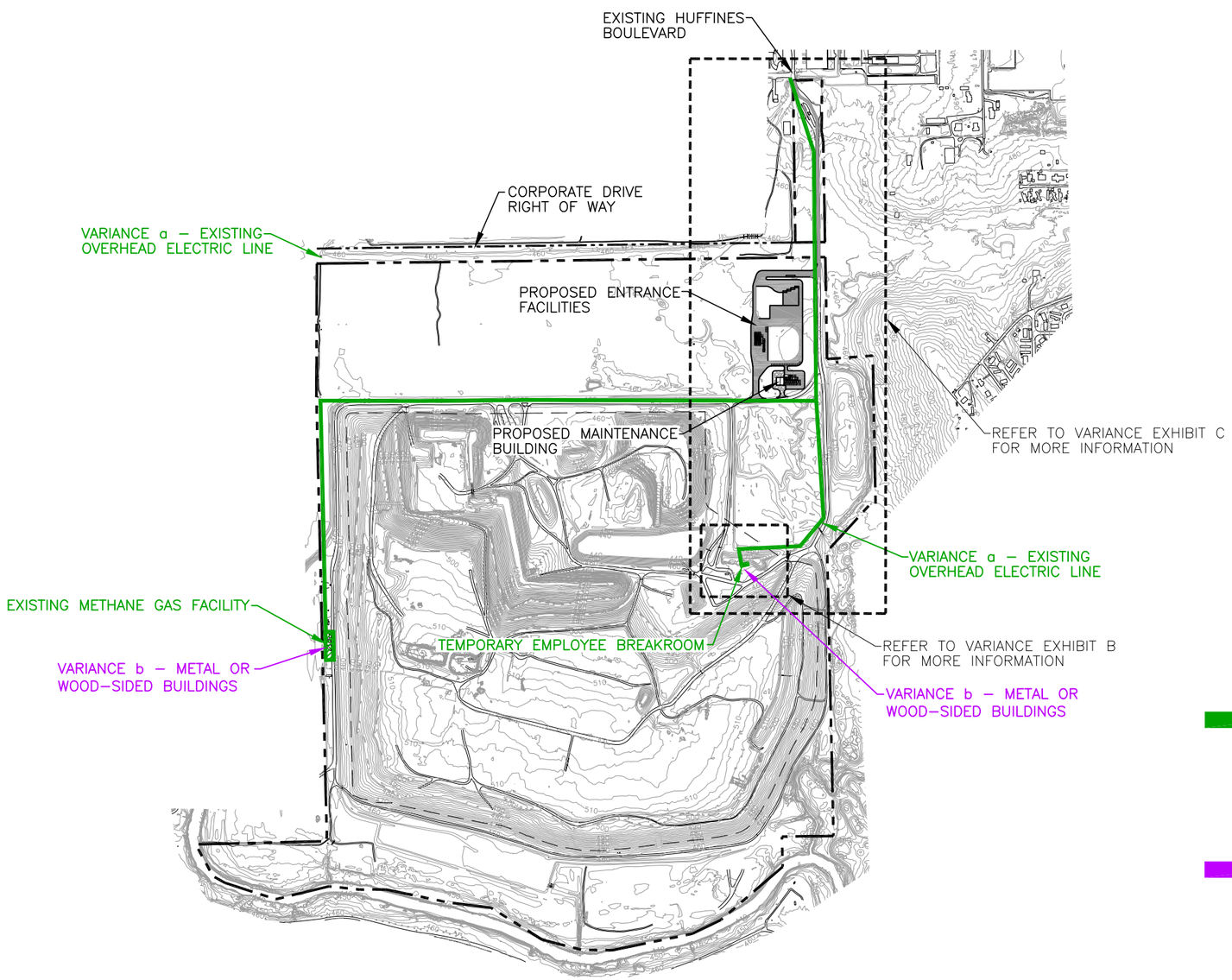
Please call if you have any questions.

Sincerely,
Weaver Consultants Group

Jason A. Edwards, P.E.
Senior Engineer

Attachments: Variance Exhibits

cc: Shave Davis, City of Farmers Branch



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SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- CORPORATE DRIVE RIGHT OF WAY
- 430 EXISTING CONTOUR
- LIMITS OF WASTE
- EXISTING LANDFILL ACCESS ROAD

NOTES:
1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.

VARIANCE a – TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

VARIANCE b – TO ALLOW METAL OR WOOD–SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

VARIANCE EXHIBIT

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339–351–11
CAD: EXHIBIT A.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
466.084 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

WWW.WCGRP.COM

EXHIBIT A

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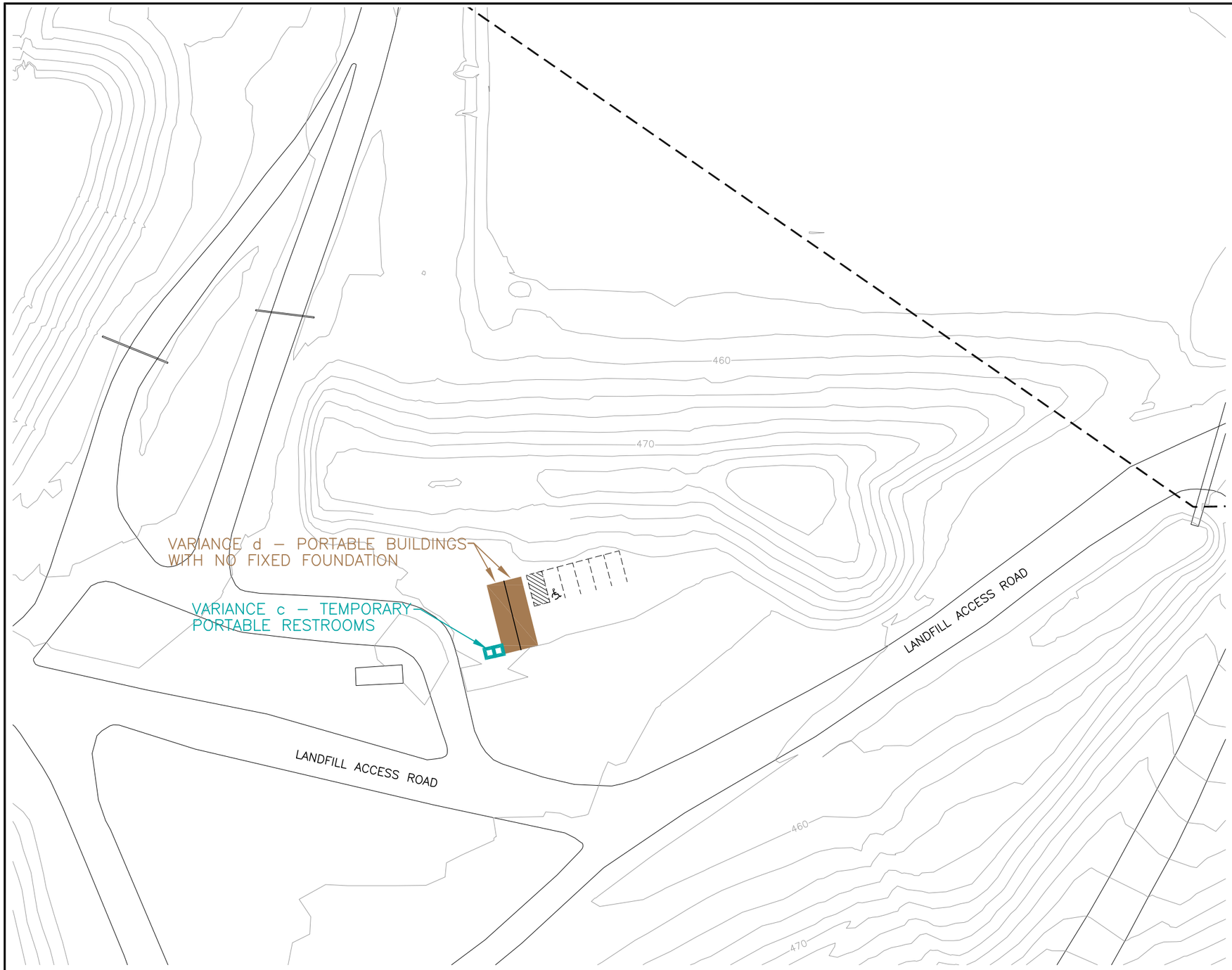
F:\Solid waste\City of Farmers Branch\Zoning Application 2016\Variance Exhibit A.dwg



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SCALE IN FEET

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- EXISTING LANDFILL ACCESS ROAD

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.

VARIANCE c – TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

VARIANCE d – TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

VARIANCE EXHIBIT

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339–351–11
CAD: EXHIBIT B.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
466.084 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

WWW.WCGRP.COM

EXHIBIT B

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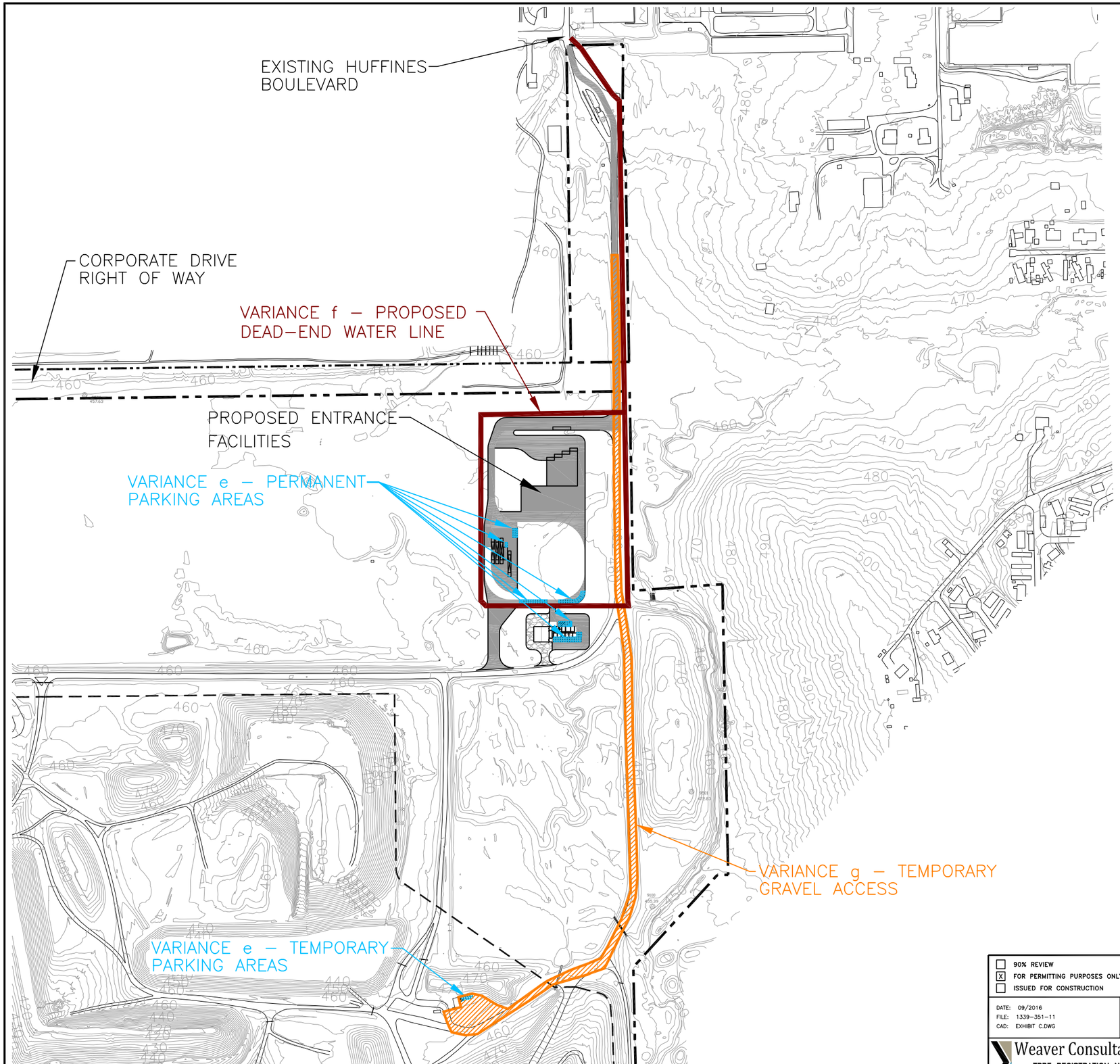
P:\Solid waste\City of Farmers Branch\Zoning Application 2016\Variance Exhibit B.dwg



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- EXISTING LANDFILL ACCESS ROAD

NOTES:
1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.

VARIANCE e – TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

VARIANCE f – TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

VARIANCE g – TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

VARIANCE EXHIBIT

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339–351–11
CAD: EXHIBIT C.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
466.084 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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EXHIBIT C

P:\Solid waste\City of Farmers Branch\Zoning Application 2016\Variance Exhibit C.dwg

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL, AMENDING THE ZONING ORDINANCE BY REZONING APPROXIMATELY 470 ACRES SITUATED IN THE P.O. LEARY SURVEY, ABSTRACT NO. 974; A.J. CHOWNING SURVEY, ABSTRACT NO. 1638; P. HIGGINS SURVEY, ABSTRACT NO. 525; H. HARPER SURVEY, ABSTRACT NO. 605; AND THE S. M. HAYDEN SURVEY, ABSTRACT NO. 537, GENERALLY LOCATED AT THE SOUTHERN TERMINUS OF HUFFINES BOULEVARD AND SOUTH OF THE FUTURE EXTENSION OF EAST CORPORATE DRIVE, AT 580 HUFFINES BOULEVARD; FROM AGRICULTURAL OPEN SPACE DISTRICT (AO) ZONING, LIGHT INDUSTRIAL DISTRICT (LI) ZONING AND SPECIFIC USE – LANDFILL OPERATIONS DISTRICT (SU – LANDFILL OPERATIONS) ZONING TO SPECIFIC USE – LANDFILL OPERATIONS AND ACCESSORY USES DISTRICT (SU – LANDFILL OPERATIONS AND ACCESSORY USES) ZONING; CORRECTING THE OFFICIAL ZONING MAP; PRESERVING ALL OTHER PORTIONS OF THE ZONING ORDINANCE; DETERMINING THAT THE PUBLIC INTERESTS AND GENERAL WELFARE DEMAND THIS ZONING CHANGE AND AMENDMENT THEREIN MADE; PROVIDING FOR A REPEALER, SEVERABILITY, AND A PENALTY; AND DECLARING AN EMERGENCY.

WHEREAS, applications were made to amend the Official Zoning Map of Lewisville, Texas by making applications for same with the Planning and Zoning Commission of the City of Lewisville, Texas, as required by State statutes and the Zoning Ordinances of the City of Lewisville, Texas, said Planning and Zoning Commission has recommended that rezoning of the approximately 470-acre property described in the attached Exhibit "A" (the "Property") be **approved**, and all the legal requirements, conditions and prerequisites having been complied with, the case having come before the City Council of the City of Lewisville, Texas, after all legal notices, requirements, conditions and prerequisites having been complied with; and,

WHEREAS, the City Council of the City of Lewisville, Texas, at a public hearing called by the City Council of the City of Lewisville, Texas, did consider the following factors in making a determination as to whether this requested change should be granted or denied: effect on the congestion of the streets; the fire hazards, panics and other dangers possibly present in the securing of safety from same; the effect on the promotion of health and the general welfare; effect on adequate light and air; the effect on the overcrowding of the land; the effect of the concentration on population; the effect on the transportation, water, sewerage, schools, parks and other public facilities; and,

WHEREAS, the City Council further considered among other things the character of the district and its peculiar suitability for particular uses and with the view to conserve the value of buildings, encourage the most appropriate use of land throughout this City; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that there is a public necessity for the zoning change, that the public interest clearly requires the amendment, that the zoning changes do not unreasonably invade the rights of adjacent property owners; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that the change in zoning lessens the congestion in the streets; helps secure safety from fire, panic and other dangers; promotes health and the general welfare; provides adequate light and air; prevents the overcrowding of land; avoids undue concentration of population; facilitates the adequate provisions of transportation, water, sewerage, schools, parks and other public requirements; and,

WHEREAS, the City Council of the City of Lewisville, Texas, has determined that there is a necessity and need for this change in zoning and has also found and determined that there has been a change in the conditions of the property surrounding and in close proximity to the Property since

it was originally classified and, therefore, feels that a change in zoning classification for the Property is needed, is called for, and is in the best interest of the public at large, the citizens of the City of Lewisville, Texas, and helps promote the general health, safety, and welfare of this community.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The Zoning Ordinance of the City of Lewisville, Texas, be, and the same is hereby amended and changed in that the zoning of the Property is hereby changed to **SPECIFIC USE - LANDFILL OPERATIONS AND ACCESSORY USES DISTRICT (SU – LANDFILL OPERATIONS AND ACCESSORY USES) ZONING**; in compliance with the narrative and engineering site plan attached hereto as Exhibit "B".

SECTION 2. The City Manager, or her designee, is hereby directed to correct the official zoning map of the City of Lewisville, Texas, to reflect this change in zoning.

SECTION 3. That in all other respects the use of the tract or tracts of land hereinabove described shall be subject to all the applicable regulations contained in said City of Lewisville Zoning Ordinance and all other applicable and pertinent ordinances of the City of Lewisville, Texas.

SECTION 4. That the zoning regulations and districts as herein established have been made in accordance with the comprehensive plan for the purpose of promoting health, safety, and the general welfare of the community. They have been designed with respect to both present conditions and the conditions reasonably anticipated to exist in the foreseeable future, to lessen congestion in the streets; to secure safety from fire, panic, flood and other dangers; provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population; facilitate the adequate

provisions of transportation, water, sewage, parks and other public requirements, and to make adequate provisions for the normal business, commercial needs and development of the community. They have been made with reasonable consideration, among other things of the character of the district, and its peculiar suitability for the particular uses and with a view of conserving the value of buildings and encouraging the most appropriate use of land throughout the community.

SECTION 5. This Ordinance shall be cumulative of all other ordinances of the City of Lewisville, Texas, affecting zoning and shall not repeal any of the provisions of said ordinances, except in those instances where provisions of those ordinances which are in direct conflict with the provisions of this Ordinance.

SECTION 6. That the terms and provisions of this Ordinance shall be deemed to be severable and that if the validity of the zoning affecting any portion of the Property shall be declared to be invalid, the same shall not affect the validity of the zoning of the balance of the tract or tracts of land described herein.

SECTION 7. Any person, firm or corporation who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof in the Municipal Court, shall be subject to a fine of not more than $2,000.00 for each offense, and each and every day such offense is continued shall constitute a new and separate offense.

SECTION 8. The fact that the present Zoning Ordinance and regulations of the City of Lewisville, Texas are inadequate to properly safeguard the health, safety, peace and general welfare of the inhabitants of the City of Lewisville, Texas, creates an emergency for the immediate preservation of the public business, property, health, safety and general welfare of the public which

requires that this Ordinance shall become effective from and after the date of its final passage, and it is accordingly so ordained.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

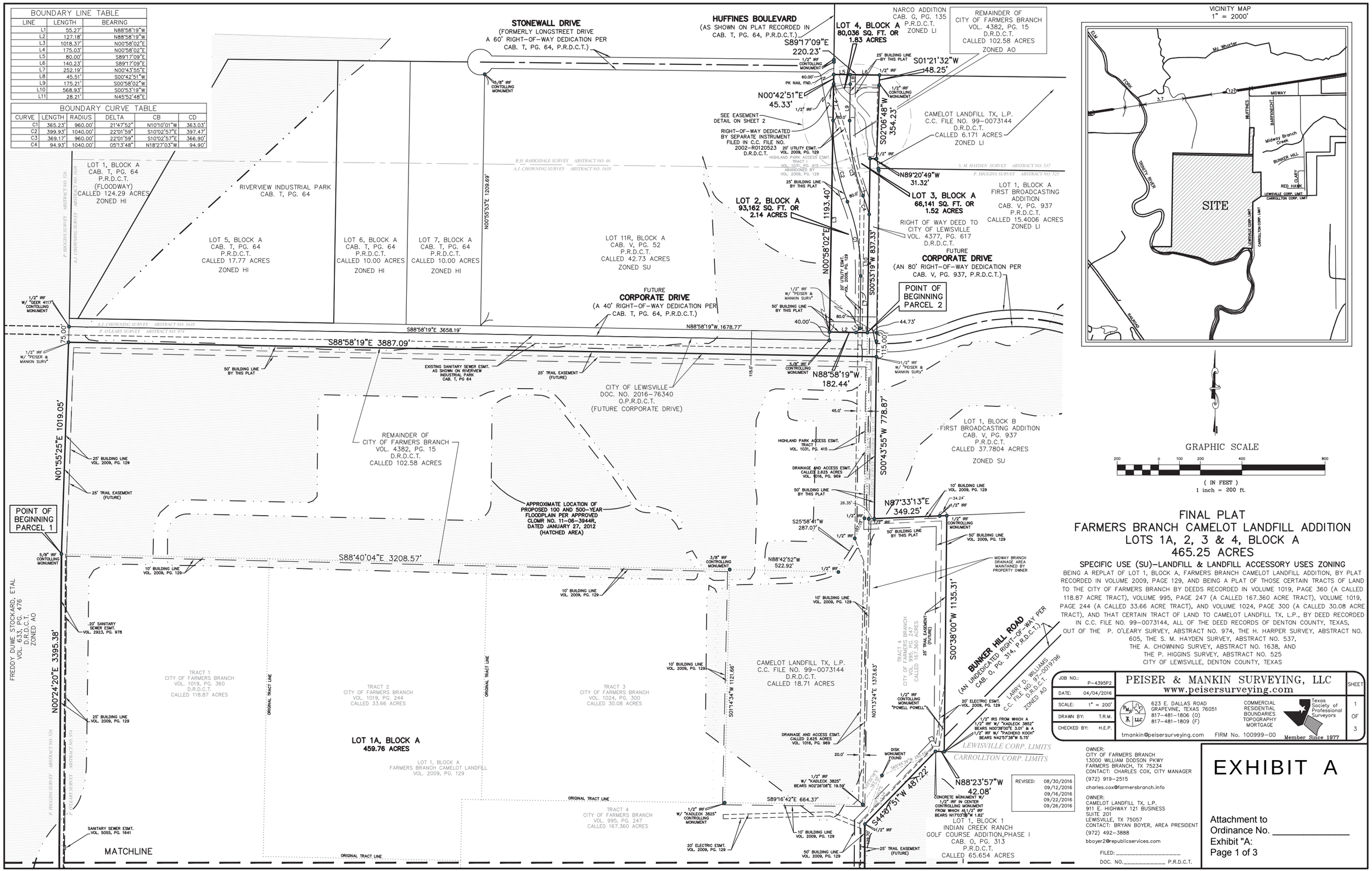
_____
Lizbeth Plaster, CITY ATTORNEY

Exhibit A
Property Description

Exhibit B
Narrative
Engineering Site Plan

BOUNDARY LINE TABLE		
LINE	LENGTH	BEARING
L1	55.27'	N88°58'19"W
L2	127.18'	N88°58'19"W
L3	1018.37'	N00°58'02"E
L4	175.03'	N00°58'02"E
L5	80.00'	S89°17'09"E
L6	140.23'	S89°17'09"E
L7	252.19'	N00°43'55"E
L8	45.51'	S00°42'51"W
L9	175.21'	S00°58'02"W
L10	568.93'	S00°53'19"W
L11	28.21'	N45°52'48"E

BOUNDARY CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CB	CD
C1	365.23'	960.00'	21°47'52"	N10°10'01"W	363.03'
C2	399.93'	1040.00'	22°01'59"	S10°02'57"E	397.47'
C3	369.17'	960.00'	22°01'59"	S10°02'57"E	366.90'
C4	94.93'	1040.00'	05°13'48"	N18°27'03"W	94.90'



FINAL PLAT
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3 & 4, BLOCK A
465.25 ACRES

SPECIFIC USE (SU)–LANDFILL & LANDFILL ACCESSORY USES ZONING

BEING A REPLAT OF LOT 1, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION, BY PLAT RECORDED IN VOLUME 2009, PAGE 129, AND BEING A PLAT OF THOSE CERTAIN TRACTS OF LAND TO THE CITY OF FARMERS BRANCH BY DEEDS RECORDED IN VOLUME 1019, PAGE 360 (A CALLED 118.87 ACRE TRACT), VOLUME 995, PAGE 247 (A CALLED 167.360 ACRE TRACT), VOLUME 1019, PAGE 244 (A CALLED 33.66 ACRE TRACT), AND VOLUME 1024, PAGE 300 (A CALLED 30.08 ACRE TRACT), AND THAT CERTAIN TRACT OF LAND TO CAMELOT LANDFILL TX, L.P., BY DEED RECORDED IN C.C. FILE NO. 99-0073144, ALL OF THE DEED RECORDS OF DENTON COUNTY, TEXAS, OUT OF THE P. O'LEARY SURVEY, ABSTRACT NO. 974, THE H. HARPER SURVEY, ABSTRACT NO. 605, THE S. M. HAYDEN SURVEY, ABSTRACT NO. 537, THE A. CHOWNING SURVEY, ABSTRACT NO. 1638, AND THE P. HIGGINS SURVEY, ABSTRACT NO. 525 CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

JOB NO.:	P-4395P2	PEISER & MANKIN SURVEYING, LLC www.peisersurveying.com	SHEET
DATE:	04/04/2016	623 E. DALLAS ROAD GRAPEVINE, TEXAS 76051 817-481-1806 (O) 817-481-1809 (F)	1 OF 3
SCALE:	1" = 200'	COMMERCIAL RESIDENTIAL BOUNDARIES TOPOGRAPHY MORTGAGE	
DRAWN BY:	T.R.M.	Texas Society of Professional Surveyors	
CHECKED BY:	H.E.P.	tmankin@peisersurveying.com FIRM No. 100999-00 Member Since 1977	

OWNER:
CITY OF FARMERS BRANCH
13000 WILLIAM DODSON PKWY
FARMERS BRANCH, TX 75234
CONTACT: CHARLES COX, CITY MANAGER
(972) 919-2515
charles.cox@farmersbranch.info

OWNER:
CAMELOT LANDFILL TX, L.P.
911 E. HIGHWAY 121 BUSINESS
SUITE 201
LEWISVILLE, TX 75057
CONTACT: BRYAN BOYER, AREA PRESIDENT
(972) 492-3888
bboyer2@republicservices.com

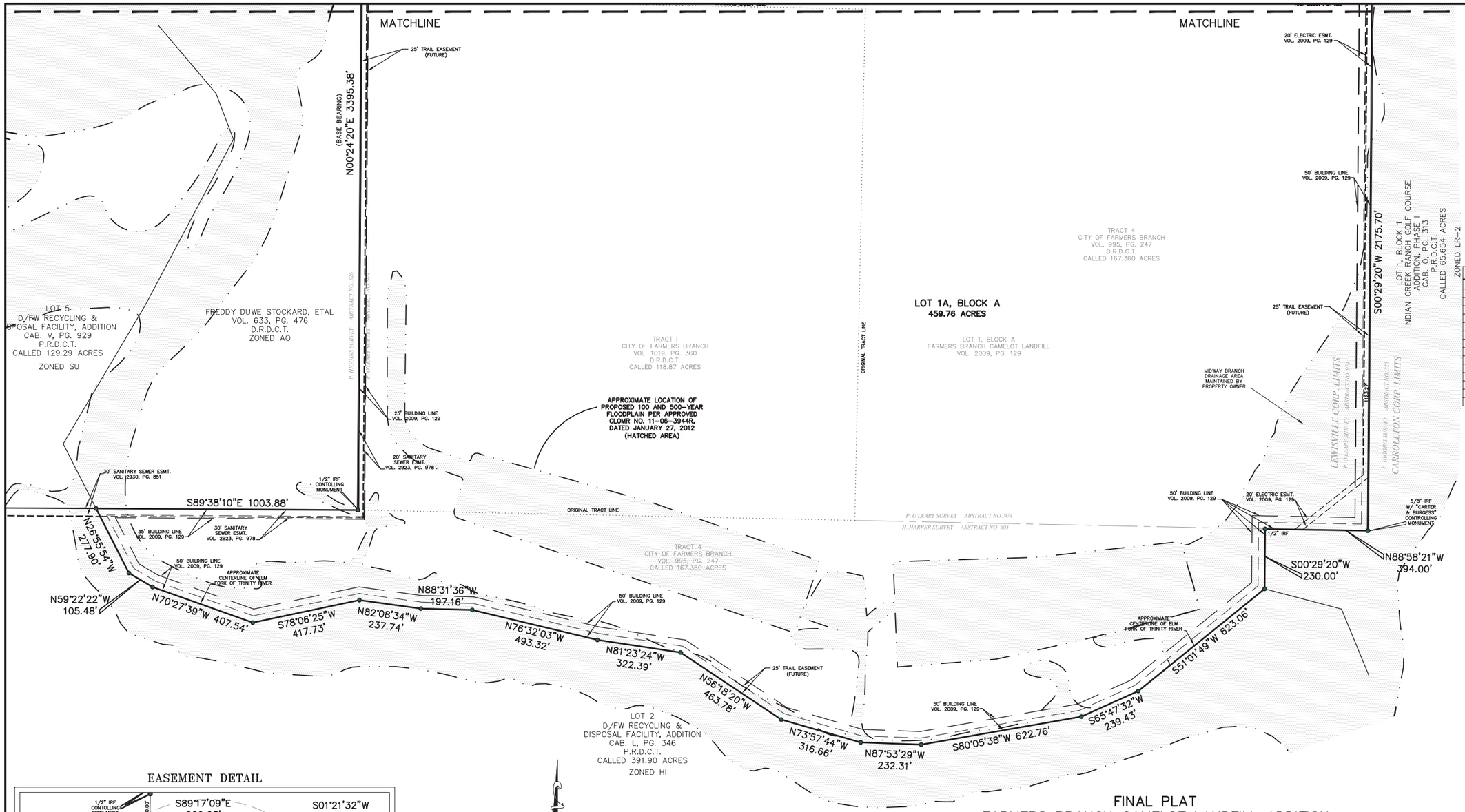
REVISED:	08/30/2016
	09/12/2016
	09/16/2016
	09/22/2016
	09/26/2016

FILED: _____

DOC. NO._____ P.R.D.C.T.

EXHIBIT A

Attachment to
Ordinance No. _____
Exhibit "A:
Page 1 of 3

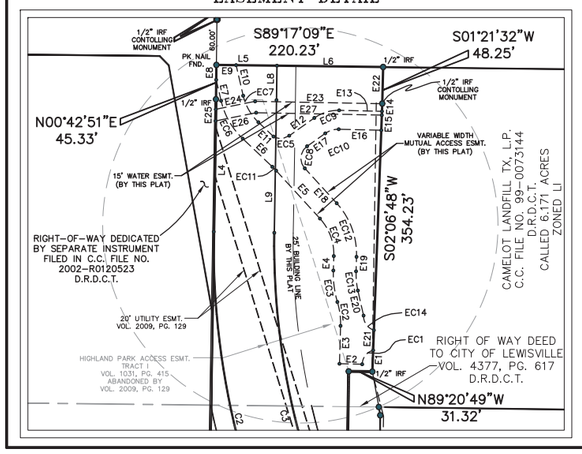


EASEMENT LINE TABLE		
LINE	LENGTH	BEARING
E1	28.20'	N 02°06'48" E
E2	30.00'	N 88°44'10" W
E3	50.10'	N 01°37'17" E
E4	19.08'	N 01°53'43" E
E5	85.79'	N 42°26'20" W
E6	53.92'	N 46°30'50" W
E7	28.48'	N 13°04'43" W
E8	19.72'	N 00°42'51" E
E9	26.05'	S 89°17'09" E
E10	41.43'	S 13°04'43" E
E11	27.48'	S 46°30'50" E
E12	40.65'	N 54°42'12" E
E13	56.59'	S 88°42'26" E
E14	10.28'	N 02°06'48" E
E15	25.00'	S 02°06'48" W
E16	56.24'	N 88°42'26" W
E17	29.42'	S 54°42'12" W
E18	62.40'	S 42°26'20" E
E19	19.08'	S 01°53'43" W
E20	33.86'	S 12°47'13" E
E21	26.53'	S 02°06'48" W
E22	48.52'	S 01°21'48" W
E23	167.95'	N 88°55'07" W
E24	52.97'	S 78°33'52" W
E25	15.36'	S 00°58'02" W
E26	54.63'	N 78°33'52" E
E27	166.04'	S 88°55'07" E

EASEMENT CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CB	CD
EC1	25.15'	19.50'	73°54'39"	S 38°13'10" W	23.45'
EC2	31.86'	100.00'	18°15'09"	N 07°30'18" W	31.72'
EC3	42.04'	130.00'	18°31'35"	S 07°22'04" E	41.85'
EC4	54.16'	70.00'	44°20'03"	N 20°16'18" W	52.82'
EC5	7.11'	100.00'	04°04'30"	N 44°28'35" W	7.11'
EC6	58.36'	100.00'	33°26'07"	S 29°47'47" E	57.53'
EC7	40.85'	70.00'	33°26'07"	S 29°47'47" E	40.27'
EC8	22.02'	19.50'	64°42'35"	N 87°03'30" E	20.87'
EC9	34.80'	54.50'	36°35'22"	S 72°59'53" W	34.22'
EC10	18.84'	29.50'	36°35'22"	S 72°59'53" W	18.52'
EC11	33.24'	19.50'	97°38'59"	S 05°52'22" W	29.36'
EC12	77.38'	100.00'	44°20'03"	N 20°16'18" W	75.46'
EC13	25.63'	100.00'	14°40'56"	S 05°26'45" E	25.56'
EC14	25.42'	19.50'	74°40'56"	S 35°17'17" E	23.66'

LOT #	ACREAGE
1A	459.76
2	2.14
3	1.52
4	1.83
TOTAL	465.25

EASEMENT DETAIL



GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

NOTES:

1. IRF – Iron Rod Found
2. IRS – Iron Rod Set w/ PEISER & MANKIN SURV red plastic cap
3. Basis of Bearing – Based on the west line of that certain called 118.87 acre tract of land to the City of Farmers Branch, by deed recorded in Volume 1019, Page 360, of the Deed Records of Denton County, Texas.
4. The Trail Easements shown hereon labeled (FUTURE) will be dedicated by future Separate Instrument, and is subject to approval of TCEQ. These easements are not dedicated by this plat, and are shown for pictorial purposes only.

REVISED: 08/30/2016
09/12/2016
09/16/2016
09/22/2016
09/26/2016

OWNER:
CITY OF FARMERS BRANCH
13000 WILLIAM DODSON PKWY
FARMERS BRANCH, TX 75234
CONTACT: CHARLES COX, CITY MANAGER
(972) 919-2515
charles.cox@farmersbranch.info

OWNER:
CAMELOT LANDFILL TX, L.P.
911 E. HIGHWAY 121 BUSINESS
SUITE 201
LEWISVILLE, TX 75057
CONTACT: BRYAN BOYER, AREA PRESIDENT
(972) 492-3888
bboyer2@republicservices.com

FINAL PLAT
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3 & 4, BLOCK A
465.25 ACRES

SPECIFIC USE (SU)–LANDFILL & LANDFILL ACCESSORY USES ZONING

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JOB NO.: P-4395P2	PEISER & MANKIN SURVEYING, LLC www.peisersurveying.com		SHEET
DATE: 04/04/2016			2
SCALE: 1" = 200'	623 E. DALLAS ROAD GRAPEVINE, TEXAS 76051 817-481-1806 (O) 817-481-1809 (F)	COMMERCIAL RESIDENTIAL BOUNDARIES TOPOGRAPHY MORTGAGE	OF
DRAWN BY: T.R.M.		Texas Society of Professional Surveyors	3
CHECKED BY: H.E.P.	tmankin@peisersurveying.com FIRM No. 100999-00	Member Since 1977	

FILED: _____

DOC. NO _____ P.R.D.C.T.

EXHIBIT A

Attachment to
Ordinance No. _____
Exhibit "A:
Page 2 of 3

Whereas the City of Farmers Branch and Camelot Landfill TX, L.P. are the sole owners of that certain lot, tract or parcel of land situated in the Patrick O'Leary Survey, Abstract No. 974, the H. Harper Survey, Abstract No. 605, and the P. Higgins Survey, Abstract No. 525, Denton County, Texas, and being all of Lot 1, Block A of Farmers Branch Camelot Landfill Addition, an addition to the City of Lewisville, as recorded in Document No. 2009–129, of the Plat Records of Denton County, Texas, and being all that certain tract of land described in deed dated March 24, 1967 from M.L. Ledbetter et al to The Town of Highland Park, as recorded in Volume 551, Page 136, Deed Records, Denton County, Texas, and being that called 0.238 acre tract of land described in deed dated May 23, 1988, from 121 County Venture to the Town of Highland Park, as recorded in Volume 2384, Page 64, said Deed Records, and being a portion of that certain called 102.58 acre tract of land described in deed dated July 13, 1999, from the Town of Highland Park to the City of Farmers Branch, as recorded in Volume 4382, Page 15, said Deed Records, also being that certain tract of land described in deed dated July 19, 1999 from Barfknecht Enterprises, L.C. to Camelot Landfill TX, L.P., as recorded in Volume 4383, Page 742, said Deed Records, and being more particularly described as follows:

PARCEL 1:

BEGINNING at a 5/8 inch iron rod found for the southwest corner of said City of Farmers Branch tract, same being the northwest corner of said Lot 1, same being in the east line of that certain tract of land to Freddy Duwe Stockard, etal, by deed recorded in Volume 633, Page 476, of said Deed Records;

THENCE North 01 deg. 55 min. 25 sec. East, along the common line of said City of Farmers Branch tract, and said Stockard tract, a distance of 1,019.05 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northwest corner of the herein described tract, same being the southwest corner of that certain tract of land from City of Farmers Branch to City of Lewisville, by Special Warranty Deed dated June 28, 2016, and recorded under Document No. 2016–76340, Official Public Records, Denton County, Texas;

THENCE South 88 deg. 58 min. 19 sec. East, through the interior of said City of Farmers Branch tract, and along the south line of said City of Lewisville tract, a distance of 3,887.09 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northeast corner of the herein described tract, same being in the east line of said City of Farmers Branch tract, same being in the west line of Lot 1, Block B of First Broadcasting Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 937, aforesaid Plat Records;

THENCE South 00 deg. 43 min. 55 sec. West, along the common line of said Camelot Landfill TX tract, and said Lot 1, Block B, a total distance of 778.87 feet to a 1/2 inch iron rod found for the southwest corner of said Lot 1, Block B, same being in a north line of aforesaid Lot 1, Block A, Farmers Branch Camelot Landfill Addition;

THENCE North 87 deg. 33 min. 13 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B of First Broadcasting Addition, passing at a distance of 315.01 feet a 1/2 inch iron rod found for corner corner, and continuing a total distance of 349.25 feet a 1/2 inch iron rod found for corner, said point being the most northerly northeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being an internal corner of said Lot 1, Block B;

THENCE South 00 deg. 38 min. 00 sec. West, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B, passing at a distance of 1030.53 feet a 1/2 inch iron rod found with "Powell Powell" cap, said point being the most southerly southwest corner of said Lot 1, Block B, same being the northwest corner of that certain tract of land to Larry D. Williams, by deed recorded in C.C. File No. 97–0019796, of aforesaid Deed Records, and continuing along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Williams tract, a total distance of 1135.31 feet to a point from which a 1/2 inch iron rod found with "Kadleck 3852" cap bears North 00 deg. 38 min. 00 sec. East, 3.01 feet, and another 1/2 inch iron rod found with "Pacheko Koch" cap bears North 42 deg. 57 min. 38 sec. West, 5.75 feet, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the southwest corner of said Williams tract, same being in the north line of Lot 1, Block 1 of Indian Creek Ranch Golf Course Addition, Phase I, an addition to the City of Carrollton, Denton County, Texas, according to the plat thereof recorded in Cabinet O, Page 313, of aforesaid Plat Records;

THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block 1 as follows:

North 88 deg. 23 min. 57 sec. West, a distance of 42.08 feet to a concrete monument with a 1/2 inch iron rod found;
South 44 deg. 07 min. 51 sec. West, a distance of 487.22 feet to a 1/2 inch iron rod found for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 2175.70 feet to a 5/8 inch iron rod found with "Carter & Burgess" cap for corner, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition;
North 88 deg. 58 min. 21 sec. West, a distance of 394.00 feet to a 1/2 inch iron rod found for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 230.00 feet to a point for corner in the approximate centerline of Elm Fork of Trinity River, said point being the most southerly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the most westerly southwest corner of said Lot 1, Block 1, same being the most northerly northeast corner of Lot 2, of D/FW Recycling & Disposal Facility, Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet L, Page 346, of aforesaid Plat Records;

THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 2, and along the approximate centerline of said Elm Fork of Trinity River as follows:

South 51 deg. 01 min. 49 sec. West, a distance of 623.06 feet to a point for corner;
South 65 deg. 47 min. 32 sec. West, a distance of 239.43 feet to a point for corner;
South 80 deg. 05 min. 38 sec. West, a distance of 622.76 feet to a point for corner;
North 87 deg. 53 min. 29 sec. West, a distance of 232.31 feet to a point for corner;
North 73 deg. 57 min. 44 sec. West, a distance of 316.66 feet to a point for corner;
North 56 deg. 18 min. 20 sec. West, a distance of 463.78 feet to a point for corner;
North 81 deg. 23 min. 24 sec. West, a distance of 322.39 feet to a point for corner;
North 76 deg. 32 min. 03 sec. West, a distance of 493.32 feet to a point for corner;
North 88 deg. 31 min. 36 sec. West, a distance of 197.16 feet to a point for corner;
North 82 deg. 08 min. 34 sec. West, a distance of 237.74 feet to a point for corner;
South 78 deg. 06 min. 25 sec. West, a distance of 417.73 feet to a point for corner;
North 70 deg. 27 min. 39 sec. West, a distance of 407.54 feet to a point for corner;
North 59 deg. 22 min. 22 sec. West, a distance of 105.48 feet to a point for corner;
North 26 deg. 55 min. 54 sec. West, a distance of 277.90 feet to a point for corner, said point being the most westerly southwest corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being a northeast corner of said Lot 2, same being the most southerly southeast corner of Lot 5, of D/FW Recycling & Disposal Facility Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 929, of aforesaid Plat Records, same being the most southerly southwest corner of aforesaid Stockard tract;

THENCE South 89 deg. 38 min. 10 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 1003.88 feet to a 1/2 inch iron rod found for corner, said point being the southeast corner of said Stockard tract;

THENCE North 00 deg. 24 min. 20 sec. East (basis of bearing), along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 3395.38 feet to the POINT OF BEGINNING and containing 459.76 acres of computed land, more or less.

PARCEL 2:

BEGINNING at a 1/2 inch iron rod set with "Peiser & Mankin Surv" red plastic cap (hereinafter referred to as 1/2 inch iron rod set) for the southeast corner of the herein described tract, same being the southwest corner of that certain Right of Way Deed to City of Lewisville, as recorded in Volume 4377, Page 617, aforesaid Deed Records, same being in the north line of aforesaid City of Lewisville tract (Doc. No. 2016–76340), same being in the east line of aforesaid City of Farmers Branch tract;

THENCE North 88 deg. 58 min. 19 sec. West, along the north line of said City of Lewisville tract (Doc. No. 2016–76340), a distance of 182.44 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap found for the southwest corner of the herein described tract, same being the southeast corner of Lot 11R, Block A, Riverview Industrial Park, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 52, said Plat Records, same being the northeast corner of a 40 foot right–of–way dedication of Corporate Drive (a 40 foot right–of–way, as dedicated by Cabinet V, Page 52, said Plat Records);

THENCE North 00 deg. 58 min. 02 sec. East, along the common line of said City of Farmers Branch tract, and said Lot 11R, passing the most easterly northeast corner of said Lot 11R, same being the most southerly point of a right–of–way dedication for Huffines Boulevard, as recorded in County Clerk's File No. (C.C. File No.) 2002–R0120523, of aforesaid Deed Records, and continuing along the common line of said City of Farmers Branch tract, and the east right–of–way line of said Huffines Boulevard, a total distance of 1193.40 feet to a 1/2 inch iron rod found for corner;

THENCE North 00 deg. 42 min. 51 sec. East, continuing along the common line of said City of Farmers Branch tract, and the east right–of–way line of said Huffines Boulevard, a distance of 45.33 feet to a pk nail found for corner for the northwest corner of the herein described tract, from which a 1/2 inch iron rod found bears North 00 deg. 42 min. 51 sec. East, 60.00 feet, said point being the most northerly northwest corner of said City of Farmers Branch tract, same being the southwest corner of NARCO Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet G, Page 135, of aforesaid Plat Records;

THENCE South 89 deg. 17 min. 09 sec. East, along the common line of said City of Farmers Branch tract, and said NARCO Addition, a distance of 220.23 feet to a 1/2 inch iron rod found for the northeast corner of the herein described tract, said point being the most northerly northeast corner of said City of Farmers Branch tract, same being the most northerly northwest corner of that certain called 6.171 acre tract of land to Camelot Landfill TX, L.P., by deed recorded in C.C. File No. 99–0073144, of aforesaid Deed Records;

THENCE South 01 deg. 21 min. 32 sec. West, along the common line of said City of Farmers Branch tract, and said called 6.171 acre tract, a distance of 48.25 feet to a 1/2 inch iron rod found for corner;

THENCE South 02 deg. 06 min. 48 sec. West, continuing along the common line of said City of Farmers Branch tract, and said called 6.171 acre tract, a distance of 354.23 feet to a 1/2 inch iron rod found for corner for the most northerly northeast corner of aforesaid City of Lewisville Right of Way deed (Volume 4377, Page 617);

THENCE North 89 deg. 20 min. 49 sec. West, along the north line of said City of Lewisville Right of Way deed, a distance of 31.32 feet to a 1/2 inch iron rod set for an internal corner, same being the northwest corner of said City of Lewisville Right of Way deed,

THENCE South 00 deg. 53 min. 19 sec. West, continuing along the common of said Farmers Branch tract and said City of Lewisville Right of Way deed, a distance of 837.33 feet to the POINT OF BEGINNING and containing 239,357 square feet or 5.49 acres of computed land, more or less.

NOW THEREFORE, KNOW ALL MEN BY THESE PRESENTS:
THAT **THE CITY OF FARMERS BRANCH** ACTING BY AND THROUGH ITS OFFICER, CHARLES COX, CITY MANAGER, THE UNDERSIGNED AUTHORITY, AND **CAMELOT LANDFILL TX, L.P.**, ACTING BY AND THROUGH ITS AREA PRESIDENT, BRYAN BOYER, THE UNDERSIGNED AUTHORITY, DO HEREBY ADOPT THIS PLAT DESIGNATING THE HEREIN ABOVE DESCRIBED PROPERTY AS **FARMERS BRANCH CAMELOT LANDFILL ADDITION, LOTS 1A, 2, 3 & 4, BLOCK A**, AN ADDITION TO THE CITY OF LEWISVILLE, DENTON COUNTY, TEXAS, AND DO HEREBY DEDICATE TO THE PUBLIC USE FOREVER THE STREETS AND ALLEYS SHOWN HEREON; AND DO HEREBY DEDICATE THE FOREVER THE STREETS AND ALLEYS SHOWN HEREON; AND DO HEREBY DEDICATE THE EASEMENT STRIPS SHOWN ON THE PLAT FOR MUTUAL USE AND ACCOMMODATION OF THE CITY OF LEWISVILLE AND ALL PUBLIC UTILITIES DESIRING TO USE, OR USING SAME. NO BUILDINGS, FENCES, TREES, SHRUBS, SIGNS, OR OTHER IMPROVEMENTS SHALL BE CONSTRUCTED OR PLACED UPON, OVER OR ACROSS THE EASEMENT STRIPS ON SAID PLAT. THE CITY OF LEWISVILLE AND ANY PUBLIC UTILITY SHALL HAVE THE RIGHT TO REMOVE AND KEEP REMOVED ALL OR PART OF ANY BUILDINGS, FENCES, TREES, SHRUBS, SIGNS, OR OTHER IMPROVEMENTS OR GROWTHS WHICH IN ANY WAY ENDANGER OR INTERFERE WITH THE CONSTRUCTION, MAINTENANCE, OR EFFICIENCY OF ITS RESPECTIVE SYSTEM ON ANY OF THESE EASEMENT STRIPS, AND THE CITY OF LEWISVILLE AND ANY PUBLIC UTILITY SHALL AT ALL TIMES HAVE THE RIGHT OF INGRESS AND EGRESS TO AND FROM AND UPON ANY OF SAID EASEMENT STRIPS FOR THE PURPOSE OF CONSTRUCTING, RECONSTRUCTING, INSPECTING, PATROLLING, MAINTAINING, AND ADDING TO OR REMOVING ALL OR PART OF ITS RESPECTIVE SYSTEM WITHOUT THE NECESSITY AT ANY TIME OF PROCURING THE PERMISSION OF ANYONE. A BLANKET EASEMENT OF A FIVE (5) FOOT RADIUS FROM THE CENTER POINT OF ALL FIRE HYDRANTS AND A FIVE (5) FOOT RADIUS FROM THE CENTER POINT OF ALL OTHER APPURTENANCES (FIRE HYDRANT VALVES, WATER METERS, METER BOXES, STREET LIGHTS) IS HERE BY GRANTED TO THE CITY OF LEWISVILLE FOR THE PURPOSE OF CONSTRUCTING, RECONSTRUCTING, INSPECTING AND MAINTAINING THE ABOVE NAMED APPURTENANCES.

WE DO FURTHER DEDICATE, SUBJECT TO THE EXCEPTIONS AND RESERVATIONS SET FORTH HEREINAFTER, TO THE PUBLIC USE FOREVER, ALL PUBLIC USE SPACES SHOWN ON THE FACE OF THE PLAT.

ALL LOTS IN THE SUBDIVISION SHALL BE SOLD AND DEVELOPED SUBJECT TO THE BUILDING LINES SHOWN ON THE PLAT.

CHARLES COX, CITY MANAGER
CITY OF FARMERS BRANCH

_____ _____ _____
DATE

STATE OF TEXAS
COUNTY OF _____

BEFORE ME, THE UNDERSIGNED AUTHORITY, ON THIS DAY PERSONALLY APPEARED CHARLES COX, KNOWN TO ME TO BE THE PERSON WHOSE NAME IS SUBSCRIBED TO THE FOREGOING INSTRUMENT AND ACKNOWLEDGED TO ME THAT HE EXECUTED THE SAME FOR THE PURPOSES AND CONSIDERATIONS THEREIN EXPRESSED AND IN THE CAPACITY THEREIN AND HEREIN STATED, AND AS THE ACT AND DEED OF SAID COOPERATION.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, THIS _____ DAY OF _____, 2016.

_____
NOTARY PUBLIC IN AND FOR THE STATE OF TEXAS
MY COMMISSION EXPIRES: _____

BRYAN BOYER, AREA PRESIDENT
CAMELOT LANDFILL TX, L.P.

_____ _____ _____
DATE

STATE OF TEXAS
COUNTY OF _____

BEFORE ME, THE UNDERSIGNED AUTHORITY, ON THIS DAY PERSONALLY APPEARED BRYAN BOYER, KNOWN TO ME TO BE THE PERSON WHOSE NAME IS SUBSCRIBED TO THE FOREGOING INSTRUMENT AND ACKNOWLEDGED TO ME THAT HE EXECUTED THE SAME FOR THE PURPOSES AND CONSIDERATIONS THEREIN EXPRESSED AND IN THE CAPACITY THEREIN AND HEREIN STATED, AND AS THE ACT AND DEED OF SAID COOPERATION.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, THIS _____ DAY OF _____, 2016.

_____
NOTARY PUBLIC IN AND FOR THE STATE OF TEXAS
MY COMMISSION EXPIRES: _____

All variances (if any) from the General Development Ordinance Approved by City Council.

_____ _____ _____
JAMES DAVIS
CHAIRMAN, PLANNING & COMMUNITY SERVICES DIVISION
CITY OF LEWISVILLE, TEXAS
Date

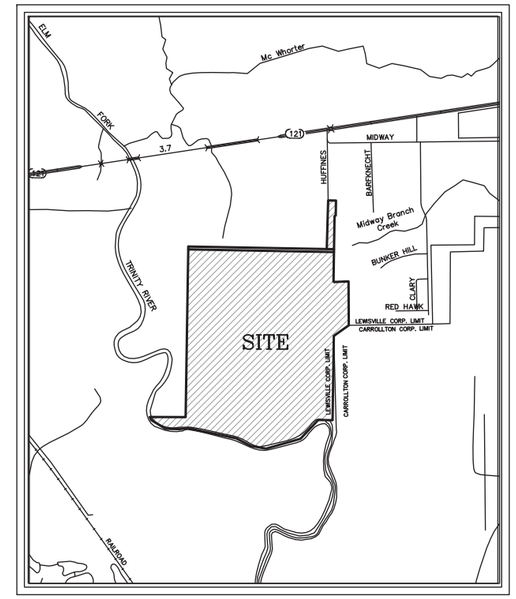
SIGNATURE BLOCK FOR CITY SECRETARY

THE UNDERSIGNED, THE CITY SECRETARY OF THE CITY OF LEWISVILLE, TEXAS, HEREBY CERTIFIES THAT THE FOREGOING FINAL PLAT OF THE **FARMERS BRANCH CAMELOT LANDFILL ADDITION** TO THE CITY OF LEWISVILLE WAS SUBMITTED TO THE APPROPRIATE PLANNING AND ZONING COMMISSION OR CITY COUNCIL AS REQUIRED BY THE ORDINANCES OF THE CITY OF LEWISVILLE ON THE _____ DAY OF _____, 2016, AND SUCH BODY BY FORMAL ACTION, THEN AND THERE ACCEPTED THE DEDICATION OF STREETS, ALLEYS, PARKS, EASEMENTS, PUBLIC PLACES AND WATER AND SEWER LINES, AS SHOWN AND SET FORTH IN AND UPON SAID PLAT, AND SAID BODY FURTHER AUTHORIZED THE ACCEPTANCE THEREOF BY SIGNING AS HEREINABOVE SUBSCRIBED IN THE CAPACITY STATED.

WITNESS MY HAND THIS _____ DAY OF _____, 2016.

_____
JULIE HEINZE, CITY SECRETARY
CITY OF LEWISVILLE, TEXAS

VICINITY MAP
1" = 2000'



I, TIMOTHY R. MANKIN, AM REGISTERED UNDER THE LAWS OF THE STATE OF TEXAS TO PRACTICE THE PROFESSION OF SURVEYING AND HEREBY CERTIFY THAT THE ABOVE SUBDIVISION IS TRUE AND CORRECT; WAS PREPARED FROM AN ACTUAL SURVEY OF THE PROPERTY MADE UNDER MY SUPERVISION ON THE GROUND; THAT ALL BOUNDARY CORNERS, ANGLE POINTS, POINTS OF CURVATURE AND OTHER POINTS OF REFERENCE HAVE BEEN MARKED ON THE GROUND, AND THAT THIS PLAT CORRECTLY REPRESENTS THAT SURVEY MADE BY ME OR UNDER MY SUPERVISION, IN ACCORDANCE WITH THE PLATTING RULES AND REGULATIONS OF THE CITY OF LEWISVILLE, TEXAS.

PRELIMINARY–FOR REVIEW ONLY
RELEASED 09/26/2016

TIMOTHY R. MANKIN
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6122

STATE OF TEXAS
COUNTY OF TARRANT

BEFORE ME, THE UNDERSIGNED AUTHORITY, ON THIS DAY PERSONALLY APPEARED TIMOTHY R. MANKIN, KNOWN TO ME TO BE THE PERSON WHOSE NAME IS SUBSCRIBED TO THE FOREGOING INSTRUMENT AND ACKNOWLEDGED TO ME THAT HE EXECUTED THE SAME FOR THE PURPOSES AND CONSIDERATIONS THEREIN EXPRESSED AND IN THE CAPACITY THEREIN AND HEREIN STATED, AND AS THE ACT AND DEED OF SAID COOPERATION.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, THIS _____ DAY OF _____, 2016.

_____
NOTARY PUBLIC IN AND FOR THE STATE OF TEXAS
MY COMMISSION EXPIRES: _____

FINAL PLAT
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3 & 4, BLOCK A
465.25 ACRES

SPECIFIC USE (SU)–LANDFILL & LANDFILL ACCESSORY USES ZONING

BEING A REPLAT OF LOT 1, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION, BY PLAT RECORDED IN VOLUME 2009, PAGE 129, AND BEING A PLAT OF THOSE CERTAIN TRACTS OF LAND TO THE CITY OF FARMERS BRANCH BY DEEDS RECORDED IN VOLUME 1019, PAGE 360 (A CALLED 118.87 ACRE TRACT), VOLUME 995, PAGE 247 (A CALLED 167.360 ACRE TRACT), VOLUME 1019, PAGE 244 (A CALLED 33.66 ACRE TRACT), AND VOLUME 1024, PAGE 300 (A CALLED 30.08 ACRE TRACT), AND THAT CERTAIN TRACT OF LAND TO CAMELOT LANDFILL TX, L.P., BY DEED RECORDED IN C.C. FILE NO. 99–0073144, ALL OF THE DEED RECORDS OF DENTON COUNTY, TEXAS, OUT OF THE P. O'LEARY SURVEY, ABSTRACT NO. 974, THE H. HARPER SURVEY, ABSTRACT NO. 605, THE S. M. HAYDEN SURVEY, ABSTRACT NO. 537, THE A. CHOWNING SURVEY, ABSTRACT NO. 1638, AND THE P. HIGGINS SURVEY, ABSTRACT NO. 525 CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

REVISED:	08/30/2016
	09/12/2016
	09/16/2016
	09/22/2016
	09/26/2016

OWNER:
CITY OF FARMERS BRANCH
13000 WILLIAM DODSON PKWY
FARMERS BRANCH, TX 75234
CONTACT: CHARLES COX, CITY MANAGER
(972) 919–2515
charles.cox@farmersbranch.info

OWNER:
CAMELOT LANDFILL TX, L.P.
911 E. HIGHWAY 121 BUSINESS
SUITE 201
LEWISVILLE, TX 75057
CONTACT: BRYAN BOYER, AREA PRESIDENT
(972) 492–3888
bboyer2@republicservices.com

JOB NO.:	P–4395P2	PEISER & MANKIN SURVEYING, LLC www.peisersurveying.com	SHEET
DATE:	04/04/2016		
SCALE:	1" = 200'	623 E. DALLAS ROAD GRAPEVINE, TEXAS 76051 817–481–1806 (O) 817–481–1809 (F)	COMMERCIAL RESIDENTIAL BOUNDARIES TOPOGRAPHY MORTGAGE	3 OF 3
DRAWN BY:	T.R.M.		
CHECKED BY:	H.E.P.	tmankin@peisersurveying.com FIRM No. 100999–00	Texas Society of Professional Surveyors Member Since 1977

FILED: _____

DOC. NO _____ P.R.D.C.T.

EXHIBIT A

Attachment to
Ordinance No. _____
Exhibit "A:
Page 3 of 3

EXHIBIT B

FARMERS BRANCH

Camelot Landfill Site Rezoning Request

NARRATIVE

580 Huffines Road
Lewisville Texas
466 Acres

General Location

The existing municipal solid waste landfill owned by the City of Farmers Branch is located at the southern terminus of Huffines Road, approximately 1500 feet south of State Highway 121 Business. The site contains approximately 350 acres of land that extends southward to the centerline of the Elm Fork and is currently permitted for municipal solid waste disposal activities. The site is surrounded by vast wooded areas along the Elm Fork floodplain on its southern and western borders. The northern portion of the site also contains a heavily wooded area. The southeastern border of the site is adjacent to the City of Carrollton (see Exhibit 1).

History

The City of Farmers Branch has owned the site since 1978. The site, commonly referred to as the "Camelot Landfill", was purchased by the City of Farmers Branch for use as a municipal solid waste landfill. The City of Farmers Branch received a permit to operate a solid waste landfill operation on this property in December 1979 from the Texas Natural Resource Conservation Commission (TNRCC), now known as the Texas Commission on Environmental Quality. TNRCC approved an amendment to change the waste footprint configuration in March 1981, resulting in the current permit number of 1312A. In 1980 the City of Farmers Branch began landfill operations at this facility. When the City began operations at Camelot Landfill, the site was not located within the City of Lewisville.

The City of Farmers Branch entered into an agreement with Camelot Landfill TX LP, a wholly owned subsidiary of Republic Services, to operate and maintain the site for the operational life of the permit. The City retained ownership of the land and municipal solid waste permit. Since operations began, the City and/or its contractor has operated the disposal facility in accordance with the facility permit and local, state and federal requirements.

In 2008, the City of Farmers Branch submitted a zoning change application to the City of Lewisville to change the zoning of approximately 350 acres from AO zoning to SU zoning for the landfill gas to energy facility. In order to properly design the new "Gas to Energy" project Lewisville City staff recommended rezoning the entire tract to a more flexible zoning classification, the Special Use (SU) zoning district. Using the SU zoning district, the City of Farmers Branch could establish its own development standards that would better fit the proposed "Gas to Energy" project. The zoning change request was approved by the City of Lewisville.

Reason for Rezoning Request

In March 2012, the City of Farmers Branch submitted a permit amendment application to the Texas Commission on Environmental Quality to increase the permitted disposal

volume both horizontally and vertically for Camelot Landfill. The total area of land in the application is approximately 470 acres. The amendment application was declared technically complete by TCEQ on March 19, 2015. On June 18, 2015 the Texas Legislature passed HB-281, which prohibited TCEQ from approving the City of Farmers Branch municipal solid waste permit amendment application without prior approval from the City of Lewisville. As a result, the cities of Farmers Branch and Lewisville reached an agreement in which the City of Farmers Branch would submit a zoning application request to the City of Lewisville.

Approximately 350 acres of the site is currently zoned **Special Use (SU)** for a municipal solid waste landfill as a result of the 2008 zoning change request. With the current request, the City of Farmers Branch is seeking to amend the zoning of Lot 1A, Lot 2, Lot 3, and Lot 4 which consist of the currently-zoned 350 acre SU area, approximately 18 acres of **Light Industrial (LI)** property, and approximately 102 acres of **Agriculture-Open Space (AO)** to **Special Use** for a municipal solid waste landfill as well as amend the Engineering Site Plan and plat to reflect proposed operational changes at the facility. Currently, the 350 acres with SU zoning are permitted by the State of Texas for municipal solid waste landfill operations. The permit amendment application proposes to add approximately 120 additional acres to the landfill permit, which is comprised of a larger tract of approximately 102 acres and a smaller tract of approximately 18 acre to provide additional disposal capacity as well as area for operational support and potential beneficial reuse activities.

The Camelot Landfill Expansion will add an additional 38 acres to the waste footprint area. The future waste disposal area is located in the northeast portion of the 350 acres currently zoned SU. In addition the City of Farmers Branch proposes to increase the maximum height of the landfill to 675 feet, which is equivalent to the maximum height permitted for the Lewisville Landfill. In addition, the City will construct a new scalehouse and maintenance facility to improve operational efficiency within the site and better working conditions for facility staff. The new facilities will be constructed prior to the completion of Corporate Drive.

For these reasons the **City of Farmers Branch is requesting rezoning of Lots 1A, 2, 3, and 4 (SU, LI, and AO) consisting of approximately 466 acres** to the **Special Use (SU)** zoning district and amending the current engineering site plan to reflect the current conditions as well as future development within the landfill boundary.

As part of the global effort to become more efficient with our limited energy resources, the City of Farmers Branch contracted with Waste Management's renewable energy group to develop and construct a "Gas to Energy Project" that uses methane gas collected from the buried waste material to power large engines to generate electricity onsite. This electricity generated from the project is sold and distributed to the regional electrical power grid system.

If approved by the City of Lewisville and subsequently by the Texas Commission on Environmental Quality, the Camelot Landfill Expansion will continue operations as they

occur today. The projected life of the facility is around 40 years with this expansion assuming waste volumes continue along projected trends and landfill operations and compaction are consistent with current operational standards.

The City of Farmers Branch and its contractor, Camelot Landfill TX LP, will begin assessing the timeliness of constructing the new scalehouse, citizens' convenience center, and office/maintenance facility. However, the new scalehouse and maintenance facilities will be constructed no later than 6 months prior to the completion of the Corporate Drive extension. This has to be done in order for the landfill to operate. The current scalehouse is located north of the future Corporate Drive extension. There must be an operational scalehouse south of Corporate Drive to maintain operations. After the scalehouse is constructed and before the opening of Corporate Drive, right of way for Huffines Boulevard in the area where the existing scalehouse is located will be dedicated to Lewisville by a separate instrument. Landfills weigh the solid waste transport vehicles to determine the amount of material discarded for annual reports as well as to determine the appropriate billing for the waste material. In addition the landfill staff is excited to one day have a place to repair equipment in doors rather than outside in the elements.

Within the landfill, there is a citizens' collection center for residents to use. This avoids residents in personal vehicles backing up in the active disposal area over uneven terrain and next to large solid waste transportation vehicles. As the site develops, the current citizens' collection center will be moved to a location adjacent to the proposed scalehouse. A citizens' collection center is typically a concrete pad adjacent to a excavated ridge of soil where rolloff containers are located. The rolloff containers are typically below the concrete pad making it easier for residents to deposit waste materials.

Zoning Request

The Special Use (SU) zoning district also allows for "Landfill Operations and accessory uses". The primary use of this tract will remain as a Municipal Solid Waste Landfill. The generation of electricity through the use of these proposed gas fueled generators will continue to be an accessory use on the site. Some other accessory uses include leachate storage, stormwater conveyance and detention, water storage, vehicle and equipment servicing, soil stockpiling. In the future, approximately 10 acres in the current AO acreage could be used for mulching or composting of woody material to divert organic material from the active disposal area.

The operation of a solid waste landfill is a very unique land use, and requires some special development standards. Landfills are dynamic. As new disposal areas, or cells, are constructed based on near term disposal capacity needs. Thus, landfill operations must adjust accordingly.

Overhead power lines already exist on site. In the northeast portion of the facility overhead electrical lines provide electricity to the maintenance area. A privately maintained line from this location powers the landfill flare and pumps for the landfill gas condensate and leachate generated by the buried waste material. Overhead electrical lines also carry electricity off site from the methane gas facility operated by Waste Management. The 2008 zoning change request and engineering site plan allowed a variance for the exteriors of the temporary employee breakroom and methane gas facility to be metal or wood-sided. The methane gas facility is constructed with metal siding and is currently operational. The facility will remain on site through the term of the contract. In addition, temporary breakroom and supply storage are wood or metal-sided, temporary, portable buildings. The breakroom and supply storage buildings will exist until the proposed entrance facilities and maintenance/office building are constructed (See Exhibit 2). Construction of these proposed buildings will be completed no later than 6 months prior to the completion of the proposed Corporate Drive extension. Currently, there is not a sewer line to the current maintenance and breakroom area. Therefore, portable restrooms are necessary for landfill staff and visitors. During the construction of the proposed buildings at Camelot Landfill, the utilities associated with the construction of the Corporate Drive extension may not be available. As a result there may be a dead end water line that is longer than 600 linear feet. A connection will be installed by Farmers Branch to connect to the future water line that will lie along the future Corporate Drive Extension. Once the water line for Corporate Drive is constructed and usable, the line will be connected to the existing line for Camelot Landfill. Landfill equipment is designed to move or compact soil and solid waste materials. This machinery is not conducive to traveling on paved roads. The machinery will quickly ruin concrete and asphalt paved roads (See Exhibit 3). Therefore, the roads from the active disposal area to the maintenance facility bay doors should not be paved. For these reasons, the City of Farmers Branch is requesting the following variances to be allowed within the 466 acre tract.

1) To allow overhead electrical lines to existing methane gas facility and temporary employee breakroom.
2) To allow metal or wood-sided buildings for the existing methane gas facility and temporary employee breakroom.
3) To allow existing portable restrooms in lieu of sewer lines until the construction of the proposed entrance facilities and office/maintenance buildings are complete.
4) To allow portable building without fixed foundations.
5) To wave interior landscaping and irrigation for temporary and permanent parking areas.
6) To allow a dead end water line that exceeds 600 linear feet until the construction of Corporate Drive.
7) To allow gravel to access the temporary buildings and to the bay doors of the prosed maintenance building.

Exhibit 1 -- Aerial Photograph of the Site

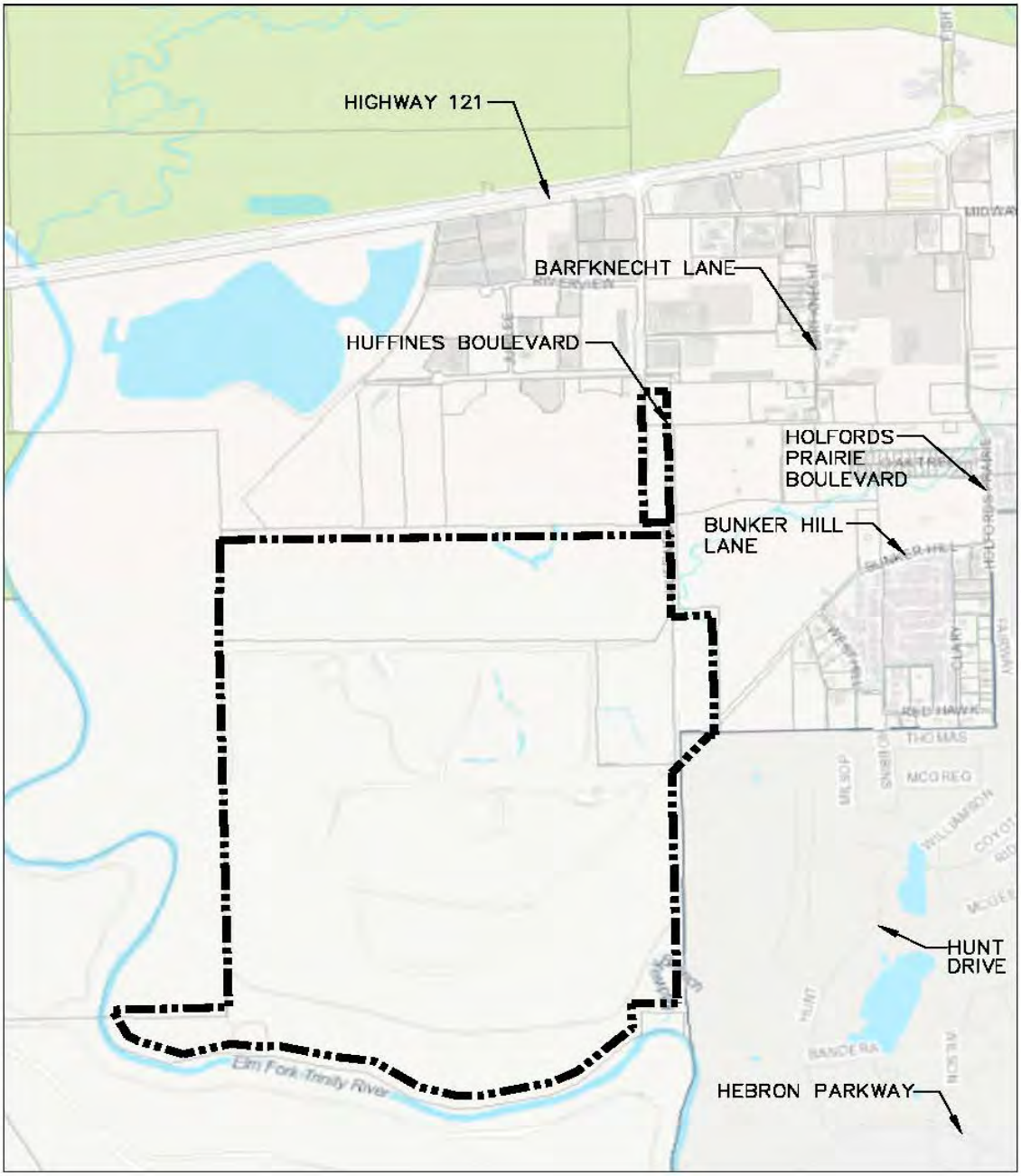


Exhibit 2 – Existing structures located within site

Existing leachate Tank (located on western edge near gas flare complex)

Existing storage areas and buildings on site

Existing scalehouse north of future Corporate Drive.

Exhibit 3 -- Landfill Heavy Equipment

Landfill compactor with compactor “teeth” on metal wheels.

ENGINEERING SITE PLAN FOR

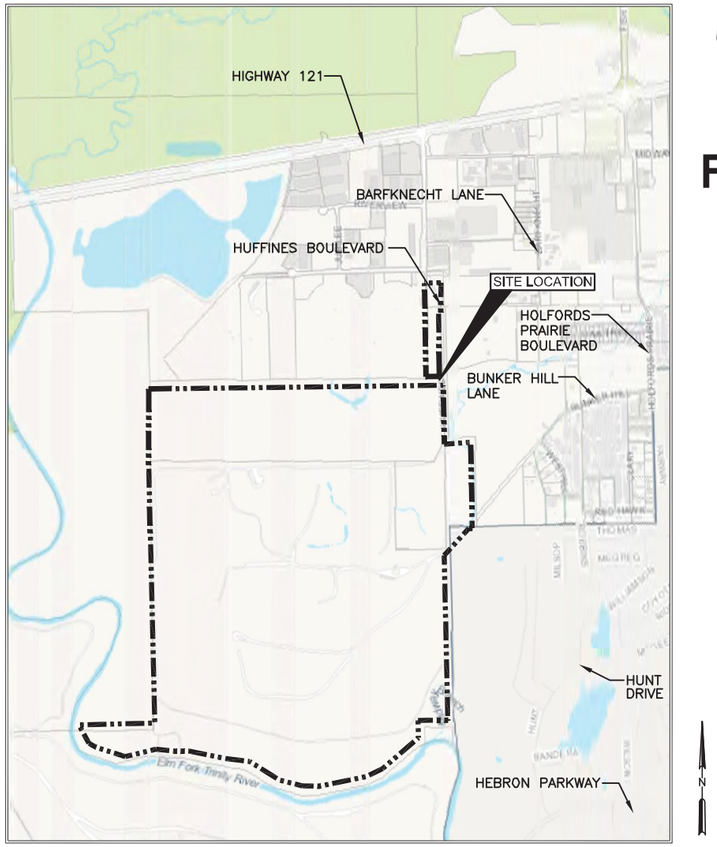
CAMELOT LANDFILL EXPANSION

LOTS 1A, 2, 3, AND 4 BLOCK A
FARMERS BRANCH CAMELOT LANDFILL ADDITION

465.250 ACRES
SPECIFIC USE DISTRICT-LANDFILL & LANDFILL ACCESSORY USES

LEWISVILLE, TEXAS

SEPTEMBER 2016



VICINITY MAP

0 1000 2000
SCALE IN FEET

APPROVED FOR CONSTRUCTION*		
CITY DEPARTMENT	DATE	SIGNATURE
PLANNING & ZONING		
ENGINEERING		
BUILDING INSPECTION		
FIRE PREVENTION		
PUBLIC SERVICES		
PARKS & LEISURE		
PUBLIC WORKS		

APPROVED FOR CONSTRUCTION*			
UTILITY	COMPANY NAME	DATE	SIGNATURE
ELECTRIC			
GAS			
PHONE			
CABLE			
SOLID WASTE			

* SIGNATURES NEEDED FOR APPLICABLE COMPANY ONLY.

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VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

PREPARED FOR

CITY OF FARMERS BRANCH

OWNER:

CITY OF FARMERS BRANCH
13000 WM. DODSON PARKWAY
FARMERS BRANCH, TEXAS 75391
(972)919-2614
CONTACT: SHANE DAVIS

CAMELOT LANDFILL TX, LP
911 E.HIGHWAY 121 BUSINESS, SUITE 201
LEWISVILLE, TX 75057
(972)492-3888
CONTACT: BRYAN BOYER

PREPARED BY

Weaver Consultants Group

6420 SOUTHWEST BLVD., SUITE 206
FORT WORTH, TEXAS 76109
(817) 735-9770
(817) 735-9775 (FAX)
TBPE REGISTRATION NO. F-3727

FOR PERMITTING PURPOSES ONLY

NOTES:

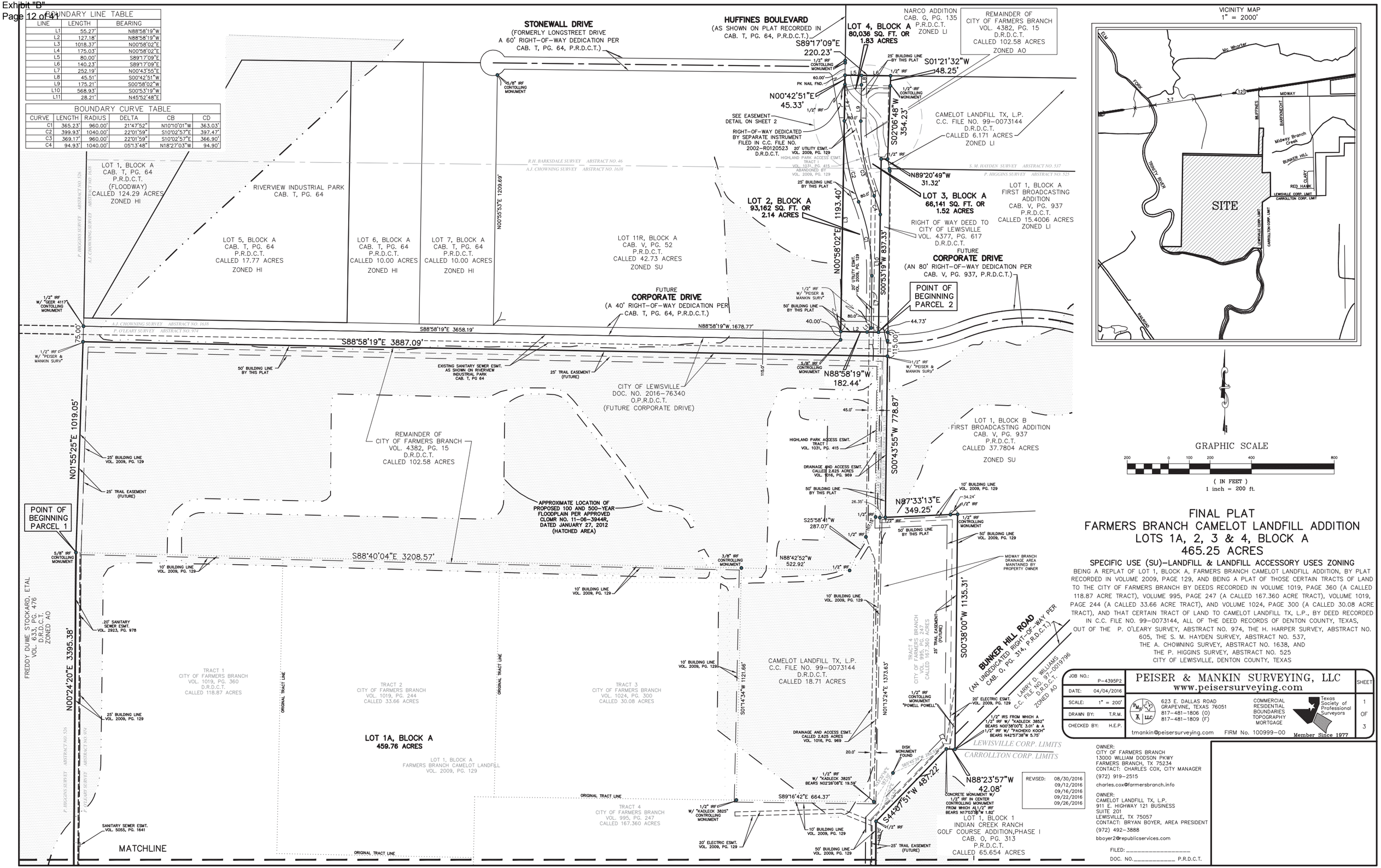
1. EXPANSION OF THE CAMELOT LANDFILL IS SUBJECT TO THE AGREEMENT BETWEEN THE CITY OF LEWISVILLE AND THE CITY OF FARMERS BRANCH.
2. CLOMR CASE NO. 11-06-3944R WAS APPROVED BY FEMA ON JANUARY 27, 2012. THE CDC APPLICATION WAS APPROVED BY THE CITY OF LEWISVILLE ON FEBRUARY 27, 2012, AND BY THE USACE ON OCTOBER 31, 2011.
3. ALLOWANCE OF HUFFINES ESCROW AND TREE MITIGATION BY SETTLEMENT AGREEMENT, AS AMENDED ON _____.

INDEX TO DRAWINGS

DRAWING NO	DRAWING TITLE	REVISION NO	DATE
1	COVER SHEET	1	09/2016
2	LOT 1A, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION FINAL PLAT	1	09/2016
3	LOT 1A, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION FINAL PLAT	1	09/2016
4	LOT 1A, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION FINAL PLAT	1	09/2016
5	EXISTING CONDITIONS PLAN	1	09/2016
5A	EXISTING CONDITIONS PLAN	1	09/2016
6	EXISTING ENTRANCE PLAN	1	09/2016
7	ENGINEERING SITE PLAN	1	09/2016
7A	ENGINEERING SITE PLAN	1	09/2016
7B	WELL EXHIBIT	0	09/2016
8	ENGINEERING SITE PLAN	1	09/2016
9	ENGINEERING SITE PLAN	1	09/2016
10	ENGINEERING SITE PLAN	1	09/2016
11	ENGINEERING SITE PLAN	1	09/2016
12	ENGINEERING SITE PLAN	1	09/2016
13	ENGINEERING SITE PLAN	1	09/2016
14	ENGINEERING SITE PLAN	1	09/2016
15	ENGINEERING SITE PLAN	1	09/2016
16	DRAINAGE AREA PLAN	1	09/2016
17	DRAINAGE DETAILS	0	09/2016
18	DRAINAGE DETAILS	0	09/2016
19	DRAINAGE DETAILS	0	09/2016
20	DRAINAGE DETAILS	0	09/2016
21	PROPOSED ENTRANCE PLAN	1	09/2016
22	PROPOSED ENTRANCE PLAN	2	09/2016
22A	PROPOSED ENTRANCE GRADING AND PAVING PLAN	2	09/2016
23	MAINTENANCE AND TEMPORARY EMPLOYEE BREAKROOM AREA	2	09/2016
24	FLOODPLAIN COMPARISON MAP	1	09/2016
25	LANDSCAPE PLAN	2	09/2016
26	LANDSCAPE PLAN	2	09/2016
27	UTILITY PLAN	2	09/2016

BOUNDARY LINE TABLE		
LINE	LENGTH	BEARING
L1	55.27'	N88°58'19"W
L2	127.18'	N88°58'19"W
L3	1018.37'	N00°58'02"E
L4	175.03'	N00°58'02"E
L5	80.00'	S89°17'09"E
L6	140.23'	S89°17'09"E
L7	252.19'	N00°43'55"E
L8	45.51'	S00°42'51"W
L9	175.21'	S00°58'02"W
L10	568.93'	S00°53'19"W
L11	28.21'	N45°52'48"E

BOUNDARY CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CB	CD
C1	365.23'	960.00'	21°47'52"	N10°10'01"W	363.03'
C2	399.93'	1040.00'	22°01'59"	S10°02'57"E	397.47'
C3	369.17'	960.00'	22°01'59"	S10°02'57"E	366.90'
C4	94.93'	1040.00'	05°13'48"	N18°27'03"W	94.90'



FINAL PLAT
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3 & 4, BLOCK A
465.25 ACRES

SPECIFIC USE (SU)–LANDFILL & LANDFILL ACCESSORY USES ZONING

BEING A REPLAT OF LOT 1, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION, BY PLAT RECORDED IN VOLUME 2009, PAGE 129, AND BEING A PLAT OF THOSE CERTAIN TRACTS OF LAND TO THE CITY OF FARMERS BRANCH BY DEEDS RECORDED IN VOLUME 1019, PAGE 360 (A CALLED 118.87 ACRE TRACT), VOLUME 995, PAGE 247 (A CALLED 167.360 ACRE TRACT), VOLUME 1019, PAGE 244 (A CALLED 33.66 ACRE TRACT), AND VOLUME 1024, PAGE 300 (A CALLED 30.08 ACRE TRACT), AND THAT CERTAIN TRACT OF LAND TO CAMELOT LANDFILL TX, L.P., BY DEED RECORDED IN C.C. FILE NO. 99-0073144, ALL OF THE DEED RECORDS OF DENTON COUNTY, TEXAS, OUT OF THE P. O'LEARY SURVEY, ABSTRACT NO. 974, THE H. HARPER SURVEY, ABSTRACT NO. 605, THE S. M. HAYDEN SURVEY, ABSTRACT NO. 537, THE A. CHOWNING SURVEY, ABSTRACT NO. 1638, AND THE P. HIGGINS SURVEY, ABSTRACT NO. 525 CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

JOB NO.:	P-4395P2	PEISER & MANKIN SURVEYING, LLC www.peisersurveying.com	SHEET
DATE:	04/04/2016		1
SCALE:	1" = 200'	623 E. DALLAS ROAD GRAPEVINE, TEXAS 76051 817-481-1806 (O) 817-481-1809 (F)	OF
DRAWN BY:	T.R.M.	COMMERCIAL RESIDENTIAL BOUNDARIES TOPOGRAPHY MORTGAGE	3
CHECKED BY:	H.E.P.	tmankin@peisersurveying.com FIRM No. 100999-00 Member Since 1977	

Texas Society of Professional Surveyors

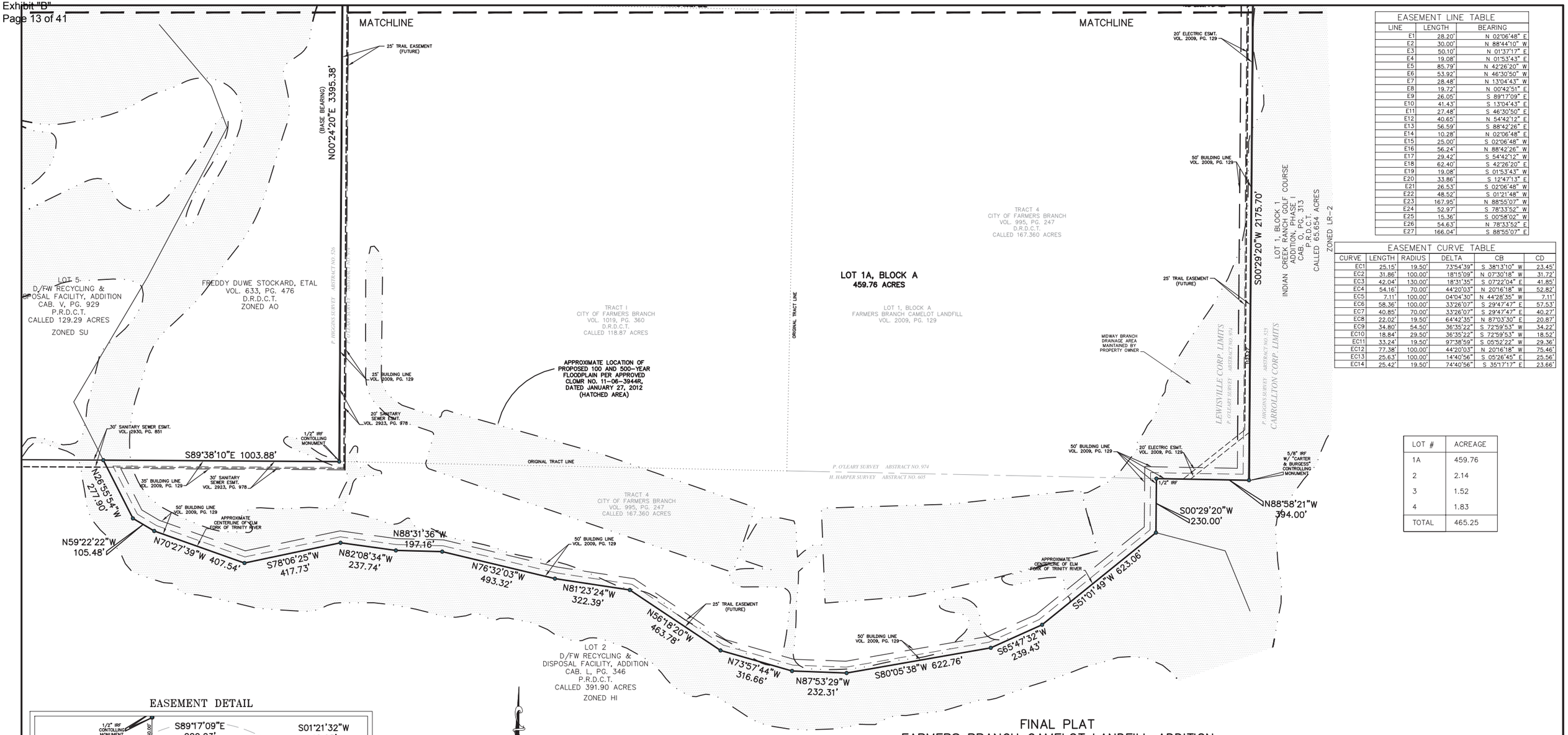
OWNER:
CITY OF FARMERS BRANCH
13000 WILLIAM DODSON PKWY
FARMERS BRANCH, TX 75234
CONTACT: CHARLES COX, CITY MANAGER
(972) 919-2515
charles.cox@farmersbranch.info

OWNER:
CAMELOT LANDFILL TX, L.P.
911 E. HIGHWAY 121 BUSINESS
SUITE 201
LEWISVILLE, TX 75057
CONTACT: BRYAN BOYER, AREA PRESIDENT
(972) 492-3888
bboyer2@republicservices.com

REVISED:	
	08/30/2016
	09/12/2016
	09/16/2016
	09/22/2016
	09/26/2016

FILED: _____

DOC. NO._____ P.R.D.C.T.

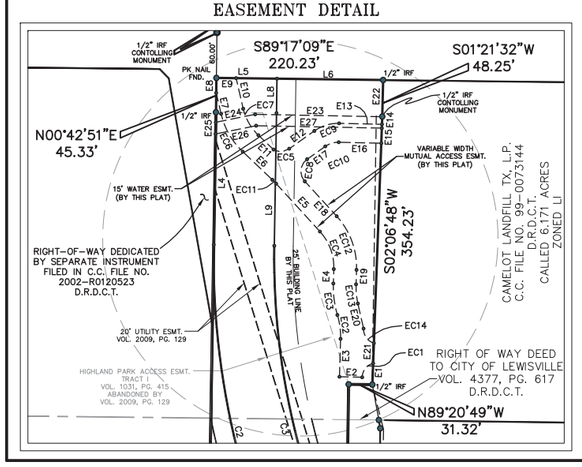


EASEMENT LINE TABLE		
LINE	LENGTH	BEARING
E1	28.20'	N 02°06'48" E
E2	30.00'	N 88°44'10" W
E3	50.10'	N 01°37'17" E
E4	19.08'	N 01°53'43" E
E5	85.79'	N 42°26'20" W
E6	53.92'	N 46°30'50" W
E7	28.48'	N 13°04'43" W
E8	19.72'	N 00°42'51" E
E9	26.05'	S 89°17'09" E
E10	41.43'	S 13°04'43" E
E11	27.48'	S 46°30'50" E
E12	40.65'	N 54°42'12" E
E13	56.59'	S 88°42'26" E
E14	10.28'	N 02°06'48" E
E15	25.00'	S 02°06'48" W
E16	56.24'	N 88°42'26" W
E17	29.42'	S 54°42'12" W
E18	62.40'	S 42°26'20" E
E19	19.08'	S 01°53'43" W
E20	33.86'	S 12°47'13" E
E21	26.53'	S 02°06'48" W
E22	48.52'	S 01°21'48" W
E23	167.95'	N 88°55'07" W
E24	52.97'	S 78°33'52" W
E25	15.36'	S 00°58'02" W
E26	54.63'	N 78°33'52" E
E27	166.04'	S 88°55'07" E

EASEMENT CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CB	CD
EC1	25.15'	19.50'	73°54'39"	S 38°13'10" W	23.45'
EC2	31.86'	100.00'	18°15'09"	N 07°30'18" W	31.72'
EC3	42.04'	130.00'	18°31'35"	S 07°22'04" E	41.85'
EC4	54.16'	70.00'	44°20'03"	N 20°16'18" W	52.82'
EC5	7.11'	100.00'	04°04'30"	N 44°28'35" W	7.11'
EC6	58.36'	100.00'	33°26'07"	S 29°47'47" E	57.53'
EC7	40.85'	70.00'	33°26'07"	S 29°47'47" E	40.27'
EC8	22.02'	19.50'	64°42'35"	N 87°03'30" E	20.87'
EC9	34.80'	54.50'	36°35'22"	S 72°59'53" W	34.22'
EC10	18.84'	29.50'	36°35'22"	S 72°59'53" W	18.52'
EC11	33.24'	19.50'	97°38'59"	S 05°52'22" W	29.36'
EC12	77.38'	100.00'	44°20'03"	N 20°16'18" W	75.46'
EC13	25.63'	100.00'	14°40'56"	S 05°26'45" E	25.56'
EC14	25.42'	19.50'	74°40'56"	S 35°17'17" E	23.66'

LOT #	ACREAGE
1A	459.76
2	2.14
3	1.52
4	1.83
TOTAL	465.25

EASEMENT DETAIL



GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

NOTES:

1. IRF – Iron Rod Found
2. IRS – Iron Rod Set w/ PEISER & MANKIN SURV red plastic cap
3. Basis of Bearing – Based on the west line of that certain called 118.87 acre tract of land to the City of Farmers Branch, by deed recorded in Volume 1019, Page 360, of the Deed Records of Denton County, Texas.
4. The Trail Easements shown hereon labeled (FUTURE) will be dedicated by future Separate Instrument, and is subject to approval of TCEQ. These easements are not dedicated by this plat, and are shown for pictorial purposes only.

REVISED:	
	08/30/2016
	09/12/2016
	09/16/2016
	09/22/2016
	09/26/2016

OWNER:
CITY OF FARMERS BRANCH
13000 WILLIAM DODSON PKWY
FARMERS BRANCH, TX 75234
CONTACT: CHARLES COX, CITY MANAGER
(972) 919-2515
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911 E. HIGHWAY 121 BUSINESS
SUITE 201
LEWISVILLE, TX 75057
CONTACT: BRYAN BOYER, AREA PRESIDENT
(972) 492-3888
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FINAL PLAT
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3 & 4, BLOCK A
465.25 ACRES

SPECIFIC USE (SU)–LANDFILL & LANDFILL ACCESSORY USES ZONING

BEING A REPLAT OF LOT 1, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION, BY PLAT RECORDED IN VOLUME 2009, PAGE 129, AND BEING A PLAT OF THOSE CERTAIN TRACTS OF LAND TO THE CITY OF FARMERS BRANCH BY DEEDS RECORDED IN VOLUME 1019, PAGE 360 (A CALLED 118.87 ACRE TRACT), VOLUME 995, PAGE 247 (A CALLED 167.360 ACRE TRACT), VOLUME 1019, PAGE 244 (A CALLED 33.66 ACRE TRACT), AND VOLUME 1024, PAGE 300 (A CALLED 30.08 ACRE TRACT), AND THAT CERTAIN TRACT OF LAND TO CAMELOT LANDFILL TX, L.P., BY DEED RECORDED IN C.C. FILE NO. 99-0073144, ALL OF THE DEED RECORDS OF DENTON COUNTY, TEXAS, OUT OF THE P. O'LEARY SURVEY, ABSTRACT NO. 974, THE H. HARPER SURVEY, ABSTRACT NO. 605, THE S. M. HAYDEN SURVEY, ABSTRACT NO. 537, THE A. CHOWNING SURVEY, ABSTRACT NO. 1638, AND THE P. HIGGINS SURVEY, ABSTRACT NO. 525 CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

JOB NO.: P-4395P2	PEISER & MANKIN SURVEYING, LLC www.peisersurveying.com		SHEET
DATE: 04/04/2016			2
SCALE: 1" = 200'	623 E. DALLAS ROAD GRAPEVINE, TEXAS 76051 817-481-1806 (O) 817-481-1809 (F)	COMMERCIAL RESIDENTIAL BOUNDARIES TOPOGRAPHY MORTGAGE	OF
DRAWN BY: T.R.M.		Texas Society of Professional Surveyors	3
CHECKED BY: H.E.P.	tmankin@peisersurveying.com FIRM No. 100999-00	Member Since 1977	

FILED: _____

DOC. NO _____ P.R.D.C.T.

Whereas the City of Farmers Branch and Camelot Landfill TX, L.P. are the sole owners of that certain lot, tract or parcel of land situated in the Patrick O'Leary Survey, Abstract No. 974, the H. Harper Survey, Abstract No. 605, and the P. Higgins Survey, Abstract No. 525, Denton County, Texas, and being all of Lot 1, Block A of Farmers Branch Camelot Landfill Addition, an addition to the City of Lewisville, as recorded in Document No. 2009–129, of the Plat Records of Denton County, Texas, and being all that certain tract of land described in deed dated March 24, 1967 from M.L. Ledbetter et al to The Town of Highland Park, as recorded in Volume 551, Page 136, Deed Records, Denton County, Texas, and being that called 0.238 acre tract of land described in deed dated May 23, 1988, from 121 County Venture to the Town of Highland Park, as recorded in Volume 2384, Page 64, said Deed Records, and being a portion of that certain called 102.58 acre tract of land described in deed dated July 13, 1999, from the Town of Highland Park to the City of Farmers Branch, as recorded in Volume 4382, Page 15, said Deed Records, also being that certain tract of land described in deed dated July 19, 1999 from Barfknecht Enterprises, L.C. to Camelot Landfill TX, L.P., as recorded in Volume 4383, Page 742, said Deed Records, and being more particularly described as follows:

PARCEL 1:

BEGINNING at a 5/8 inch iron rod found for the southwest corner of said City of Farmers Branch tract, same being the northwest corner of said Lot 1, same being in the east line of that certain tract of land to Freddy Duwe Stockard, etal, by deed recorded in Volume 633, Page 476, of said Deed Records;

THENCE North 01 deg. 55 min. 25 sec. East, along the common line of said City of Farmers Branch tract, and said Stockard tract, a distance of 1,019.05 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northwest corner of the herein described tract, same being the southwest corner of that certain tract of land from City of Farmers Branch to City of Lewisville, by Special Warranty Deed dated June 28, 2016, and recorded under Document No. 2016–76340, Official Public Records, Denton County, Texas;

THENCE South 88 deg. 58 min. 19 sec. East, through the interior of said City of Farmers Branch tract, and along the south line of said City of Lewisville tract, a distance of 3,887.09 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northeast corner of the herein described tract, same being in the east line of said City of Farmers Branch tract, same being in the west line of Lot 1, Block B of First Broadcasting Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 937, aforesaid Plat Records;

THENCE South 00 deg. 43 min. 55 sec. West, along the common line of said Camelot Landfill TX tract, and said Lot 1, Block B, a total distance of 778.87 feet to a 1/2 inch iron rod found for the southwest corner of said Lot 1, Block B, same being in a north line of aforesaid Lot 1, Block A, Farmers Branch Camelot Landfill Addition;

THENCE North 87 deg. 33 min. 13 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B of First Broadcasting Addition, passing at a distance of 315.01 feet a 1/2 inch iron rod found for corner corner, and continuing a total distance of 349.25 feet a 1/2 inch iron rod found for corner, said point being the most northerly northeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being an internal corner of said Lot 1, Block B;

THENCE South 00 deg. 38 min. 00 sec. West, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B, passing at a distance of 1030.53 feet a 1/2 inch iron rod found with "Powell Powell" cap, said point being the most southerly southwest corner of said Lot 1, Block B, same being the northwest corner of that certain tract of land to Larry D. Williams, by deed recorded in C.C. File No. 97–0019796, of aforesaid Deed Records, and continuing along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Williams tract, a total distance of 1135.31 feet to a point from which a 1/2 inch iron rod found with "Kadleck 3852" cap bears North 00 deg. 38 min. 00 sec. East, 3.01 feet, and another 1/2 inch iron rod found with "Pacheko Koch" cap bears North 42 deg. 57 min. 38 sec. West, 5.75 feet, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the southwest corner of said Williams tract, same being in the north line of Lot 1, Block 1 of Indian Creek Ranch Golf Course Addition, Phase I, an addition to the City of Carrollton, Denton County, Texas, according to the plat thereof recorded in Cabinet O, Page 313, of aforesaid Plat Records;

THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block 1 as follows:

North 88 deg. 23 min. 57 sec. West, a distance of 42.08 feet to a concrete monument with a 1/2 inch iron rod found;
South 44 deg. 07 min. 51 sec. West, a distance of 487.22 feet to a 1/2 inch iron rod found for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 2175.70 feet to a 5/8 inch iron rod found with "Carter & Burgess" cap for corner, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition;
North 88 deg. 58 min. 21 sec. West, a distance of 394.00 feet to a 1/2 inch iron rod found for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 230.00 feet to a point for corner in the approximate centerline of Elm Fork of Trinity River, said point being the most southerly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the most westerly southwest corner of said Lot 1, Block 1, same being the most northerly northeast corner of Lot 2, of D/FW Recycling & Disposal Facility, Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet L, Page 346, of aforesaid Plat Records;

THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 2, and along the approximate centerline of said Elm Fork of Trinity River as follows:

South 51 deg. 01 min. 49 sec. West, a distance of 623.06 feet to a point for corner;
South 65 deg. 47 min. 32 sec. West, a distance of 239.43 feet to a point for corner;
South 80 deg. 05 min. 38 sec. West, a distance of 622.76 feet to a point for corner;
North 87 deg. 53 min. 29 sec. West, a distance of 232.31 feet to a point for corner;
North 73 deg. 57 min. 44 sec. West, a distance of 316.66 feet to a point for corner;
North 56 deg. 18 min. 20 sec. West, a distance of 463.78 feet to a point for corner;
North 81 deg. 23 min. 24 sec. West, a distance of 322.39 feet to a point for corner;
North 76 deg. 32 min. 03 sec. West, a distance of 493.32 feet to a point for corner;
North 88 deg. 31 min. 36 sec. West, a distance of 197.16 feet to a point for corner;
North 82 deg. 08 min. 34 sec. West, a distance of 237.74 feet to a point for corner;
South 78 deg. 06 min. 25 sec. West, a distance of 417.73 feet to a point for corner;
North 70 deg. 27 min. 39 sec. West, a distance of 407.54 feet to a point for corner;
North 59 deg. 22 min. 22 sec. West, a distance of 105.48 feet to a point for corner;
North 26 deg. 55 min. 54 sec. West, a distance of 277.90 feet to a point for corner, said point being the most westerly southwest corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being a northeast corner of said Lot 2, same being the most southerly southeast corner of Lot 5, of D/FW Recycling & Disposal Facility Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 929, of aforesaid Plat Records, same being the most southerly southwest corner of aforesaid Stockard tract;

THENCE South 89 deg. 38 min. 10 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 1003.88 feet to a 1/2 inch iron rod found for corner, said point being the southeast corner of said Stockard tract;

THENCE North 00 deg. 24 min. 20 sec. East (basis of bearing), along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 3395.38 feet to the POINT OF BEGINNING and containing 459.76 acres of computed land, more or less.

PARCEL 2:

BEGINNING at a 1/2 inch iron rod set with "Peiser & Mankin Surv" red plastic cap (hereinafter referred to as 1/2 inch iron rod set) for the southeast corner of the herein described tract, same being the southwest corner of that certain Right of Way Deed to City of Lewisville, as recorded in Volume 4377, Page 617, aforesaid Deed Records, same being in the north line of aforesaid City of Lewisville tract (Doc. No. 2016–76340), same being in the east line of aforesaid City of Farmers Branch tract;

THENCE North 88 deg. 58 min. 19 sec. West, along the north line of said City of Lewisville tract (Doc. No. 2016–76340), a distance of 182.44 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap found for the southwest corner of the herein described tract, same being the southeast corner of Lot 11R, Block A, Riverview Industrial Park, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 52, said Plat Records, same being the northeast corner of a 40 foot right–of–way dedication of Corporate Drive (a 40 foot right–of–way, as dedicated by Cabinet V, Page 52, said Plat Records);

THENCE North 00 deg. 58 min. 02 sec. East, along the common line of said City of Farmers Branch tract, and said Lot 11R, passing the most easterly northeast corner of said Lot 11R, same being the most southerly point of a right–of–way dedication for Huffines Boulevard, as recorded in County Clerk's File No. (C.C. File No.) 2002–R0120523, of aforesaid Deed Records, and continuing along the common line of said City of Farmers Branch tract, and the east right–of–way line of said Huffines Boulevard, a total distance of 1193.40 feet to a 1/2 inch iron rod found for corner;

THENCE North 00 deg. 42 min. 51 sec. East, continuing along the common line of said City of Farmers Branch tract, and the east right–of–way line of said Huffines Boulevard, a distance of 45.33 feet to a pk nail found for corner for the northwest corner of the herein described tract, from which a 1/2 inch iron rod found bears North 00 deg. 42 min. 51 sec. East, 60.00 feet, said point being the most northerly northwest corner of said City of Farmers Branch tract, same being the southwest corner of NARCO Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet G, Page 135, of aforesaid Plat Records;

THENCE South 89 deg. 17 min. 09 sec. East, along the common line of said City of Farmers Branch tract, and said NARCO Addition, a distance of 220.23 feet to a 1/2 inch iron rod found for the northeast corner of the herein described tract, said point being the most northerly northeast corner of said City of Farmers Branch tract, same being the most northerly northwest corner of that certain called 6.171 acre tract of land to Camelot Landfill TX, L.P., by deed recorded in C.C. File No. 99–0073144, of aforesaid Deed Records;

THENCE South 01 deg. 21 min. 32 sec. West, along the common line of said City of Farmers Branch tract, and said called 6.171 acre tract, a distance of 48.25 feet to a 1/2 inch iron rod found for corner;

THENCE South 02 deg. 06 min. 48 sec. West, continuing along the common line of said City of Farmers Branch tract, and said called 6.171 acre tract, a distance of 354.23 feet to a 1/2 inch iron rod found for corner for the most northerly northeast corner of aforesaid City of Lewisville Right of Way deed (Volume 4377, Page 617);

THENCE North 89 deg. 20 min. 49 sec. West, along the north line of said City of Lewisville Right of Way deed, a distance of 31.32 feet to a 1/2 inch iron rod set for an internal corner, same being the northwest corner of said City of Lewisville Right of Way deed,

THENCE South 00 deg. 53 min. 19 sec. West, continuing along the common of said Farmers Branch tract and said City of Lewisville Right of Way deed, a distance of 837.33 feet to the POINT OF BEGINNING and containing 239,357 square feet or 5.49 acres of computed land, more or less.

NOW THEREFORE, KNOW ALL MEN BY THESE PRESENTS:
THAT **THE CITY OF FARMERS BRANCH** ACTING BY AND THROUGH ITS OFFICER, CHARLES COX, CITY MANAGER, THE UNDERSIGNED AUTHORITY, AND **CAMELOT LANDFILL TX, L.P.**, ACTING BY AND THROUGH ITS AREA PRESIDENT, BRYAN BOYER, THE UNDERSIGNED AUTHORITY, DO HEREBY ADOPT THIS PLAT DESIGNATING THE HEREIN ABOVE DESCRIBED PROPERTY AS **FARMERS BRANCH CAMELOT LANDFILL ADDITION, LOTS 1A, 2, 3 & 4, BLOCK A**, AN ADDITION TO THE CITY OF LEWISVILLE, DENTON COUNTY, TEXAS, AND DO HEREBY DEDICATE TO THE PUBLIC USE FOREVER THE STREETS AND ALLEYS SHOWN HEREON; AND DO HEREBY DEDICATE THE FOREVER THE STREETS AND ALLEYS SHOWN HEREON; AND DO HEREBY DEDICATE THE EASEMENT STRIPS SHOWN ON THE PLAT FOR MUTUAL USE AND ACCOMMODATION OF THE CITY OF LEWISVILLE AND ALL PUBLIC UTILITIES DESIRING TO USE, OR USING SAME. NO BUILDINGS, FENCES, TREES, SHRUBS, SIGNS, OR OTHER IMPROVEMENTS SHALL BE CONSTRUCTED OR PLACED UPON, OVER OR ACROSS THE EASEMENT STRIPS ON SAID PLAT. THE CITY OF LEWISVILLE AND ANY PUBLIC UTILITY SHALL HAVE THE RIGHT TO REMOVE AND KEEP REMOVED ALL OR PART OF ANY BUILDINGS, FENCES, TREES, SHRUBS, SIGNS, OR OTHER IMPROVEMENTS OR GROWTHS WHICH IN ANY WAY ENDANGER OR INTERFERE WITH THE CONSTRUCTION, MAINTENANCE, OR EFFICIENCY OF ITS RESPECTIVE SYSTEM ON ANY OF THESE EASEMENT STRIPS, AND THE CITY OF LEWISVILLE AND ANY PUBLIC UTILITY SHALL AT ALL TIMES HAVE THE RIGHT OF INGRESS AND EGRESS TO AND FROM AND UPON ANY OF SAID EASEMENT STRIPS FOR THE PURPOSE OF CONSTRUCTING, RECONSTRUCTING, INSPECTING, PATROLLING, MAINTAINING, AND ADDING TO OR REMOVING ALL OR PART OF ITS RESPECTIVE SYSTEM WITHOUT THE NECESSITY AT ANY TIME OF PROCURING THE PERMISSION OF ANYONE. A BLANKET EASEMENT OF A FIVE (5) FOOT RADIUS FROM THE CENTER POINT OF ALL FIRE HYDRANTS AND A FIVE (5) FOOT RADIUS FROM THE CENTER POINT OF ALL OTHER APPURTENANCES (FIRE HYDRANT VALVES, WATER METERS, METER BOXES, STREET LIGHTS) IS HERE BY GRANTED TO THE CITY OF LEWISVILLE FOR THE PURPOSE OF CONSTRUCTING, RECONSTRUCTING, INSPECTING AND MAINTAINING THE ABOVE NAMED APPURTENANCES.

WE DO FURTHER DEDICATE, SUBJECT TO THE EXCEPTIONS AND RESERVATIONS SET FORTH HEREINAFTER, TO THE PUBLIC USE FOREVER, ALL PUBLIC USE SPACES SHOWN ON THE FACE OF THE PLAT.

ALL LOTS IN THE SUBDIVISION SHALL BE SOLD AND DEVELOPED SUBJECT TO THE BUILDING LINES SHOWN ON THE PLAT.

CHARLES COX, CITY MANAGER
CITY OF FARMERS BRANCH

_____ _____ _____
DATE

STATE OF TEXAS
COUNTY OF _____

BEFORE ME, THE UNDERSIGNED AUTHORITY, ON THIS DAY PERSONALLY APPEARED CHARLES COX, KNOWN TO ME TO BE THE PERSON WHOSE NAME IS SUBSCRIBED TO THE FOREGOING INSTRUMENT AND ACKNOWLEDGED TO ME THAT HE EXECUTED THE SAME FOR THE PURPOSES AND CONSIDERATIONS THEREIN EXPRESSED AND IN THE CAPACITY THEREIN AND HEREIN STATED, AND AS THE ACT AND DEED OF SAID COOPERATION.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, THIS _____ DAY OF _____, 2016.

_____
NOTARY PUBLIC IN AND FOR THE STATE OF TEXAS
MY COMMISSION EXPIRES: _____

BRYAN BOYER, AREA PRESIDENT
CAMELOT LANDFILL TX, L.P.

_____ _____ _____
DATE

STATE OF TEXAS
COUNTY OF _____

BEFORE ME, THE UNDERSIGNED AUTHORITY, ON THIS DAY PERSONALLY APPEARED BRYAN BOYER, KNOWN TO ME TO BE THE PERSON WHOSE NAME IS SUBSCRIBED TO THE FOREGOING INSTRUMENT AND ACKNOWLEDGED TO ME THAT HE EXECUTED THE SAME FOR THE PURPOSES AND CONSIDERATIONS THEREIN EXPRESSED AND IN THE CAPACITY THEREIN AND HEREIN STATED, AND AS THE ACT AND DEED OF SAID COOPERATION.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, THIS _____ DAY OF _____, 2016.

_____
NOTARY PUBLIC IN AND FOR THE STATE OF TEXAS
MY COMMISSION EXPIRES: _____

All variances (if any) from the General Development Ordinance Approved by City Council.

_____ _____ _____
JAMES DAVIS Date
CHAIRMAN, PLANNING & COMMUNITY SERVICES DIVISION
CITY OF LEWISVILLE, TEXAS

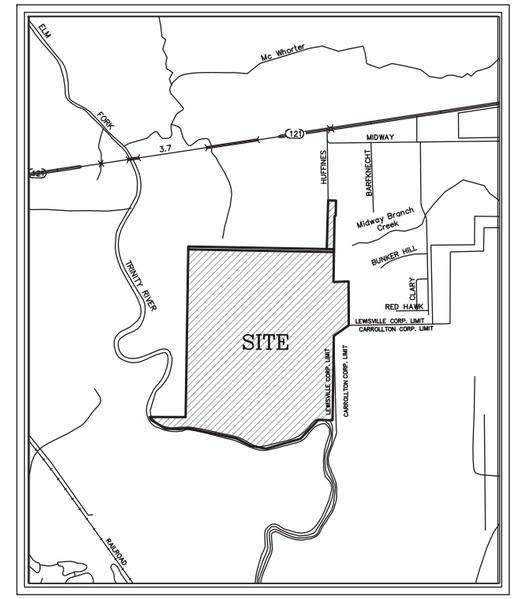
SIGNATURE BLOCK FOR CITY SECRETARY

THE UNDERSIGNED, THE CITY SECRETARY OF THE CITY OF LEWISVILLE, TEXAS, HEREBY CERTIFIES THAT THE FOREGOING FINAL PLAT OF THE **FARMERS BRANCH CAMELOT LANDFILL ADDITION** TO THE CITY OF LEWISVILLE WAS SUBMITTED TO THE APPROPRIATE PLANNING AND ZONING COMMISSION OR CITY COUNCIL AS REQUIRED BY THE ORDINANCES OF THE CITY OF LEWISVILLE ON THE _____ DAY OF _____, 2016, AND SUCH BODY BY FORMAL ACTION, THEN AND THERE ACCEPTED THE DEDICATION OF STREETS, ALLEYS, PARKS, EASEMENTS, PUBLIC PLACES AND WATER AND SEWER LINES, AS SHOWN AND SET FORTH IN AND UPON SAID PLAT, AND SAID BODY FURTHER AUTHORIZED THE ACCEPTANCE THEREOF BY SIGNING AS HEREINABOVE SUBSCRIBED IN THE CAPACITY STATED.

WITNESS MY HAND THIS _____ DAY OF _____, 2016.

_____
JULIE HEINZE, CITY SECRETARY
CITY OF LEWISVILLE, TEXAS

VICINITY MAP
1" = 2000'



I, TIMOTHY R. MANKIN, AM REGISTERED UNDER THE LAWS OF THE STATE OF TEXAS TO PRACTICE THE PROFESSION OF SURVEYING AND HEREBY CERTIFY THAT THE ABOVE SUBDIVISION IS TRUE AND CORRECT; WAS PREPARED FROM AN ACTUAL SURVEY OF THE PROPERTY MADE UNDER MY SUPERVISION ON THE GROUND; THAT ALL BOUNDARY CORNERS, ANGLE POINTS, POINTS OF CURVATURE AND OTHER POINTS OF REFERENCE HAVE BEEN MARKED ON THE GROUND, AND THAT THIS PLAT CORRECTLY REPRESENTS THAT SURVEY MADE BY ME OR UNDER MY SUPERVISION, IN ACCORDANCE WITH THE PLATTING RULES AND REGULATIONS OF THE CITY OF LEWISVILLE, TEXAS.

PRELIMINARY–FOR REVIEW ONLY
RELEASED 09/26/2016

TIMOTHY R. MANKIN
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6122

STATE OF TEXAS
COUNTY OF TARRANT

BEFORE ME, THE UNDERSIGNED AUTHORITY, ON THIS DAY PERSONALLY APPEARED TIMOTHY R. MANKIN, KNOWN TO ME TO BE THE PERSON WHOSE NAME IS SUBSCRIBED TO THE FOREGOING INSTRUMENT AND ACKNOWLEDGED TO ME THAT HE EXECUTED THE SAME FOR THE PURPOSES AND CONSIDERATIONS THEREIN EXPRESSED AND IN THE CAPACITY THEREIN AND HEREIN STATED, AND AS THE ACT AND DEED OF SAID COOPERATION.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, THIS _____ DAY OF _____, 2016.

_____
NOTARY PUBLIC IN AND FOR THE STATE OF TEXAS
MY COMMISSION EXPIRES: _____

FINAL PLAT
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3 & 4, BLOCK A
465.25 ACRES

SPECIFIC USE (SU)–LANDFILL & LANDFILL ACCESSORY USES ZONING

BEING A REPLAT OF LOT 1, BLOCK A, FARMERS BRANCH CAMELOT LANDFILL ADDITION, BY PLAT RECORDED IN VOLUME 2009, PAGE 129, AND BEING A PLAT OF THOSE CERTAIN TRACTS OF LAND TO THE CITY OF FARMERS BRANCH BY DEEDS RECORDED IN VOLUME 1019, PAGE 360 (A CALLED 118.87 ACRE TRACT), VOLUME 995, PAGE 247 (A CALLED 167.360 ACRE TRACT), VOLUME 1019, PAGE 244 (A CALLED 33.66 ACRE TRACT), AND VOLUME 1024, PAGE 300 (A CALLED 30.08 ACRE TRACT), AND THAT CERTAIN TRACT OF LAND TO CAMELOT LANDFILL TX, L.P., BY DEED RECORDED IN C.C. FILE NO. 99–0073144, ALL OF THE DEED RECORDS OF DENTON COUNTY, TEXAS, OUT OF THE P. O'LEARY SURVEY, ABSTRACT NO. 974, THE H. HARPER SURVEY, ABSTRACT NO. 605, THE S. M. HAYDEN SURVEY, ABSTRACT NO. 537, THE A. CHOWNING SURVEY, ABSTRACT NO. 1638, AND THE P. HIGGINS SURVEY, ABSTRACT NO. 525 CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

REVISED:
08/30/2016
09/12/2016
09/16/2016
09/22/2016
09/26/2016

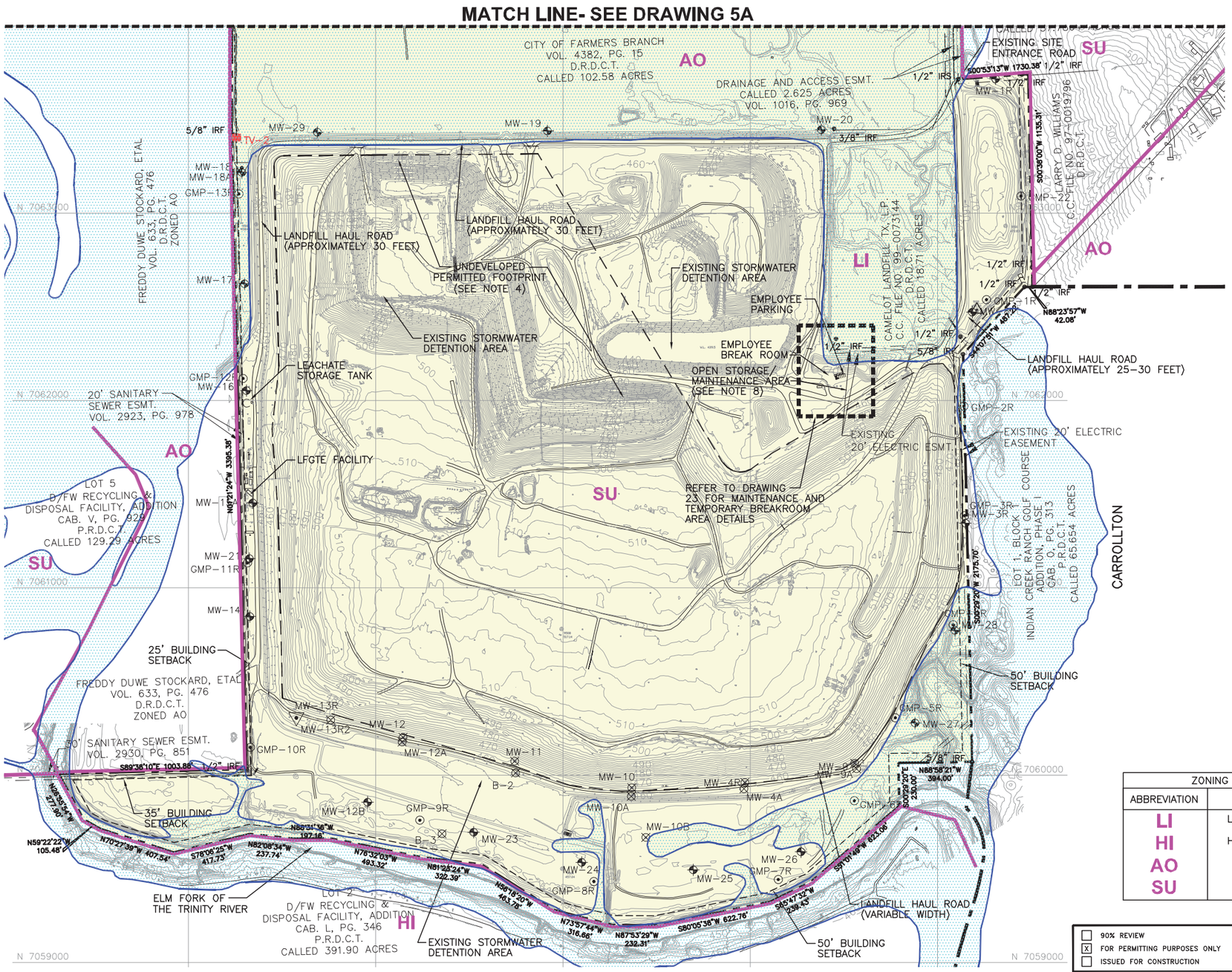
OWNER:
CITY OF FARMERS BRANCH
13000 WILLIAM DODSON PKWY
FARMERS BRANCH, TX 75234
CONTACT: CHARLES COX, CITY MANAGER
(972) 919–2515
charles.cox@farmersbranch.info

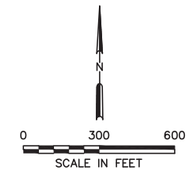
OWNER:
CAMELOT LANDFILL TX, L.P.
911 E. HIGHWAY 121 BUSINESS
SUITE 201
LEWISVILLE, TX 75057
CONTACT: BRYAN BOYER, AREA PRESIDENT
(972) 492–3888
bboyer2@republicservices.com

JOB NO.:	P–4395P2	PEISER & MANKIN SURVEYING, LLC www.peisersurveying.com	SHEET
DATE:	04/04/2016	623 E. DALLAS ROAD GRAPEVINE, TEXAS 76051 817–481–1806 (O) 817–481–1809 (F)	3
SCALE:	1" = 200'	COMMERCIAL RESIDENTIAL BOUNDARIES TOPOGRAPHY MORTGAGE	OF
DRAWN BY:	T.R.M.	Texas Society of Professional Surveyors	3
CHECKED BY:	H.E.P.	tmankin@peisersurveying.com FIRM No. 100999–00 Member Since 1977	

FILED: _____

DOC. NO _____ P.R.D.C.T.





LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312A)
- 430 — EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- EFFECTIVE 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- SU — ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- BUILDING SETBACK LINE (SEE NOTE 5)
- IRF — IRON ROD FOUND
- IRS — IRON ROD SET
- CAMELOT LANDFILL ADDITION
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL
- TV-2 — EXISTING TRENCH VENT (TO BE ABANDONED)
- SITE BENCHMARK (SEE NOTE 12)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. ZONING BOUNDARIES AND DESIGNATIONS REPRODUCED FROM THE INTERACTIVE MAPS ON THE CITY OF LEWISVILLE WEBSITE IN MARCH 2016.
3. THE EFFECTIVE 100-YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM NUMBER 48121C0565G, EFFECTIVE DATE APRIL 18, 2011.
4. THE UNDEVELOPED FOOTPRINT WILL CONTINUE TO BE DEVELOPED UNDER TEXAS COMMISSION ON ENVIRONMENTAL QUALITY MUNICIPAL SOLID WASTE PERMIT NUMBER 1312A.
5. BUILDING SETBACKS ARE 25-FEET OR 35-FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10-FEET ALONG THE NORTH, 50-FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
6. ALL PAVING BEHIND THE SCALEHOUSE MAY BE COMPRESSED GRAVEL OR CRUSHED STONE. ADDITIONALLY, HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMODATE SITE OPERATIONS.
7. THE MAINTENANCE AREA MAY BE RELOCATED WITHIN THE SITE TO ACCOMODATE SITE OPERATIONS.
8. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312A.
9. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.
10. ELECTRICITY TO THE LFGTE FACILITY, LEACHATE TANKS, AND FLARE FACILITY IS SUPPLIED BY AN OWNER MAINTAINED ELECTRIC LINE.
11. SITE BENCHMARK INFORMATION IS LISTED BELOW.

ZONING LEGEND

ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE

SITE BENCHMARK INFORMATION

MONUMENT	NORTHING	EASTING	ELEVATION (FT-MSL)
1	7062483.83	2445210.12	455.46

BENCHMARK WAS ESTABLISHED ON AUGUST 13, 2004.
ELEVATION IS BASED ON NAVD 88.

EXISTING CONDITIONS PLAN

- ☐ 90% REVIEW
- ☒ FOR PERMITTING PURPOSES ONLY
- ☐ ISSUED FOR CONSTRUCTION

DATE: 08/2016
FILE: 1339-351-11
CAD: 5-EXISTING CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 5

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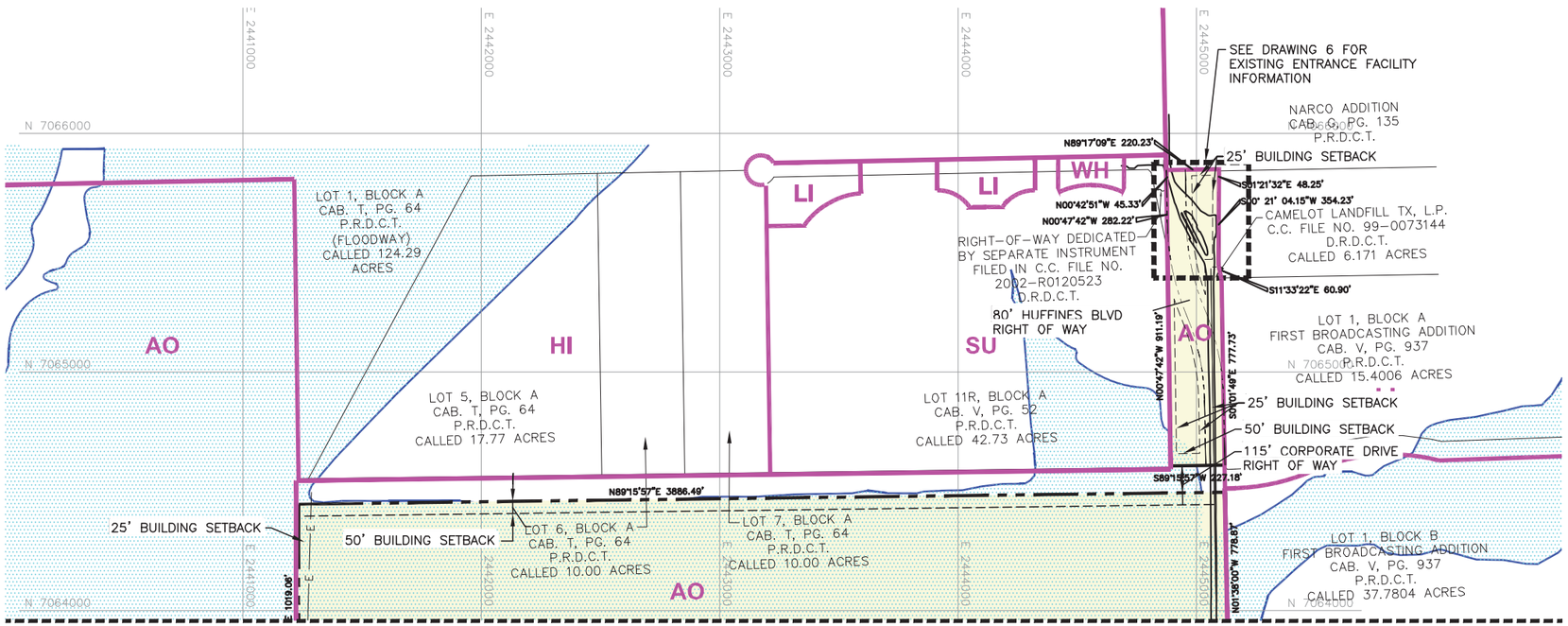
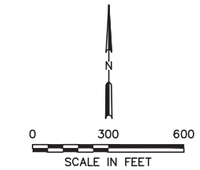


MATCH LINE- SEE DRAWING 5



LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312A)
- CELL BOUNDARY
- 430 EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 STATE PLANE COORDINATE SYSTEM
- EFFECTIVE 100-YEAR FLOODPLAIN (SEE NOTE 3)
- BUILDING SETBACK LINE (SEE NOTE 7)
- ZONING BOUNDARY
- SU ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- CAMELOT LANDFILL ADDITION

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. ZONING BOUNDARIES AND DESIGNATIONS REPRODUCED FROM THE INTERACTIVE MAPS ON THE CITY OF LEWISVILLE WEBSITE IN MARCH 2016.
3. THE EFFECTIVE 100-YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM NUMBER 48121C0565G, EFFECTIVE DATE APRIL 18, 2011.
4. ALL PAVING BEHIND THE SCALEHOUSE MAY BE COMPRESSED GRAVEL OR CRUSHED STONE. ADDITIONALLY, HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMODATE SITE OPERATIONS.
5. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312A.
6. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.
7. BUILDING SETBACKS ARE 25-FEET OR 35-FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10-FEET ALONG THE NORTH, 50-FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.

ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE
WH	WAREHOUSE

EXISTING CONDITIONS PLAN

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 08/2016
FILE: 1339-351-11
CAD: 5A-EXISTING CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 5A

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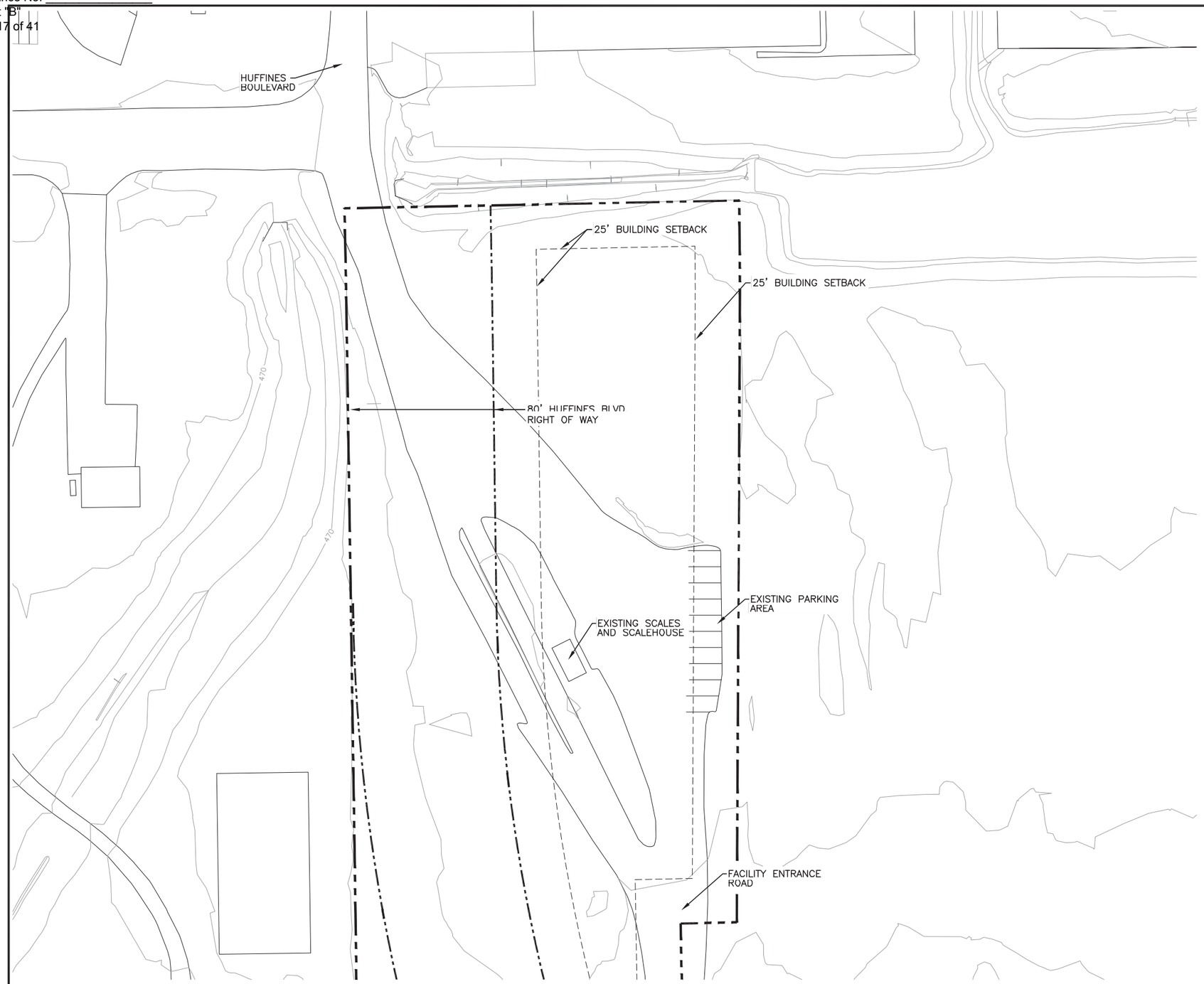

N

0 30 60
SCALE IN FEET

LEGEND:

- LANDFILL PROPERTY BOUNDARY (TCEQ PERMIT NO. 1312B)
- CELL BOUNDARY
- 430 EXISTING CONTOUR
- BUILDING SETBACK LINE (SEE NOTE 4)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.
2. ZONING BOUNDARIES AND DESIGNATIONS REPRODUCED FROM THE INTERACTIVE MAPS ON THE CITY OF LEWISVILLE WEBSITE IN MARCH 2016.
3. THE PROPOSED 100–YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM CLOMR CASSE NO. 11–06–3944R, APPROVED BY FEMA ON JANUARY 27, 2012.
4. BUILDING SETBACKS ARE 25–FEET OR 35–FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10–FEET ALONG THE NORTH, 50–FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
5. STORMWATER RUN–ON AND RUN–OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312A.
6. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.

EXISTING ENTRANCE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339–351–11
CAD: 6–EXISTING ENT.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 6

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ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD–SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

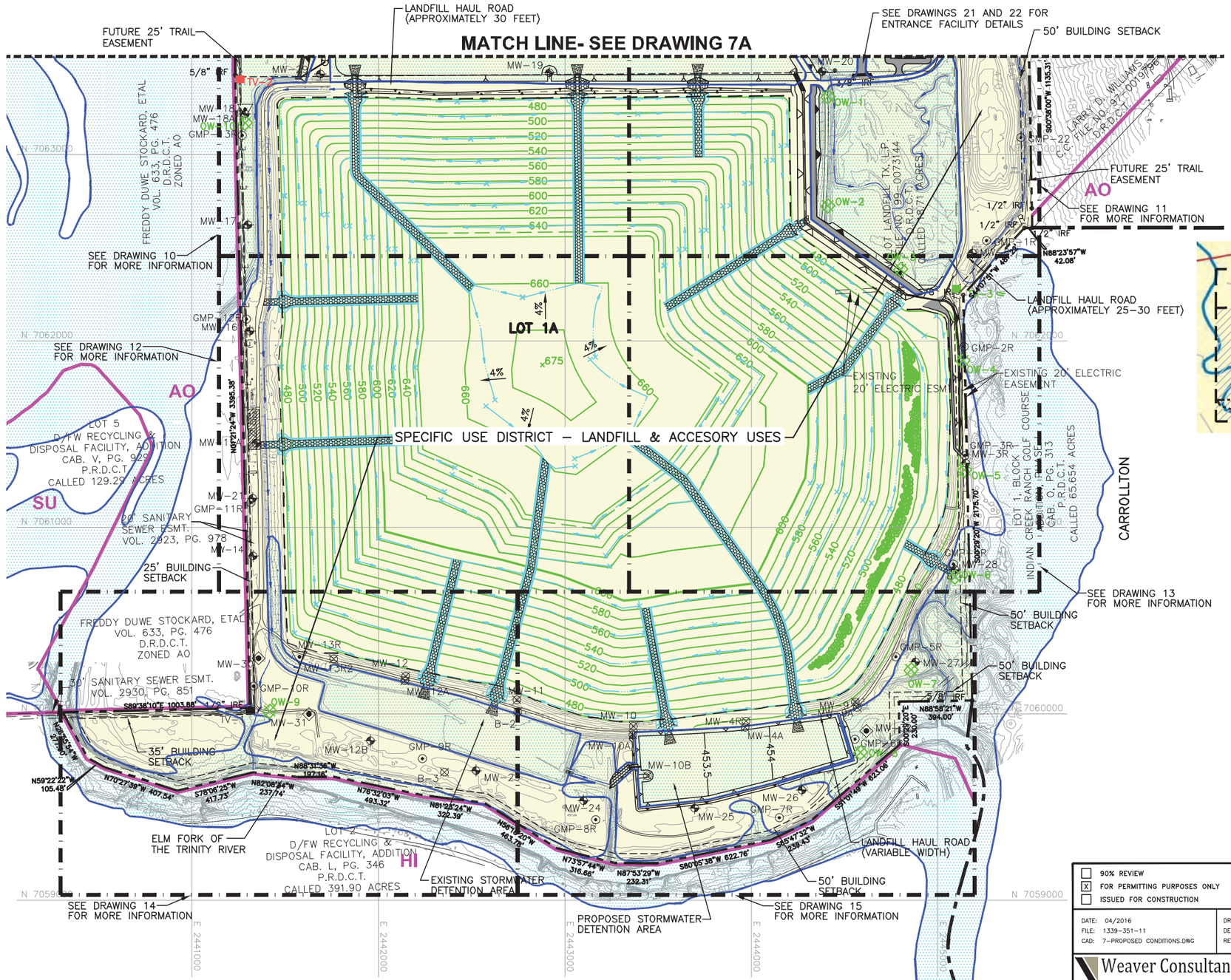
c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

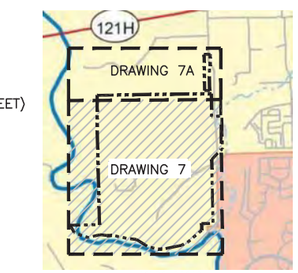
d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.





KEY MAP

0 300 600
SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- 430 EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 STATE PLANE COORDINATE SYSTEM
- PROPOSED 100–YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- SU ZONING DESIGNATION
- PROPOSED LANDFILL ACCESS ROAD
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- E E PROPOSED ELECTRICAL LINE (SEE NOTE 5)
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRF IRON ROD FOUND
- IRS IRON ROD SET
- CAMELOT LANDFILL ADDITION
- MW–8 EXISTING GROUNDWATER MONITORING WELL
- MW–30 PROPOSED GROUNDWATER MONITORING WELL
- GMP–20 PROPOSED LANDFILL GAS MONITORING PROBE
- GMP–1R EXISTING LANDFILL GAS MONITORING PROBE
- MW–12 OBSERVATION/MONITORING WELL
- OW–1 PROPOSED WOODBINE MONITOR WELL
- TV–4 PROPOSED TRENCH VENT
- TV–1 EXISTING TRENCH VENT
- TV–2 EXISTING TRENCH VENT (TO BE ABANDONED)
- MATCHLINES

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.
2. ZONING BOUNDARIES AND DESIGNATIONS REPRODUCED FROM THE INTERACTIVE MAPS ON THE CITY OF LEWISVILLE WEBSITE IN MARCH 2016.
3. THE PROPOSED 100–YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM CLOMR CASE NO. 11–06–3944R, APPROVED BY FEMA ON JANUARY 27, 2012.
4. BUILDING SETBACKS ARE 25–FEET OR 35–FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10–FEET ALONG THE NORTH, 50–FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
5. ROADS WILL BE UNPAVED EXCEPT AS SHOWN ON DRAWING 21 AND 22. ADDITIONALLY, HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMMODATE THE SITE OPERATIONS.
6. THE MAINTENANCE AREA MAY BE RELOCATED WITHIN THE SITE TO ACCOMMODATE SITE OPERATIONS.
7. STORMWATER RUN–ON AND RUN–OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
8. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.
9. EMERGENCY ACCESS WILL BE PROVIDED AS THE LANDFILL DEVELOPS.
10. ELECTRICITY TO THE LFGTE FACILITY, LEACHATE TANKS, AND FLARE FACILITY IS SUPPLIED BY AN OWNER MAINTAINED ELECTRIC LINE.
11. THE LOCATION AND ALIGNMENT OF THE TRAIL EASEMENT IS SUBJECT TO THE APPROVAL OF TCEQ.

ENGINEERING SITE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339–351–11
CAD: 7–PROPOSED CONDITIONS.DWG
DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 7

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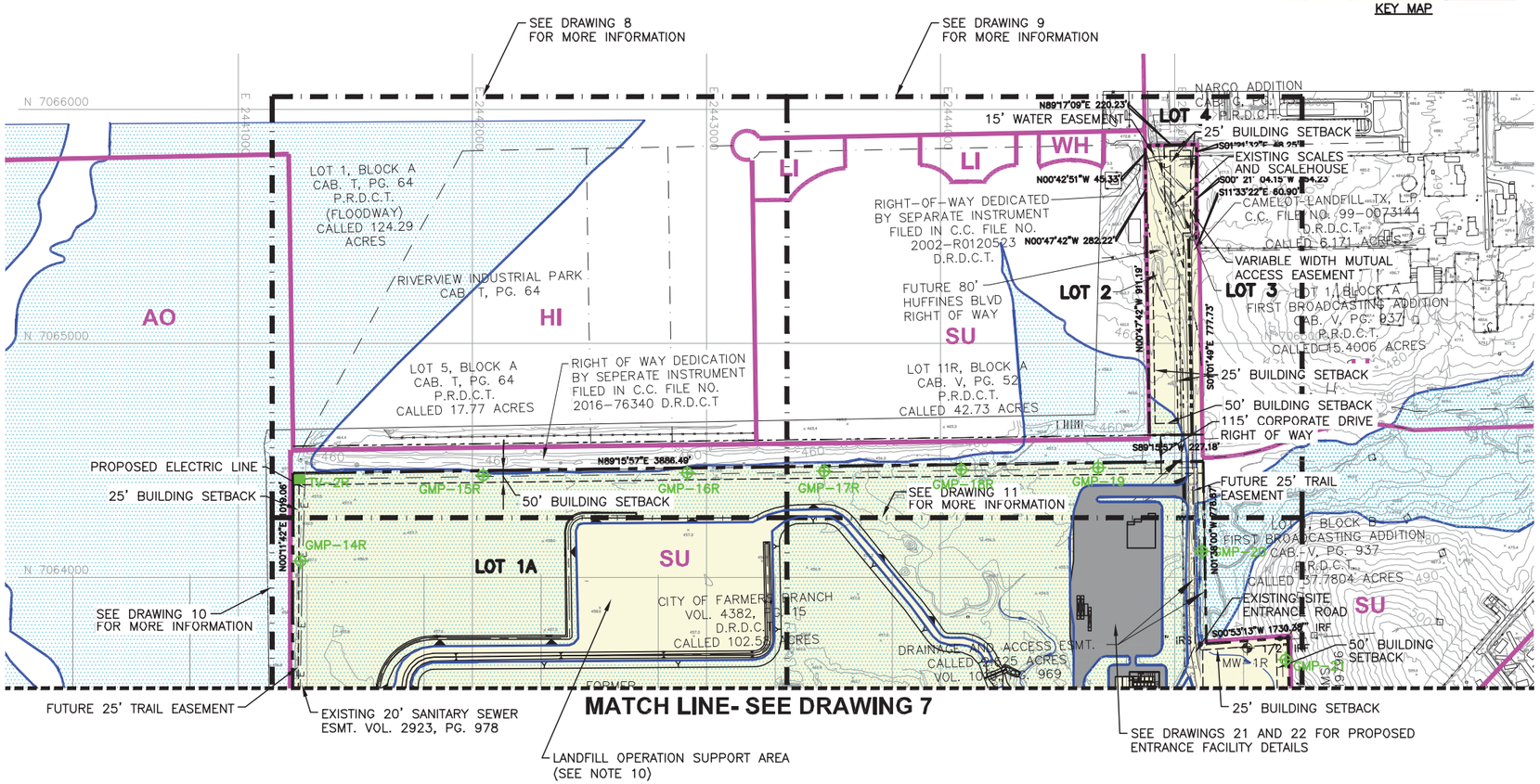
ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE
WH	WAREHOUSE

KEY MAP

0 300 600
SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- PROPERTY BOUNDARY
- 430 EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- SU ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- E E ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRF IRON ROD FOUND
- IRS IRON ROD SET
- CAMELOT LANDFILL ADDITION
- GMP-20 PROPOSED LANDFILL GAS MONITORING PROBE
- TV-2 PROPOSED TRENCH VENTS
- MATCHLINES



NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. ZONING BOUNDARIES AND DESIGNATIONS REPRODUCED FROM THE INTERACTIVE MAPS ON THE CITY OF LEWISVILLE WEBSITE IN MARCH 2016.
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5. ROADS WILL BE UNPAVED EXCEPT AS SHOWN ON DRAWING 21 AND 22. ADDITIONALLY, HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMMODATE THE SITE OPERATIONS.
6. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
7. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.
8. ELECTRICITY TO THE LFGTE FACILITY, LEACHATE TANKS, AND FLARE FACILITY IS SUPPLIED BY AN OWNER MAINTAINED ELECTRIC LINE.
9. THE 10-ACRE LANDFILL OPERATION SUPPORT AREA MAY BE USED IN THE FUTURE TO LOCATE A CITIZEN CONVENIENCE CENTER OR A WOOD WASTE PROCESSING AREA. DETAILED PLANS WILL BE SUBMITTED TO THE CITY FOR APPROVAL PRIOR TO ANY DEVELOPMENT IN THIS AREA.
10. THE LOCATION AND ALIGNMENT OF THE TRAIL EASEMENT IS SUBJECT TO THE APPROVAL OF TCEQ.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

ENGINEERING SITE PLAN

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339-351-11
CAD: 7A-PROPOSED CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

WWW.WCGRP.COM

DRAWING 7A

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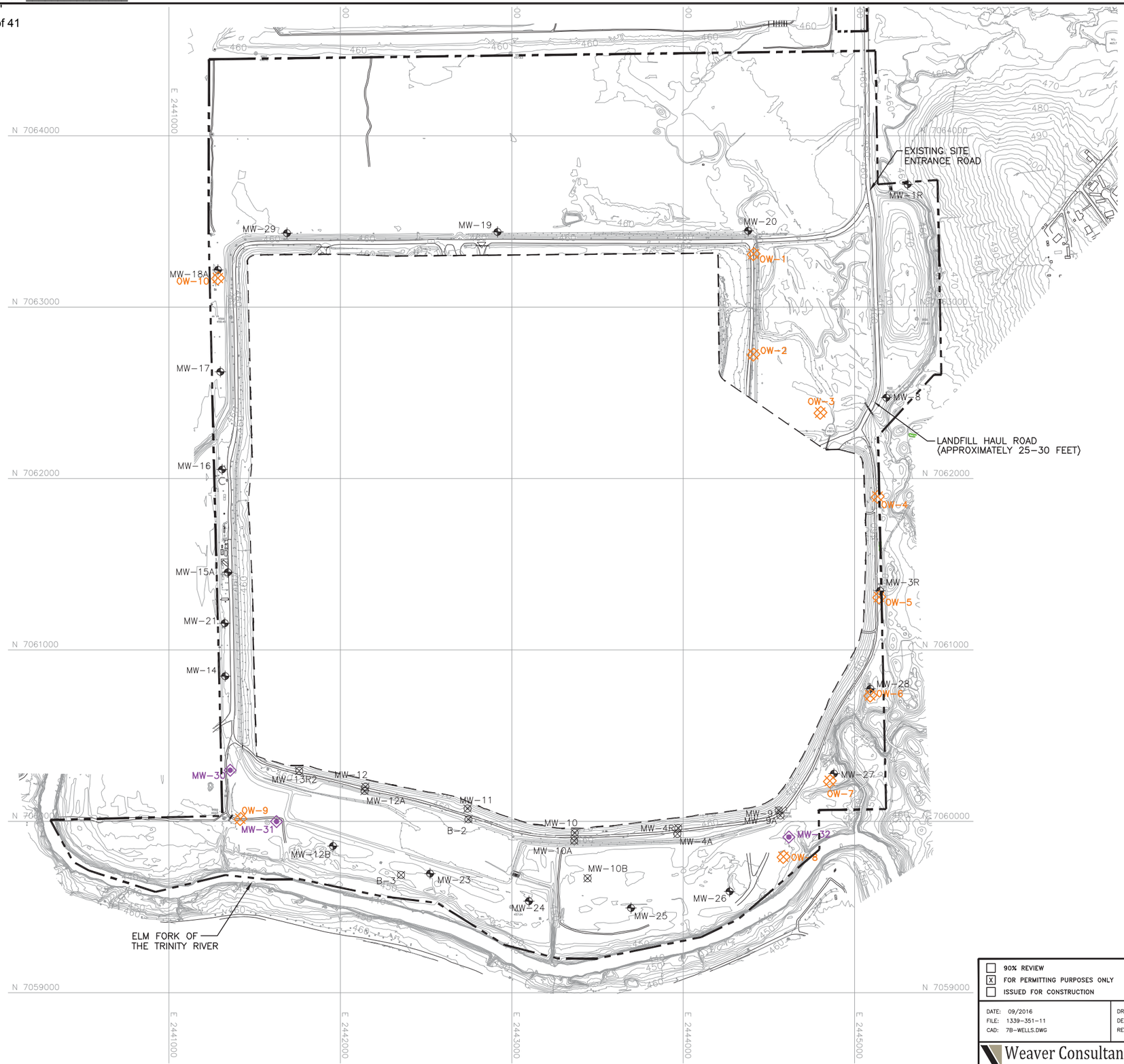

N

0 300 600
SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- LANDFILL PROPERTY BOUNDARY
- 430 — EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- EXISTING LANDFILL ACCESS ROAD
- MW–8 — EXISTING GROUNDWATER MONITORING WELL
- MW–30 — PROPOSED GROUNDWATER MONITORING WELL
- MW–12 — EXISTING OBSERVATION/MONITORING WELL
- OW–1 — PROPOSED WOODBINE MONITOR WELL

NOTES:
1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.

WELL TOTALS

EXISTING GROUNDWATER MONITORING WELL	19
PROPOSED GROUNDWATER MONITORING WELL	3
EXISTING OBSERVATION/MONITORING WELL	13
PROPOSED WOODBINE MONITOR WELL	10

WELL EXHIBIT

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339–351–11
CAD: 7B–WELLS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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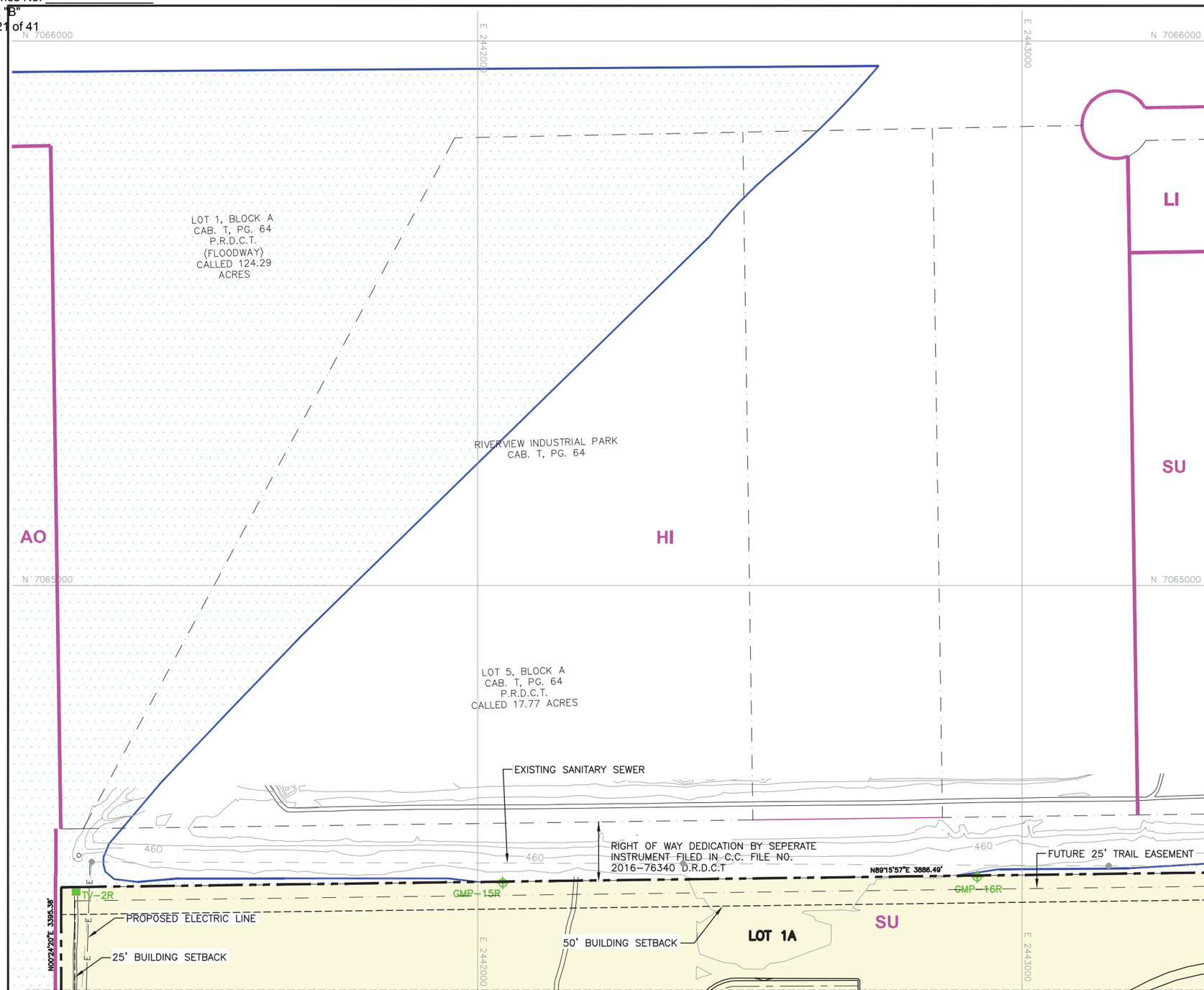
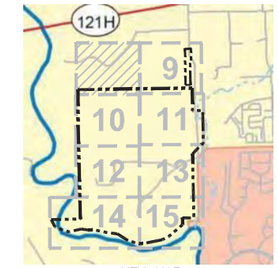


LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- PROPERTY BOUNDARY
- 430 EXISTING CONTOUR
- N 7062000 STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- SU ZONING DESIGNATION
- EASEMENT
- E E ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRF IRON ROD FOUND
- IRS IRON ROD SET
- CAMELOT LANDFILL ADDITION
- GMP-20 PROPOSED LANDFILL GAS MONITORING PROBE
- TV-2R PROPOSED TRENCH VENTS



KEY MAP

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. ZONING BOUNDARIES AND DESIGNATIONS REPRODUCED FROM THE INTERACTIVE MAPS ON THE CITY OF LEWISVILLE WEBSITE IN MARCH 2016.
3. THE PROPOSED 100-YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM CLOMR CASE NO. 11-06-3944R, APPROVED BY FEMA ON JANUARY 27, 2012.
4. BUILDING SETBACKS ARE 25-FEET OR 35-FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10-FEET ALONG THE NORTH, 50-FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
5. ROADS WILL BE UNPAVED EXCEPT AS SHOWN ON DRAWING 21 AND 22. ADDITIONALLY, HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMMODATE THE SITE OPERATIONS.
6. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
7. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.
8. ELECTRICITY TO THE LFGTE FACILITY, LEACHATE TANKS, AND FLARE FACILITY IS SUPPLIED BY AN OWNER MAINTAINED ELECTRIC LINE.
9. THE LOCATION AND ALIGNMENT OF THE TRAIL EASEMENT IS SUBJECT TO THE APPROVAL OF TCEQ.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE
WH	WAREHOUSE

N

0 100 200
SCALE IN FEET

ENGINEERING SITE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339-351-11
CAD: 8-PROPOSED CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 8

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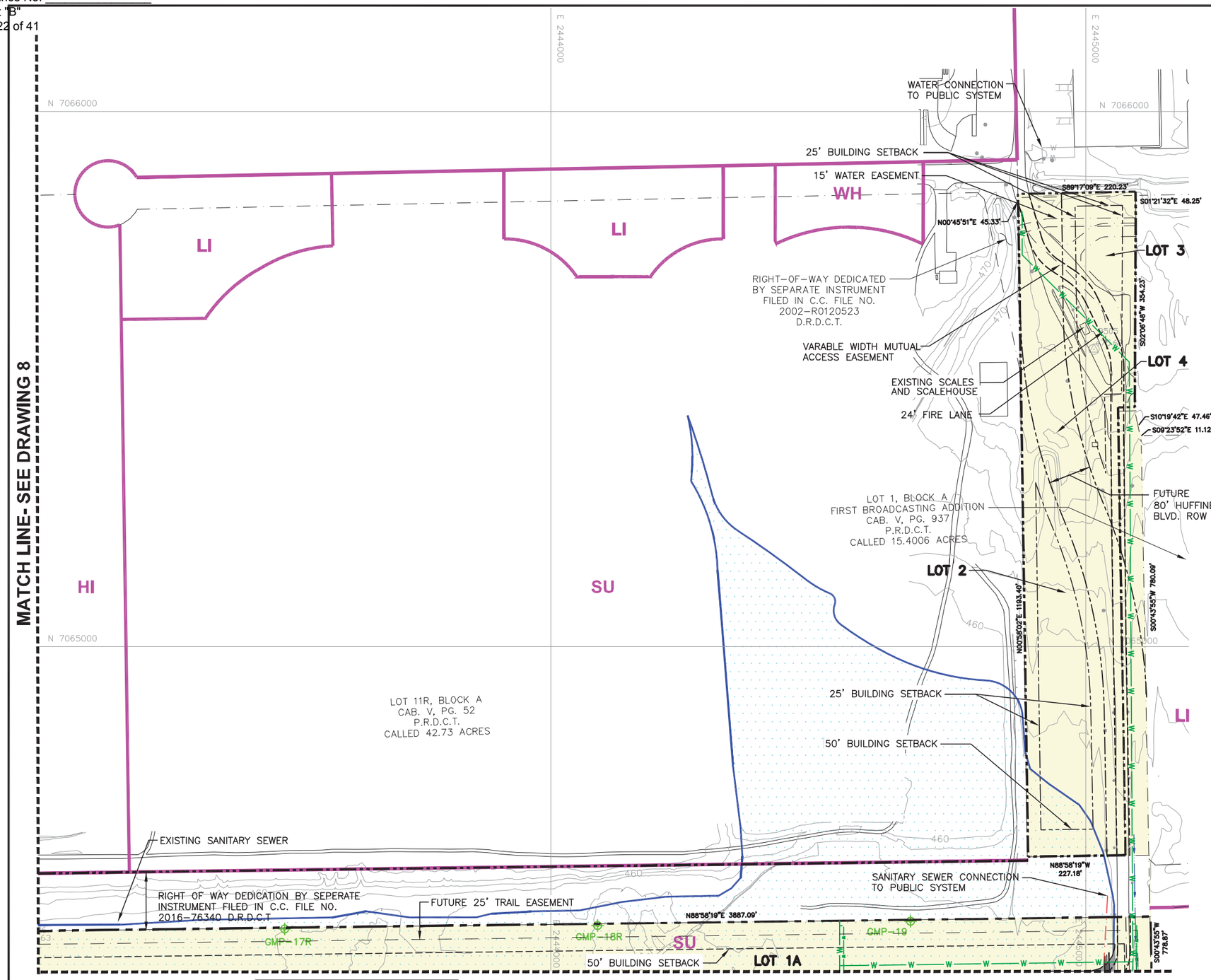
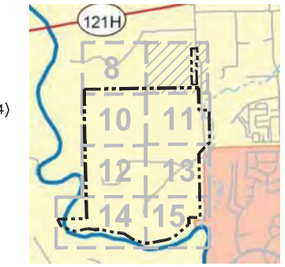


LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- PROPERTY BOUNDARY
- 430 — EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- SU — ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRF — IRON ROD FOUND
- IRS — IRON ROD SET
- CAMELOT LANDFILL ADDITION
- GMP-19 — PROPOSED LANDFILL GAS MONITORING PROBE
- TV-3 — PROPOSED TRENCH VENTS



KEY MAP

NOTES:

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5. ROADS WILL BE UNPAVED EXCEPT AS SHOWN ON DRAWING 21 AND 22. ADDITIONALLY, HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMMODATE THE SITE OPERATIONS.
6. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
7. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.
8. ELECTRICITY TO THE LFGTE FACILITY, LEACHATE TANKS, AND FLARE FACILITY IS SUPPLIED BY AN OWNER MAINTAINED ELECTRIC LINE.
9. WATERLINE WILL BE PRIVATE SOUTH OF FUTURE CORPORATE DRIVE WITH A DOUBLE DETECTOR CHECK VALVE IN A VAULT.
10. THE LOCATION AND ALIGNMENT OF THE TRAIL EASEMENT IS SUBJECT TO THE APPROVAL OF TCEQ.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

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f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE
WH	WAREHOUSE

N

0 100 200
SCALE IN FEET

ENGINEERING SITE PLAN

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339-351-11
CAD: 9-PROPOSED CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CCJ
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 9

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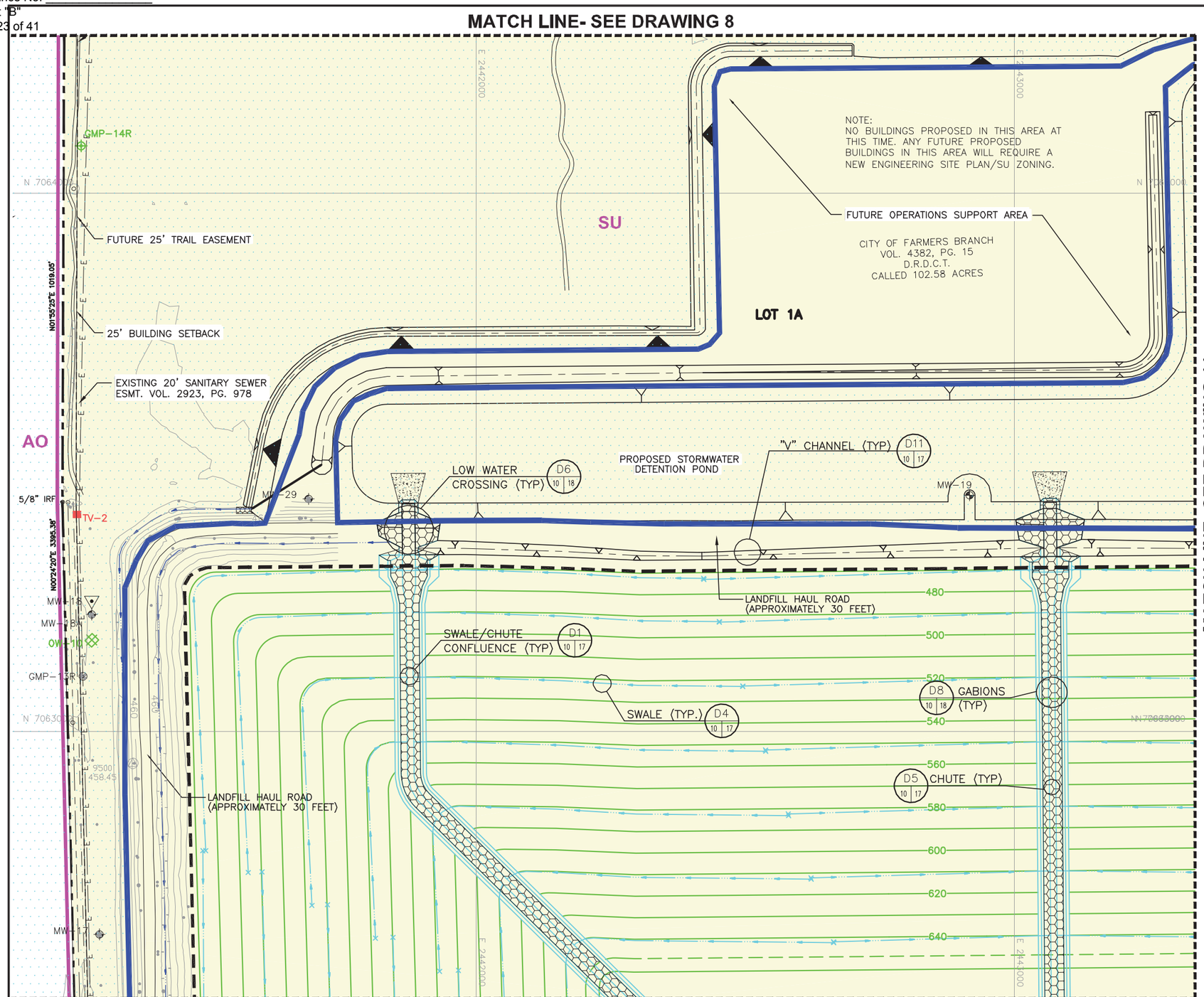

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- 430 — EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- AO — ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- E — E — ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRF — IRON ROD FOUND
- IRS — IRON ROD SET
- CAMELOT LANDFILL ADDITION
- 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-14R — PROPOSED LANDFILL GAS MONITORING PROBE
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- TV-2 — EXISTING TRENCH VENT (TO BE ABANDONED)

ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE
WH	WAREHOUSE

NOTES:

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VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.
b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.
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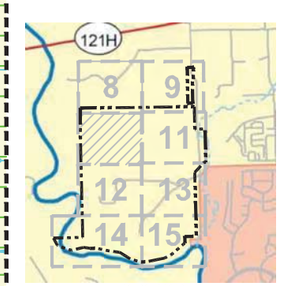

KEY MAP

ENGINEERING SITE PLAN

N

0 100 200
SCALE IN FEET

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339-351-11
CAD: 10-PROPOSED CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CCJ
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 10

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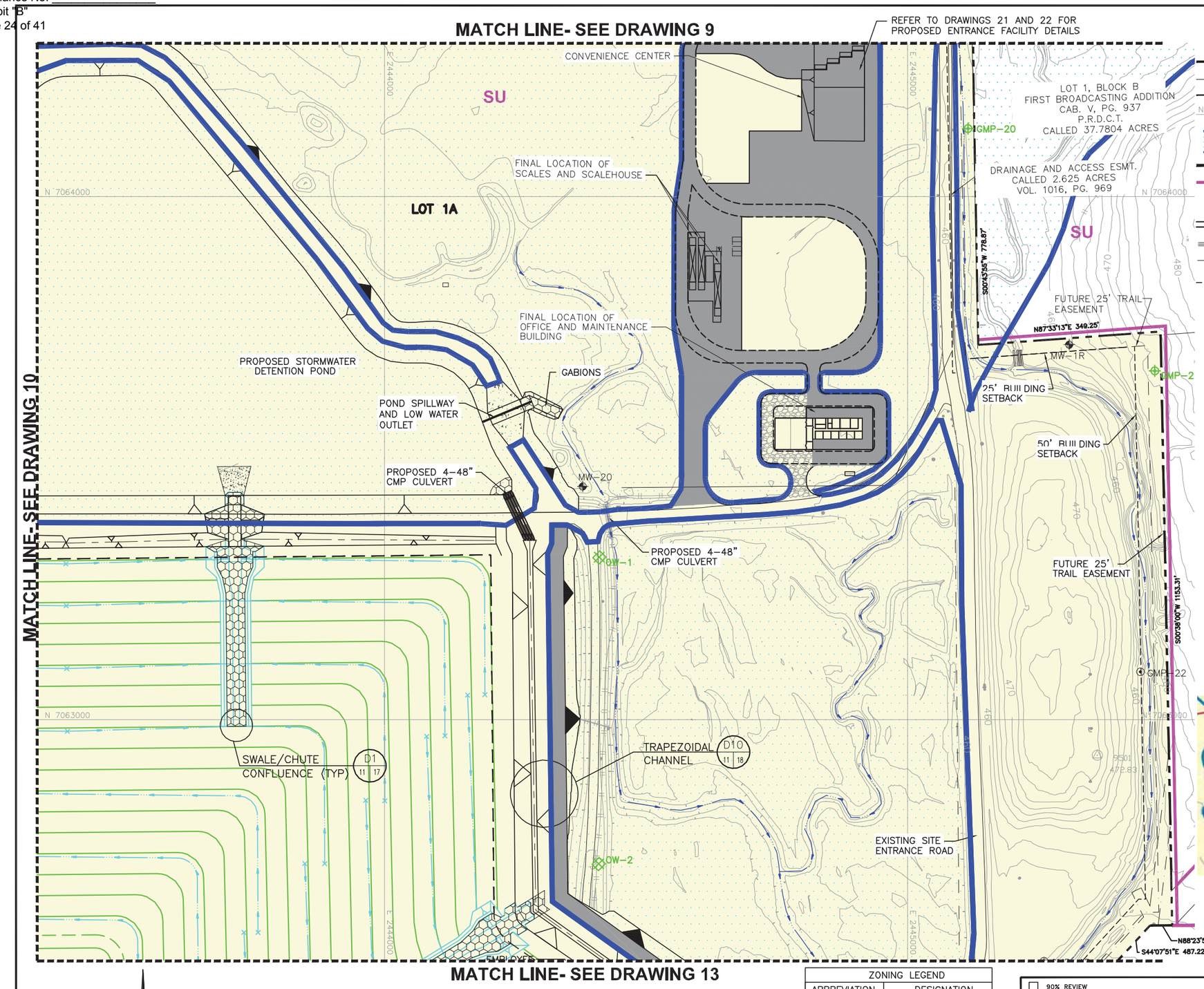

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- EXISTING CONTOUR (430)
- LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- AO — ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRF — IRON ROD FOUND
- IRS — IRON ROD SET
- CAMELOT LANDFILL ADDITION
- 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-14R — PROPOSED LANDFILL GAS MONITORING PROBE
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- GRAVEL SURFACING
- CONCRETE OR ASPHALT PAVEMENT

NOTES:

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VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

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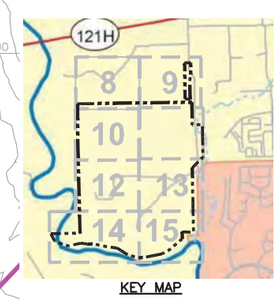

KEY MAP

ENGINEERING SITE PLAN

N

0 100 200
SCALE IN FEET

ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE
WH	WAREHOUSE

☐ 90% REVIEW
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DATE: 06/2016
FILE: 1339-351-11
CAD: 11-PROPOSED CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
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FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 11

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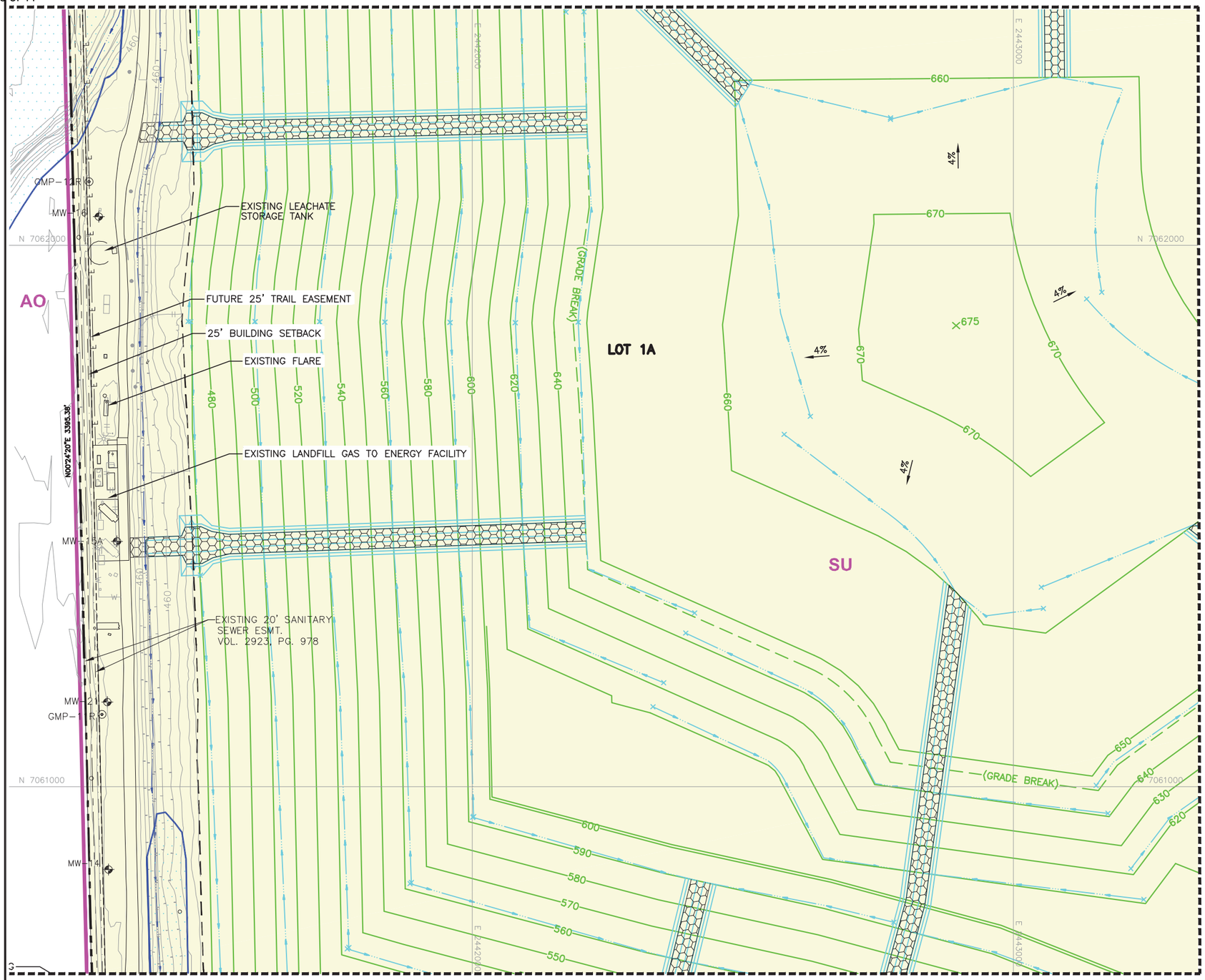
MATCH LINE- SEE DRAWING 10



MATCH LINE- SEE DRAWING 13

MATCH LINE- SEE DRAWING 14

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- EXISTING CONTOUR
- LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRON ROD FOUND
- IRON ROD SET
- CAMELOT LANDFILL ADDITION
- FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- GROUNDWATER MONITORING WELL
- EXISTING LANDFILL GAS MONITORING PROBE

ZONING LEGEND	
ABBREVIATION	DESIGNATION
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HI	HEAVY INDUSTRIAL
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SU	SPECIFIC USE
WH	WAREHOUSE

NOTES:

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7. BEARINGS AND DISTANCES TIED TO FINAL PLAT PERPARED BY PEISER SURVEYING CO.
8. ELECTRICITY TO THE LFGTE FACILITY, LEACHATE TANKS, AND FLARE FACILITY IS SUPPLIED BY AN OWNER MAINTAINED ELECTRIC LINE.
9. THE LOCATION AND ALIGNMENT OF THE TRAIL EASEMENT IS SUBJECT TO THE APPROVAL OF TCEQ.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.
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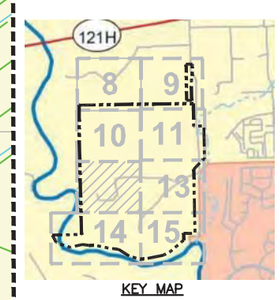
g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.



KEY MAP

ENGINEERING SITE PLAN

N

0 100 200
SCALE IN FEET

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339-351-11
CAD: 12-PROPOSED CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 12

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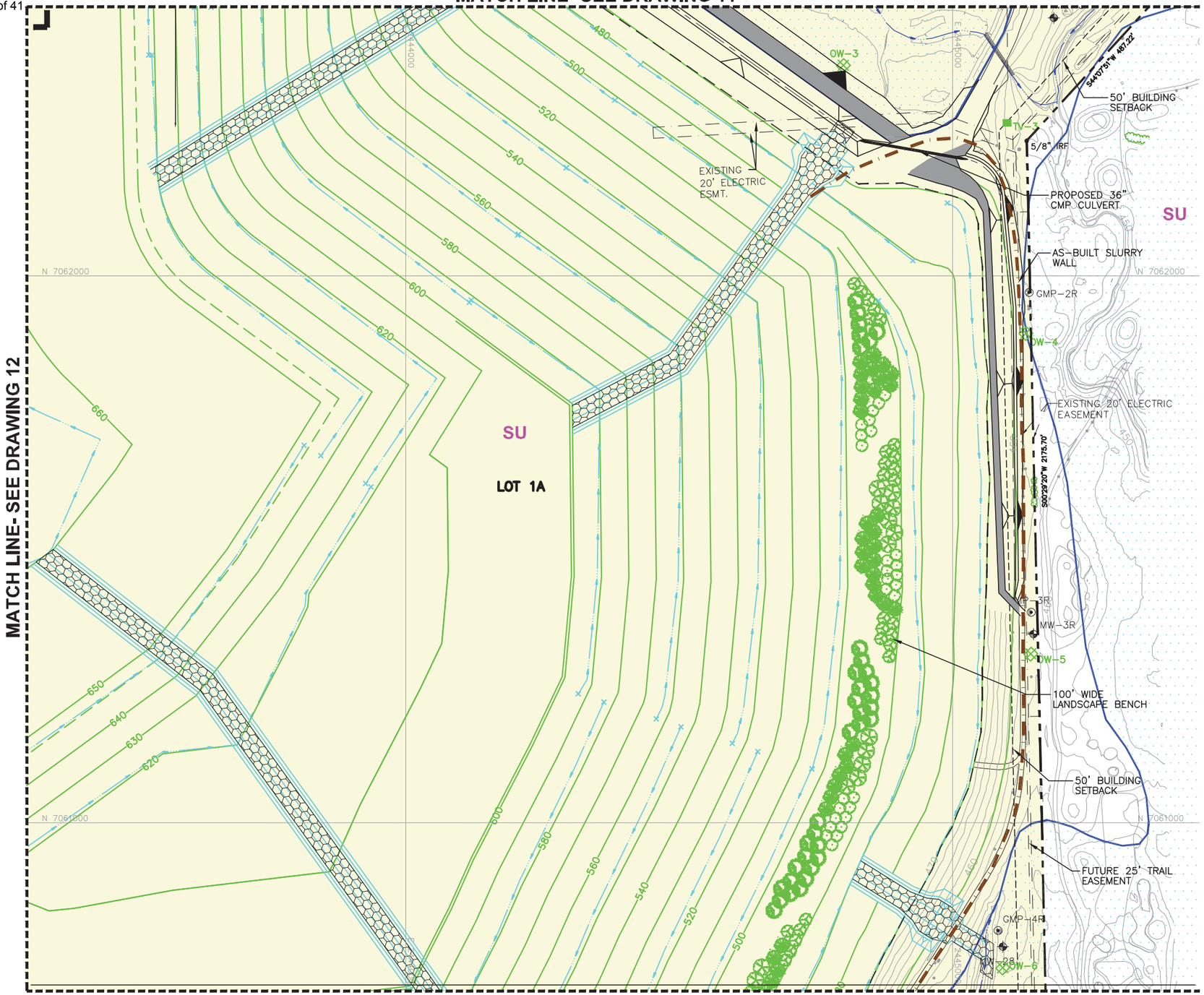
MATCH LINE- SEE DRAWING 11



MATCH LINE- SEE DRAWING 15

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- 430 — EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
- CITY LIMIT
- ZONING BOUNDARY
- AO — ZONING DESIGNATION
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- BUILDING SETBACK LINE (SEE NOTE 4)
- IRF — IRON ROD FOUND
- IRS — IRON ROD SET
- CAMELOT LANDFILL ADDITION
- TV-2R — PROPOSED TRENCH VENTS
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- LOCATION OF AS-BUILT SLURRY WALL

ZONING LEGEND	
ABBREVIATION	DESIGNATION
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
AO	AGRICULTURAL OPEN SPACE
SU	SPECIFIC USE
WH	WAREHOUSE

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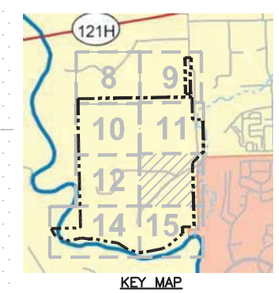

KEY MAP

ENGINEERING SITE PLAN

N

0 100 200
SCALE IN FEET

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339-351-11
CAD: 13-PROPOSED CONDITIONS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

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FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 13

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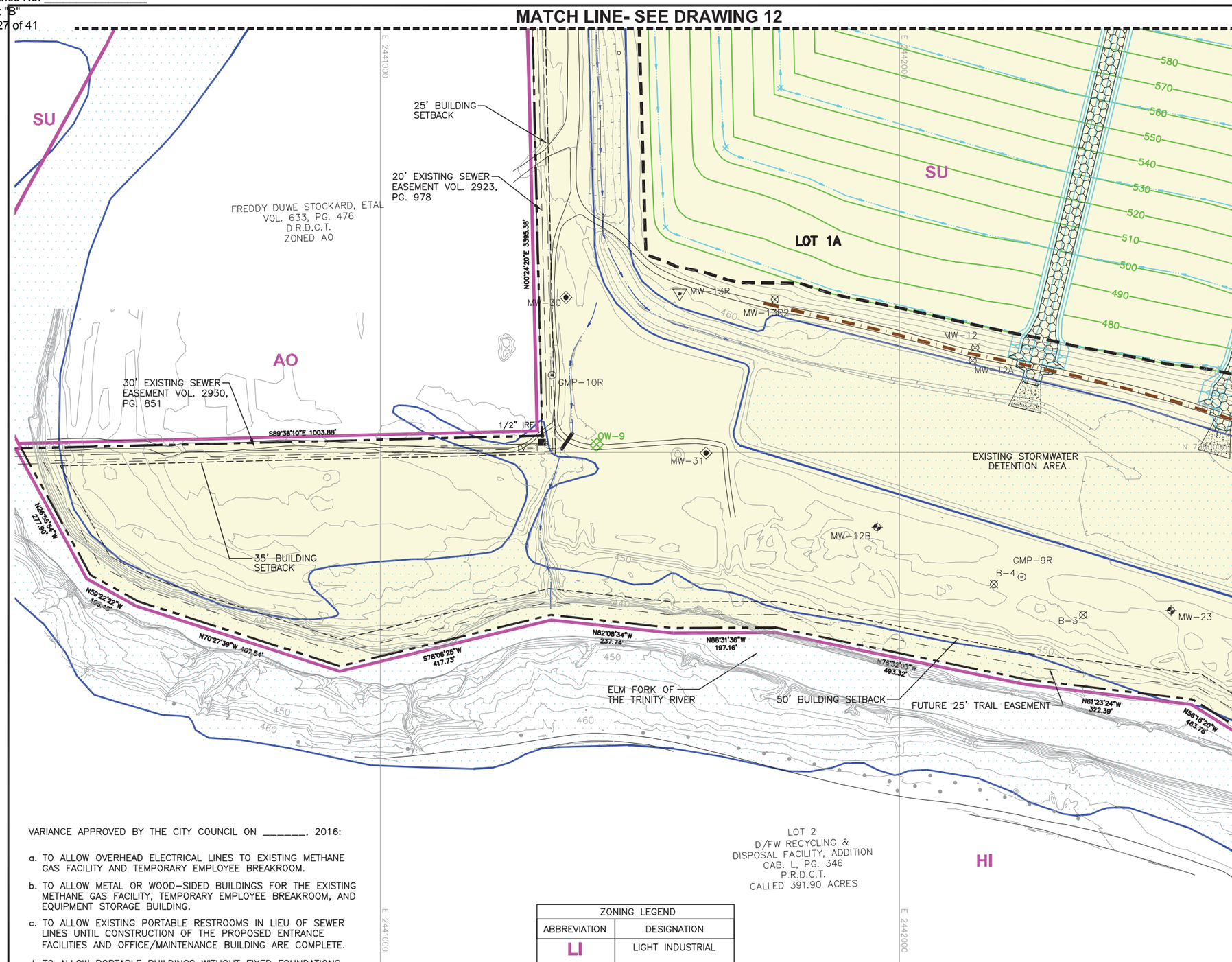

LEGEND:

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- 430 — EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 3)
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- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-14R — PROPOSED LANDFILL GAS MONITORING PROBE
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- TV-1 — EXISTING TRENCH VENT
- LOCATION OF AS-BUILT SLURRY WALL

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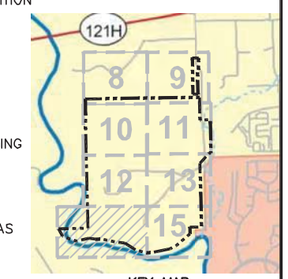
0 100 200
SCALE IN FEET



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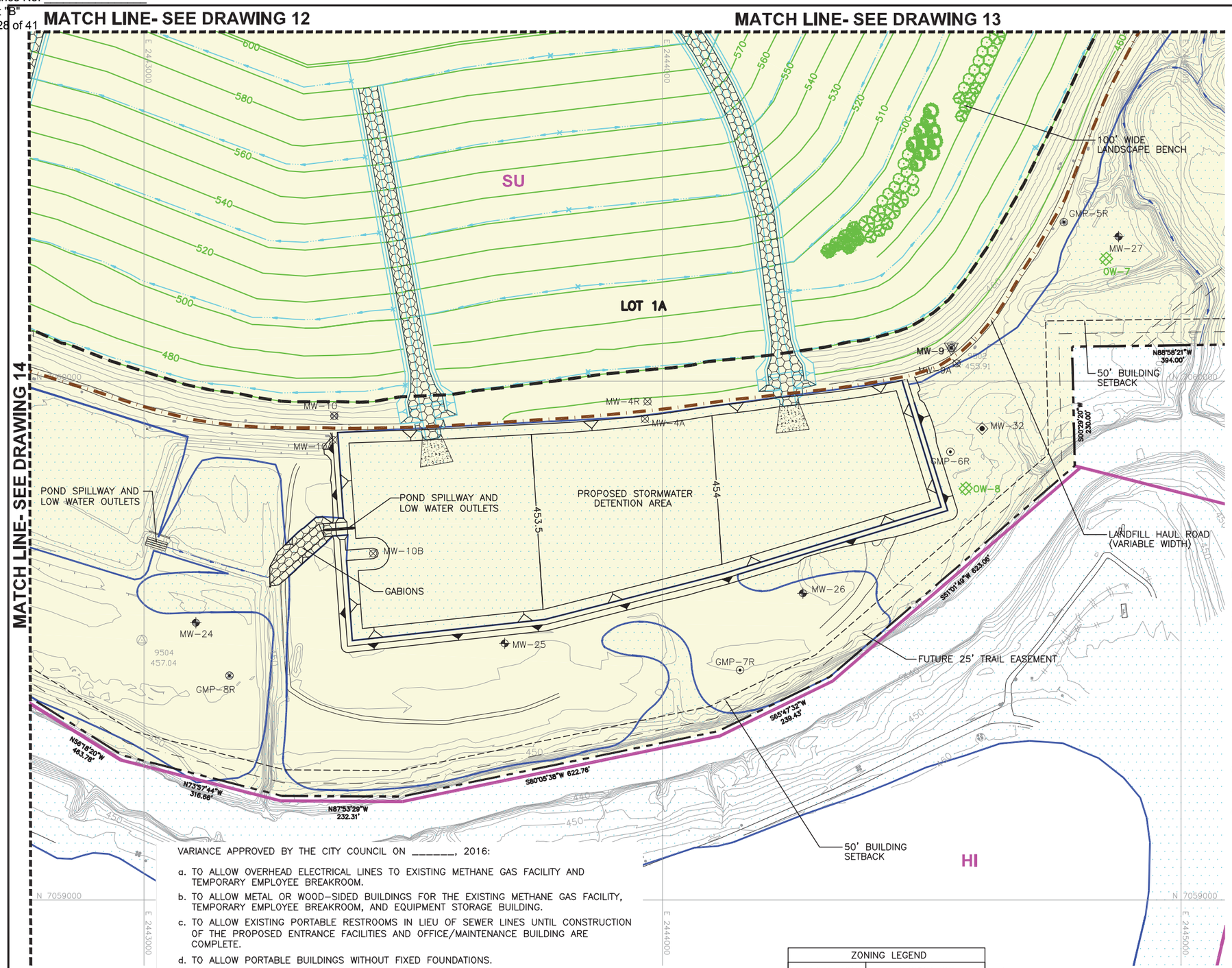
DRAWING 14



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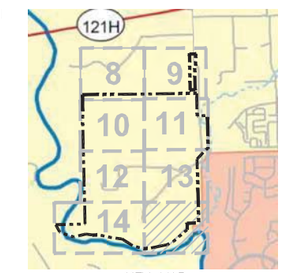

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LOTS 1A, 2, 3, AND 4 BLOCK A
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DRAWING 15

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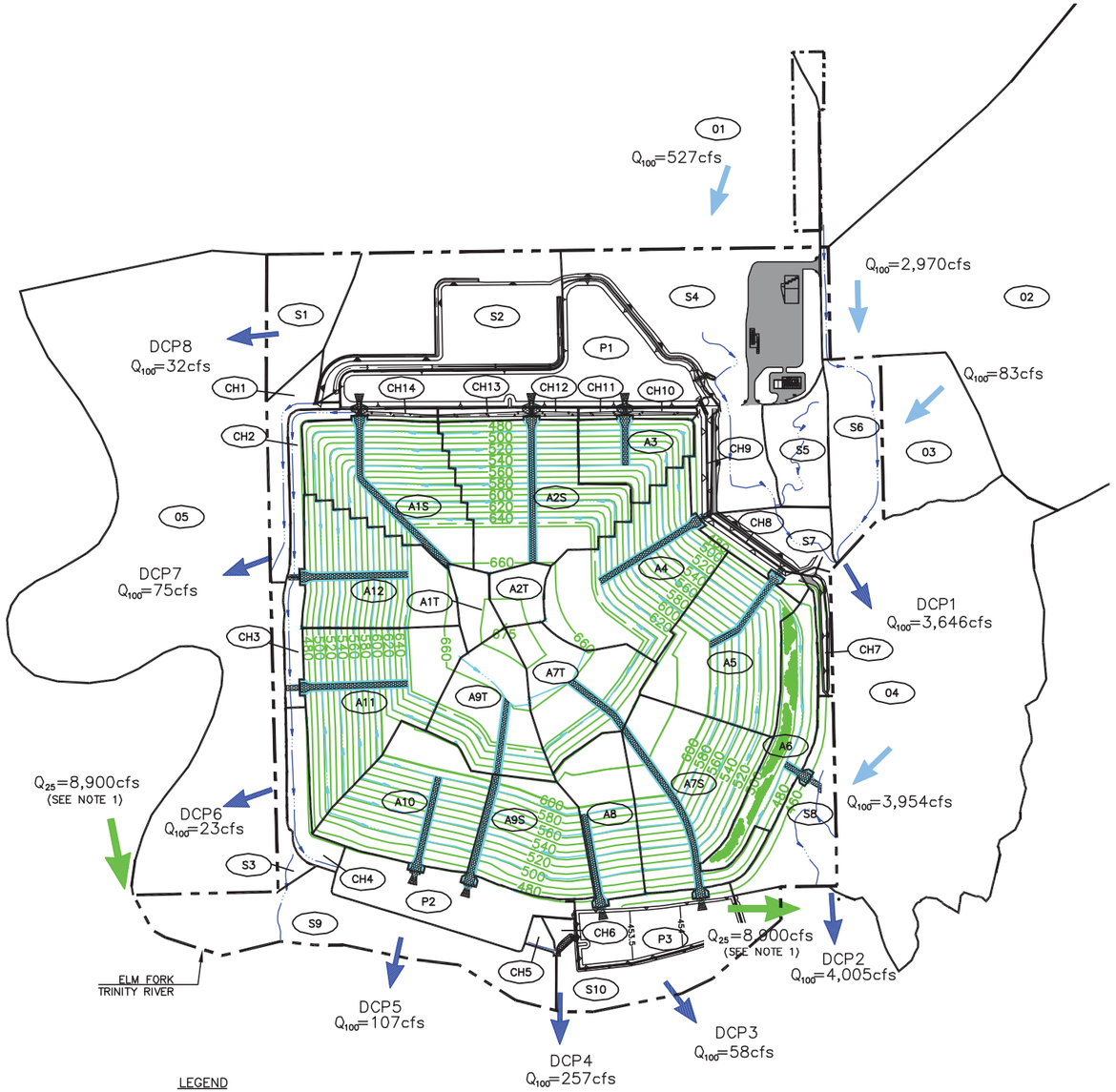

DRAINAGE AREA NO.	AREA (ACRES)	CURVE NO.	HYDROGRAPH METHOD	FLOW (CFS)	PEAK FLOW	STAGE (FT)	MAX. STAGE
O1	117.94	87	SNYDER (ESPEY)	527	12.42		
S4	43.34	84	SNYDER (ESPEY)	114	12.83		
CS4				609	12.50		
A1T	3.07	84	DIRECT RUNOFF	20	12.17		
A1S	18.86	86	DIRECT RUNOFF	177	12.08		
CA1				196	12.08		
CH14	1.01	84	DIRECT RUNOFF	9	12.08		
CCH14				205	12.08		
A2T	3.35	84	DIRECT RUNOFF	22	12.17		
A2S	22.03	86	DIRECT RUNOFF	206	12.08		
CA2				228	12.08		
CH12	0.59	84	DIRECT RUNOFF	5	12.08		
CH13	1.29	84	DIRECT RUNOFF	12	12.08		
CCH13				244	12.08		
A3	8.06	86	DIRECT RUNOFF	71	12.08		
CH10	0.85	84	DIRECT RUNOFF	7	12.08		
CH11	0.56	84	DIRECT RUNOFF	5	12.08		
CCH11				84	12.08		
CA3				533	12.08		
CH7	2.33	84	DIRECT RUNOFF	21	12.08		
A5	18.65	86	DIRECT RUNOFF	162	12.08		
CA5				182	12.08		
CH8	3.02	84	DIRECT RUNOFF	201	12.08		
A4	21.68	86	DIRECT RUNOFF	197	12.08		
CA4				398	12.08		
CH9	2.57	84	DIRECT RUNOFF	405	12.08		
P1	23.10	100		222	12.08		
P1-IN				1160	12.08		
RP1				41	14.58	458.23	14.58
CP1				640	12.50		
S5	7.34	84	SNYDER (ESPEY)	28	12.58		
CS5				666	12.50		
S7	5.39	84	SNYDER (ESPEY)	23	12.50		
CS7				690	12.50		
O2	1008.38	85	SNYDER (ESPEY)	2970	12.75		
O3	16.18	84	SNYDER (ESPEY)	83	12.33		
S6	13.92	84	SNYDER (ESPEY)	44	12.83		
CS6 (DCP1)				**3646**	**12.75**		
O4	86.04	84	SNYDER (ESPEY)	365	12.50		
CO4				3954	12.67		
A6	10.99	86	DIRECT RUNOFF	92	12.08		
S8	10.12	84	SNYDER (ESPEY)	51	12.33		
CS8 (DCP2)				**4005**	**12.67**		
S1 (DCP8)	**10.26**	**84**	**SNYDER (ESPEY)**	**32**	**12.83**		
S2	29.76	84	SNYDER (ESPEY)	69	13.25		
CH1 (DCP 7)	**5.94**	**84**	**DIRECT RUNOFF**	**75**	**13.33**		
S3 (DCP 6)	**4.55**	**84**	**SNYDER (ESPEY)**	**23**	**12.42**		

DRAINAGE DESIGN SUMMARY

DRAINAGE AREA NO.	AREA (ACRES)	CURVE NO.	HYDROGRAPH METHOD	PEAK FLOW (CFS)	TIME OF PEAK FLOW (HRS)	MAX. STAGE (FT)	TIME OF MAX. STAGE (HRS)
CH2	3.29	84	DIRECT RUNOFF	21	12.17		
A12	16.48	86	DIRECT RUNOFF	150	12.08		
CA12				169	12.08		
CH3	2.64	84	DIRECT RUNOFF	152	12.08		
A11	21.60	86	DIRECT RUNOFF	188	12.08		
CA11				340	12.08		
CH4	4.55	84	DIRECT RUNOFF	324	12.17		
A9T	12.33	84	DIRECT RUNOFF	76	12.17		
A9S	13.06	86	DIRECT RUNOFF	115	12.08		
CA9				186	12.08		
A10	17.87	86	DIRECT RUNOFF	156	12.08		
P2	12.60	100		121	12.08		
P2-IN				776	12.08		
RP2				189	12.67	458.71	12.67
CH5	0.76	84	DIRECT RUNOFF	190	12.67		
A7T	13.02	84	DIRECT RUNOFF	87	12.08		
A7S	22.24	86	DIRECT RUNOFF	196	12.08		
CA7				284	12.08		
A8	10.29	86	DIRECT RUNOFF	93	12.08		
P3	10.83	100		104	12.08		
P3-IN				481	12.08		
RP3				66	12.83	456.60	12.83
CH6	0.83	84	DIRECT RUNOFF	67	12.83		
CCH6				**257**	**12.67**		
S9	**22.75**	**84**	**SNYDER (ESPEY)**	**107**	**12.42**		
S10	**10.76**	**84**	**SNYDER (ESPEY)**	**58**	**12.33**		

LEGEND

- PERMIT BOUNDARY
- PROPERTY BOUNDARY
- 520 — PERMITTED / PROPOSED FINAL COVER CONTOUR
- P2 — DRAINAGE AREA DESIGNATION
- DRAINAGE AREA BOUNDARY
- UPLAND DRAINAGE ENTERING THE SITE
- STORMWATER DISCHARGE POINT
- DCP1 — DISCHARGE POINT LOCATION
- FLOW IN THE ELM FORK ENTERING/EXITING THE SITE

N

0 500 1000
SCALE IN FEET

NOTES:

1. FLOW RATES IN THE ELM FORK TRINITY RIVER ARE REPRODUCED FROM THE APPROVED CLOMR FOR THE SITE, CASE NO. 11–06–3944R.
2. PROPOSED DRAINAGE CALCULATIONS REPRODUCED FROM THE POST–PROJECT HEC–1 ANALYSIS DEVELOPED BY WEAVER CONSULTANTS GROUP DATED MARCH 26, 2016.
3. CLOMR CASE NO. 11–06–3944R WAS APPROVED BY FEMA ON JANUARY 27, 2012. THE CDC APPLICATION WAS APPROVED BY THE CITY OF LEWISVILLE ON FEBRUARY 27, 2012, AND BY THE USACE ON OCTOBER 31, 2011.

DRAINAGE AREA PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 06/2016
FILE: 1339–351–11
CAD: 16–DRAINAGE AREA PLAN.DWG

DRAWN BY: JDW
DESIGN BY: CCJ
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

WWW.WCGRP.COM

DRAWING 16

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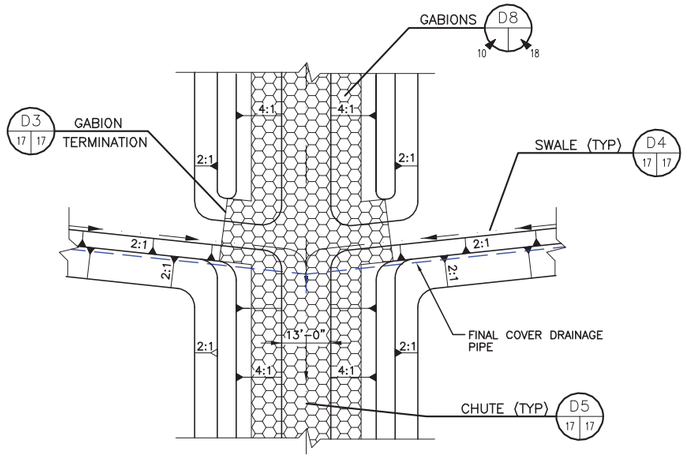
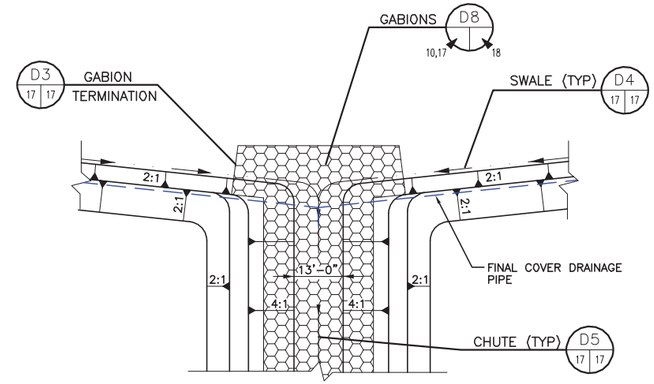


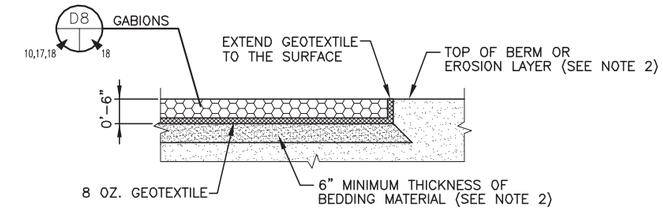
SWALE/CHUTE CONFLUENCE (TYP) D1 10 17

0 20 40
SCALE IN FEET



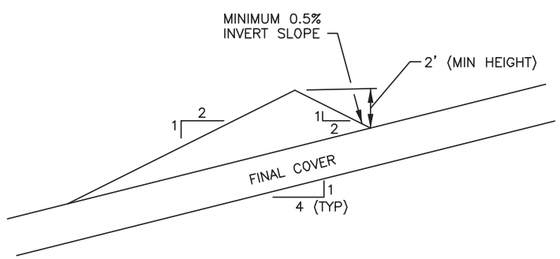
SWALE/CHUTE CONFLUENCE (TYP) D2 11 17

0 20 40
SCALE IN FEET



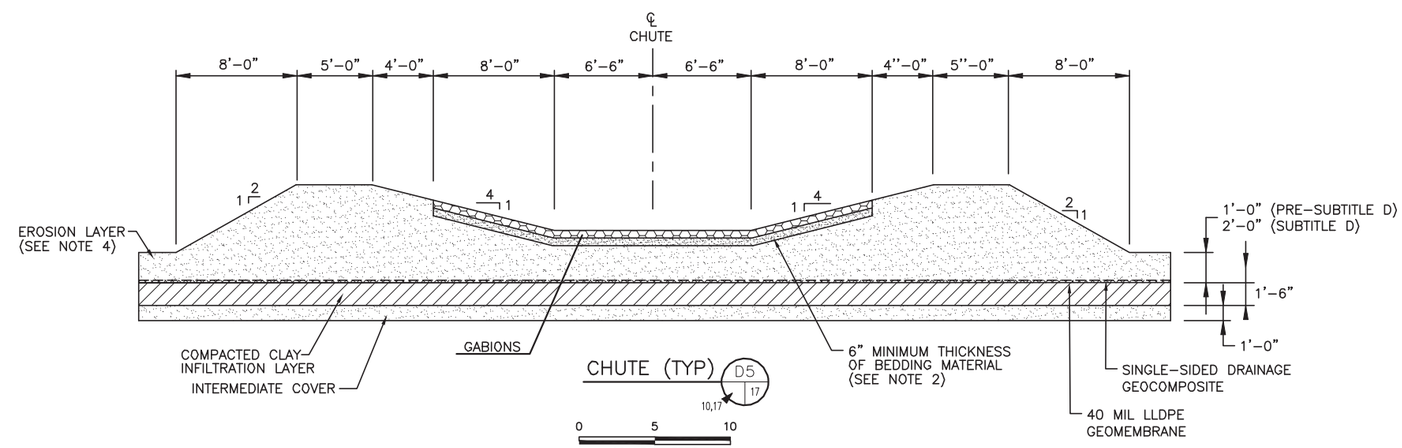
GABION TERMINATION D3 10 10

0 2 4
SCALE IN FEET



SWALE (TYP) D4 10,17 17

0 4 8
SCALE IN FEET



CHUTE (TYP) D5 10,17 17

0 5 10
SCALE IN FEET

NOTES:

1. REFER TO DRAWINGS 10 AND 11 FOR LOCATION OF DETAILS.
2. BEDDING MATERIAL WILL CONSIST OF CLAYEY SOILS COMPACTED TO PROVIDE FIRM BASE THAT WILL BE OVERLAIN BY 8 oz/sy GEOTEXTILE PRIOR TO PLACEMENT OF GABIONS.
3. CHUTE DETAILS ARE SHOWN WITH 13 FEET OF BOTTOM WIDTH. SEE THE TABLE ON DRAWING 19 FOR ACTUAL BOTTOM WIDTHS OF INDIVIDUAL CHUTES.
4. EROSION LAYER WILL BE CAPABLE OF SUSTAINING VEGETATIVE GROWTH.
5. THE EDGES OF THE INSTALLED GABIONS TIE EITHER TO THE TOP OF THE EROSION LAYER (i.e., AT UPSTREAM END OF DRAINAGE LETDOWN) OR TO SOIL BERMS THAT ESTABLISH THE TOP OF THE DRAINAGE LETDOWN SIDE SLOPES.

DRAINAGE DETAILS

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339-351-11
CAD: 17-DRAINAGE DTLS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 17

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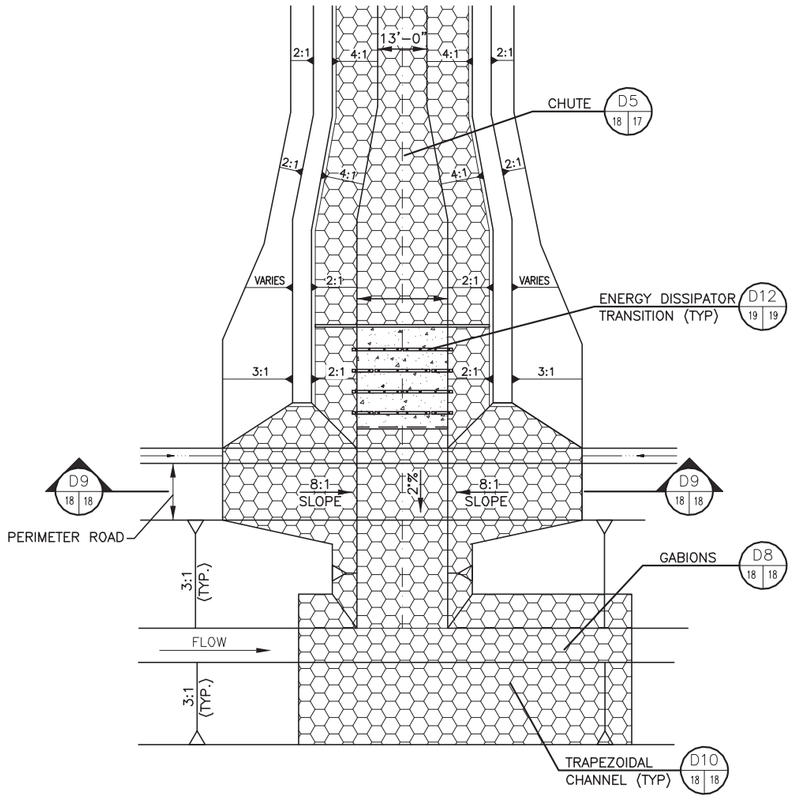
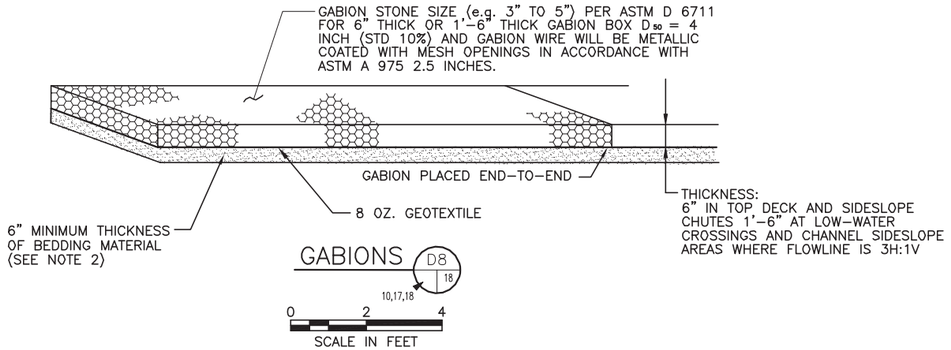


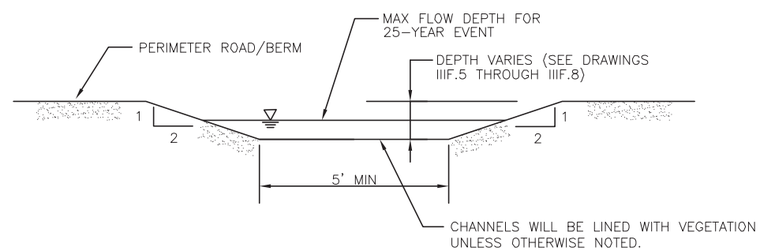
LOW-WATER CROSSING D6 18 / 10,17,18

0 20 40
SCALE IN FEET



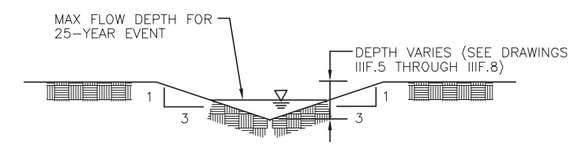
GABIONS D8 18 / 10,17,18

0 2 4
SCALE IN FEET



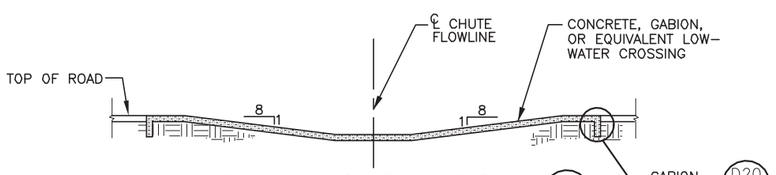
TRAPEZOIDAL CHANNEL (TYP) D10 11 / 18

0 2 4
SCALE IN FEET



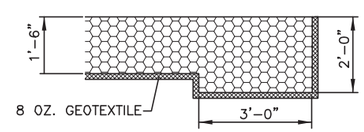
"V" CHANNEL (TYP) D11 10 / 18

0 2 4
SCALE IN FEET



LOW-WATER CROSSING SECTION D9 18 / 10,18,19

0 10 20
SCALE IN FEET



GABION KEYWAY (TYP) D20 18 / 18

0 2 4
SCALE IN FEET

NOTES:

1. REFER TO DRAWINGS 10 AND 11 FOR LOCATION OF DETAILS.
2. BEDDING MATERIAL WILL CONSIST OF CLAYEY SOILS COMPACTED TO PROVIDE A FIRM BASE THAT WILL BE OVERLAIN BY 8 oz/sy GEOTEXTILE PRIOR TO PLACEMENT OF GABIONS.

DRAINAGE DETAILS

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339-351-11
CAD: 18-DRAINAGE DTLS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 18

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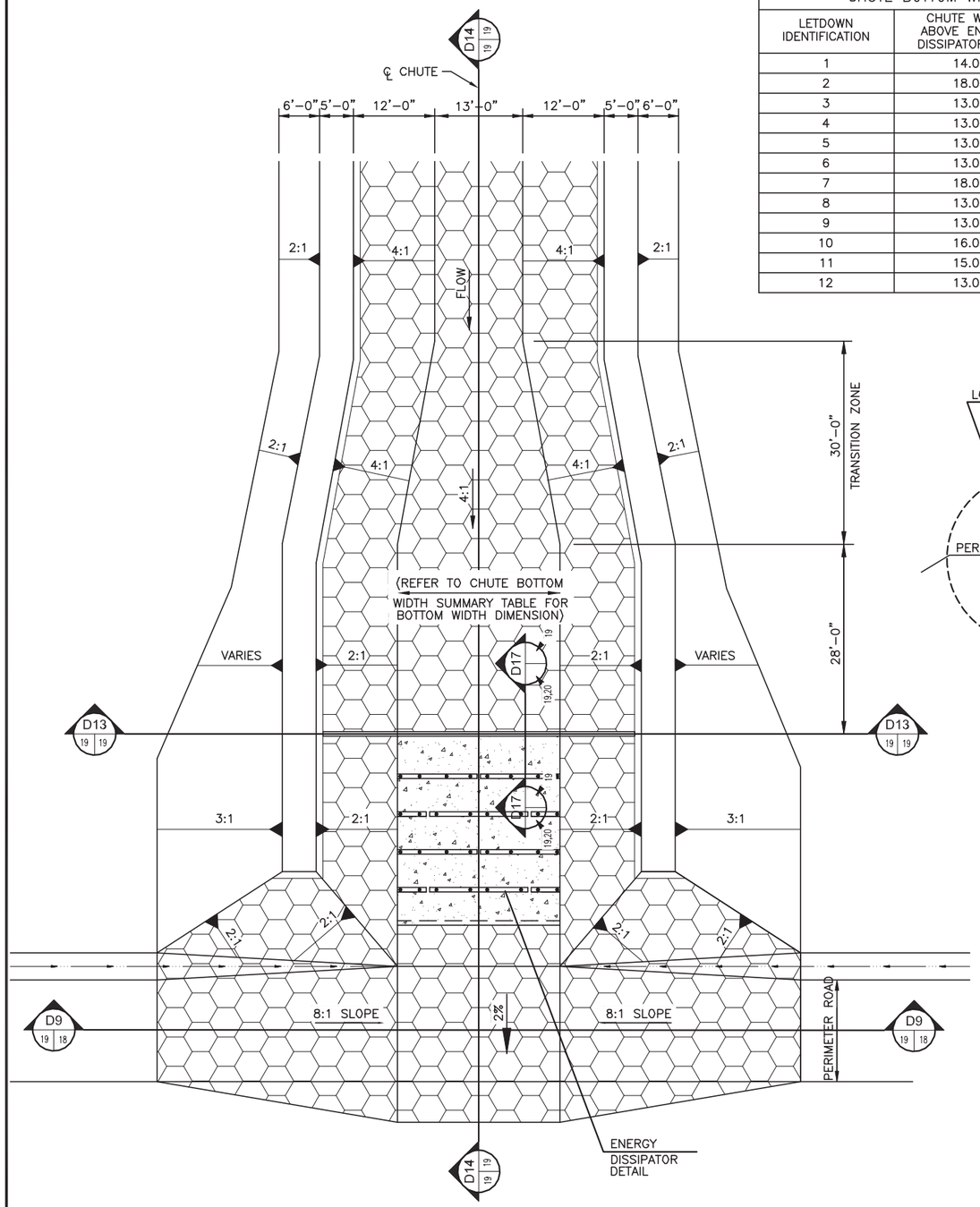
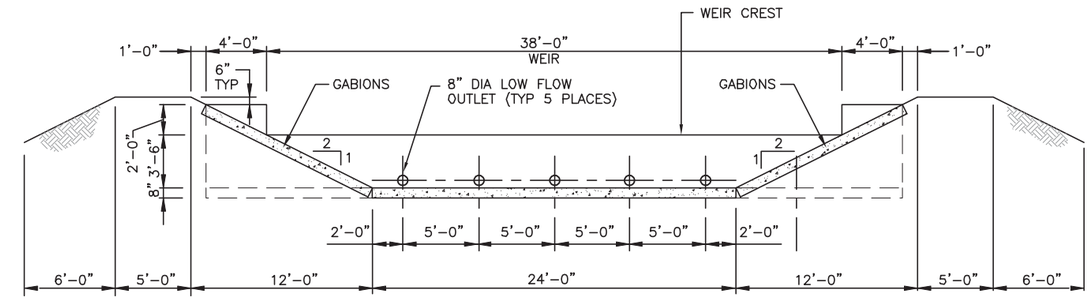
CHUTE BOTTOM WIDTH SUMMARY		
LETDOWN IDENTIFICATION	CHUTE WIDTH ABOVE ENERGY DISSIPATOR (FT)	CHUTE WIDTH ABOVE TRANSITION ZONE (FT)
1	14.0	13.0
2	18.0	13.0
3	13.0	13.0
4	13.0	13.0
5	13.0	13.0
6	13.0	13.0
7	18.0	13.0
8	13.0	13.0
9	13.0	13.0
10	16.0	13.0
11	15.0	13.0
12	13.0	13.0



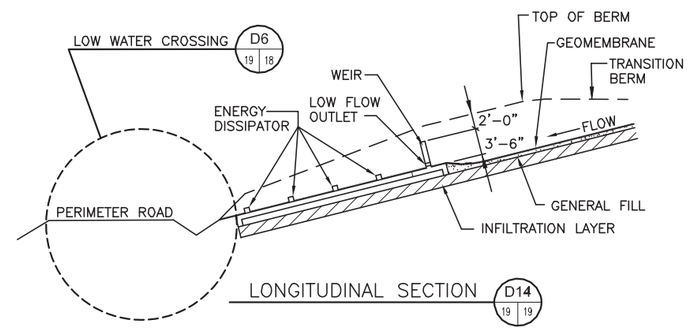
ENERGY DISSIPATOR TRANSITION (TYP) D12 19 19

0 10 20
SCALE IN FEET



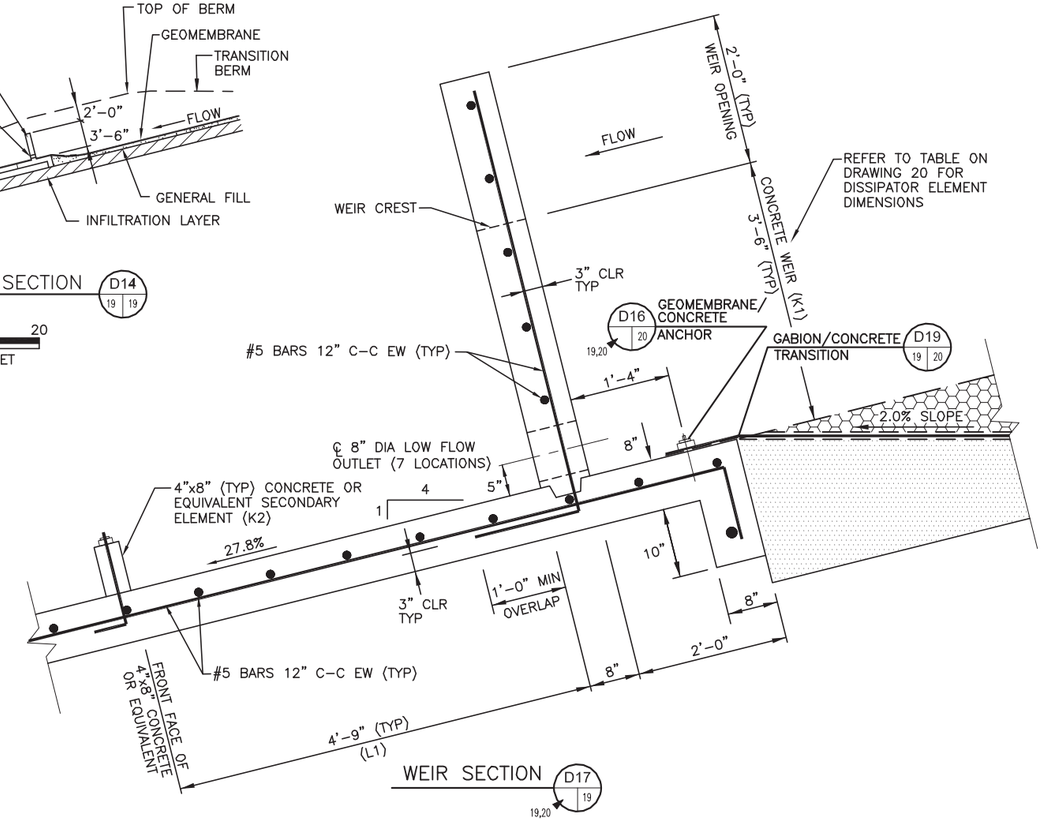
SECTION D13 19 19

0 5 10
SCALE IN FEET



LONGITUDINAL SECTION D14 19 19

0 10 20
SCALE IN FEET



WEIR SECTION D17 19 19,20

0 1 2
SCALE IN FEET

DRAINAGE DETAILS

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339-351-11
CAD: 19-DRAINAGE DTLS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 19

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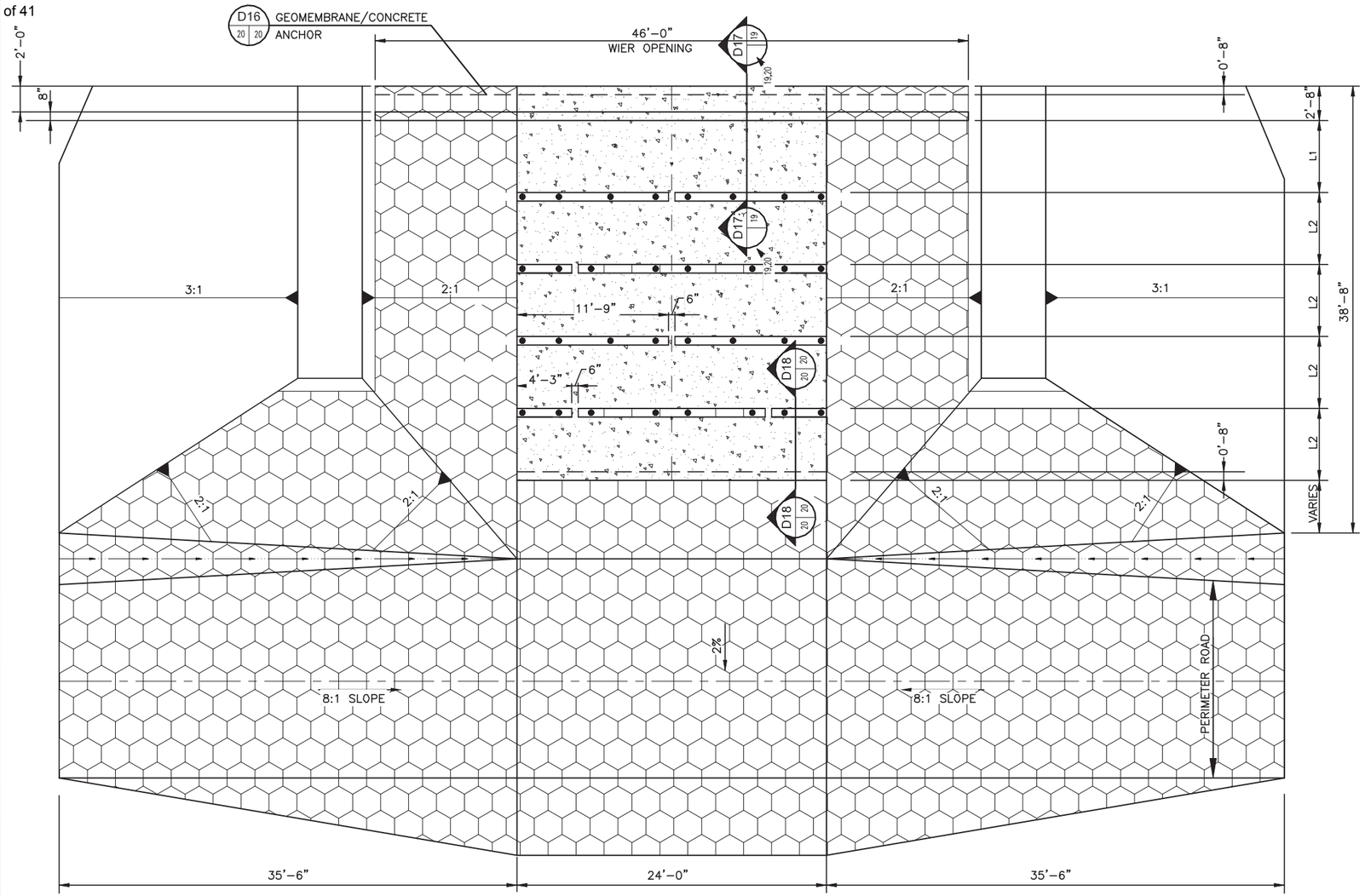
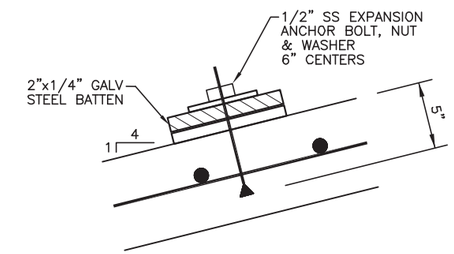
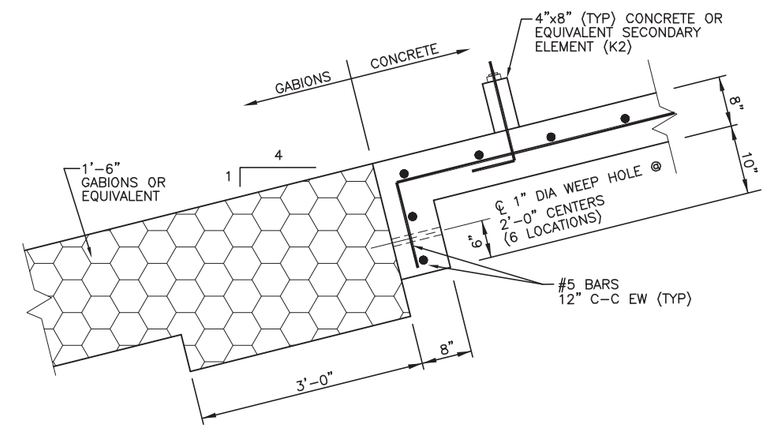


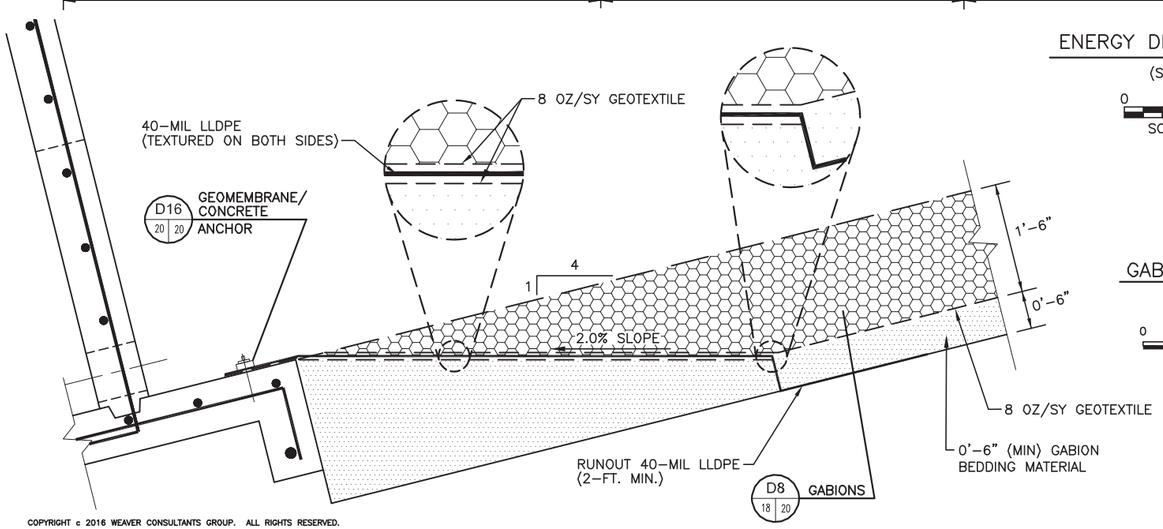
DISSIPATOR DESIGN SUMMARY				
LETDOWN IDENTIFICATION	HEIGHT OF		LENGTH BETWEEN	
	CONCRETE WEIR (K1) (FT)	SECONDARY ELEMENT (K2) (FT)	WEIR AND FIRST ELEMENT (L1) (FT)	ELEMENTS (L2) (FT)
1	3.5	0.67	2.67	6.2
2	3.5	0.67	2.67	6.2
3	3.5	0.67	2.41	4.8
4	3.5	0.67	2.96	6.1
5	3.5	0.67	2.62	6.1
6	3.5	0.67	2.91	5.6
7	3.5	0.67	2.59	6.1
8	3.5	0.67	2.86	5.7
9	3.5	0.67	2.88	6.1
10	3.5	0.67	2.60	6.2
11	3.5	0.67	2.62	6.1
12	3.5	0.67	2.76	6.0



GEOMEMBRANE/CONCRETE ANCHOR (D16 20 20) 19,20
NTS



DISSIPATOR SECTION (TYP) (D18 20 20)
0 1 2
SCALE IN FEET



ENERGY DISSIPATOR DETAIL (D15 20 20) 19,20
(SEE NOTE 1)
0 5 10
SCALE IN FEET

GABION/CONCRETE TRANSITION (D19 19 20)
0 1 2
SCALE IN FEET

DRAINAGE DETAILS

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 09/2016
FILE: 1339-351-11
CAD: 20-DRAINAGE DTLS.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 20

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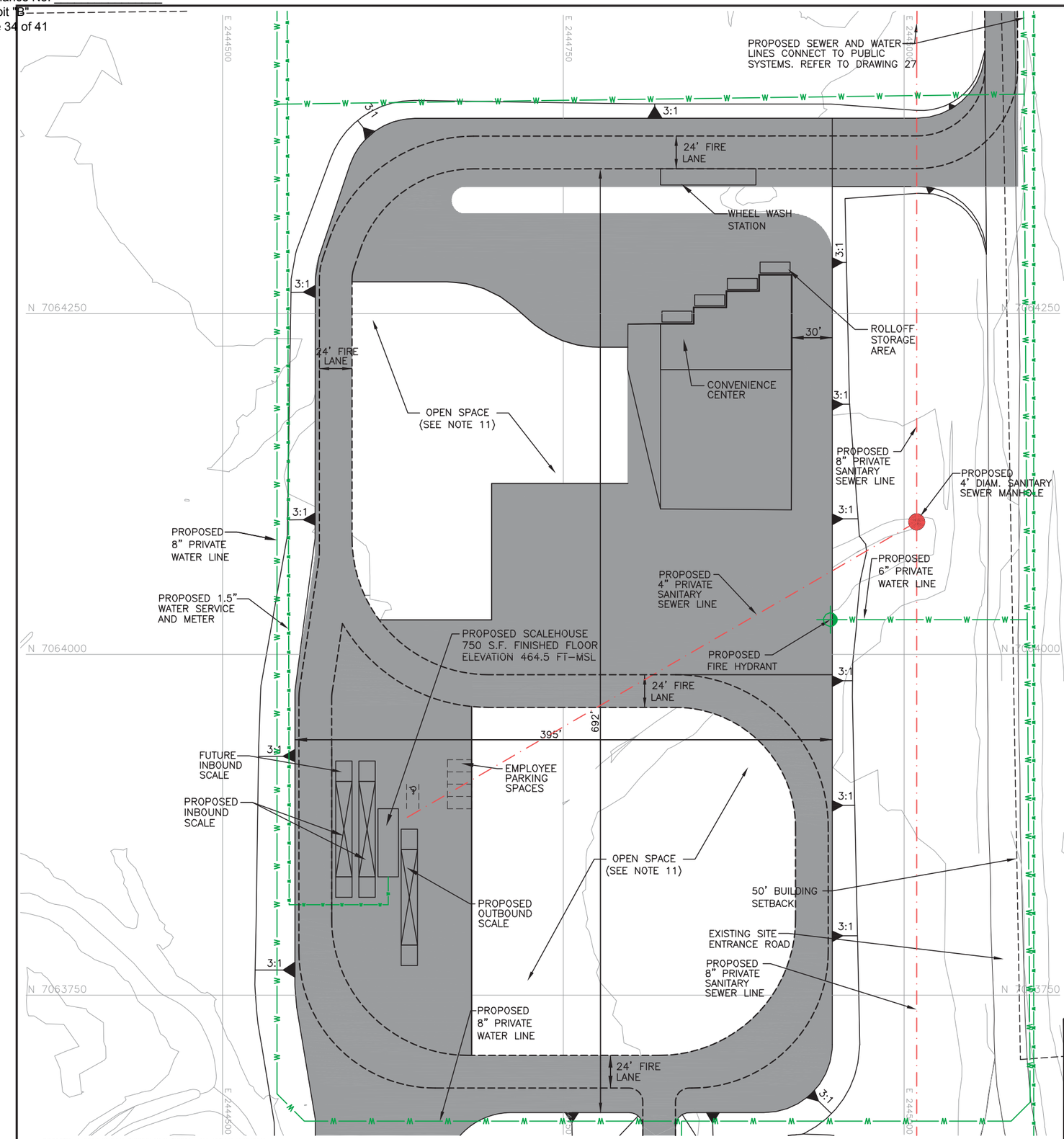

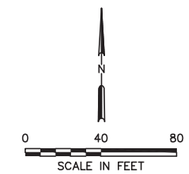

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- CELL BOUNDARY
- 430 — EXISTING CONTOUR
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- BUILDING SETBACK LINE (SEE NOTE 5)
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 2)
- W W — PROPOSED WATER LINE
- PROPOSED SANITARY SEWER LINE
- PROPOSED CONCRETE OR ASPHALT PAVEMENT
- PROPOSED FIRE LANE

PARKING TABLE
TOTAL BUILDING AREA = 750 SF @ 1 SPC/200 SF = 4 SPACES
PARKING PROVIDED = 5 SPACES
HANDICAP PARKING PROVIDED = 1 SPACE
PARKING DIMENSIONS = 9' X 18'
PARKING SURFACE = CONCRETE OR ASPHALT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. THE PROPOSED 100-YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM CLOMR CASSE NO. 11-06-3944R, APPROVED BY FEMA ON JANUARY 27, 2012.
3. BUILDING SETBACKS ARE 25-FEET OR 35-FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10-FEET ALONG THE NORTH, 50-FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
4. HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMODATE SITE OPERATIONS.
5. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
6. CONSTRUCTION OF THE PROPOSED SCALEHOUSE, SCALES, AND OFFICE/MAINTENANCE BUILDING WILL BE COMPLETED 6 MONTHS PRIOR TO THE ACCEPTANCE OF CORPORATE DRIVE BETWEEN IH-35E AND CARROLLTON PARKWAY.
7. CANOPIES MAY BE INSTALLED OVER THE CONVENIENCE CENTER UNLOADING AREAS.
8. THE WATER LINE SHALL TIE INTO A PUBLIC LINE AT CORPORATE DRIVE IF ONE IS AVAILABLE AT THE TIME OF CONSTRUCTION.
9. CONVENIENCE CENTER CONSISTS OF ROLLOFF CONTAINERS WHERE CITIZENS CAN UNLOAD WASTE AWAY FROM THE WORKING FACE.
10. A DETAILED ENGINEERING SITE PLAN WILL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
11. OPEN SPACE AREAS WILL INCORPORATE GRASSES, XERISCAPING, AND/OR DROUGHT-RESISTANT PLANTS.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

PROPOSED ENTRANCE PLAN

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 06/2016
FILE: 1339-351-11
CAD: 21-PROPOSED ENT.DWG

DRAWN BY: RDM
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 21

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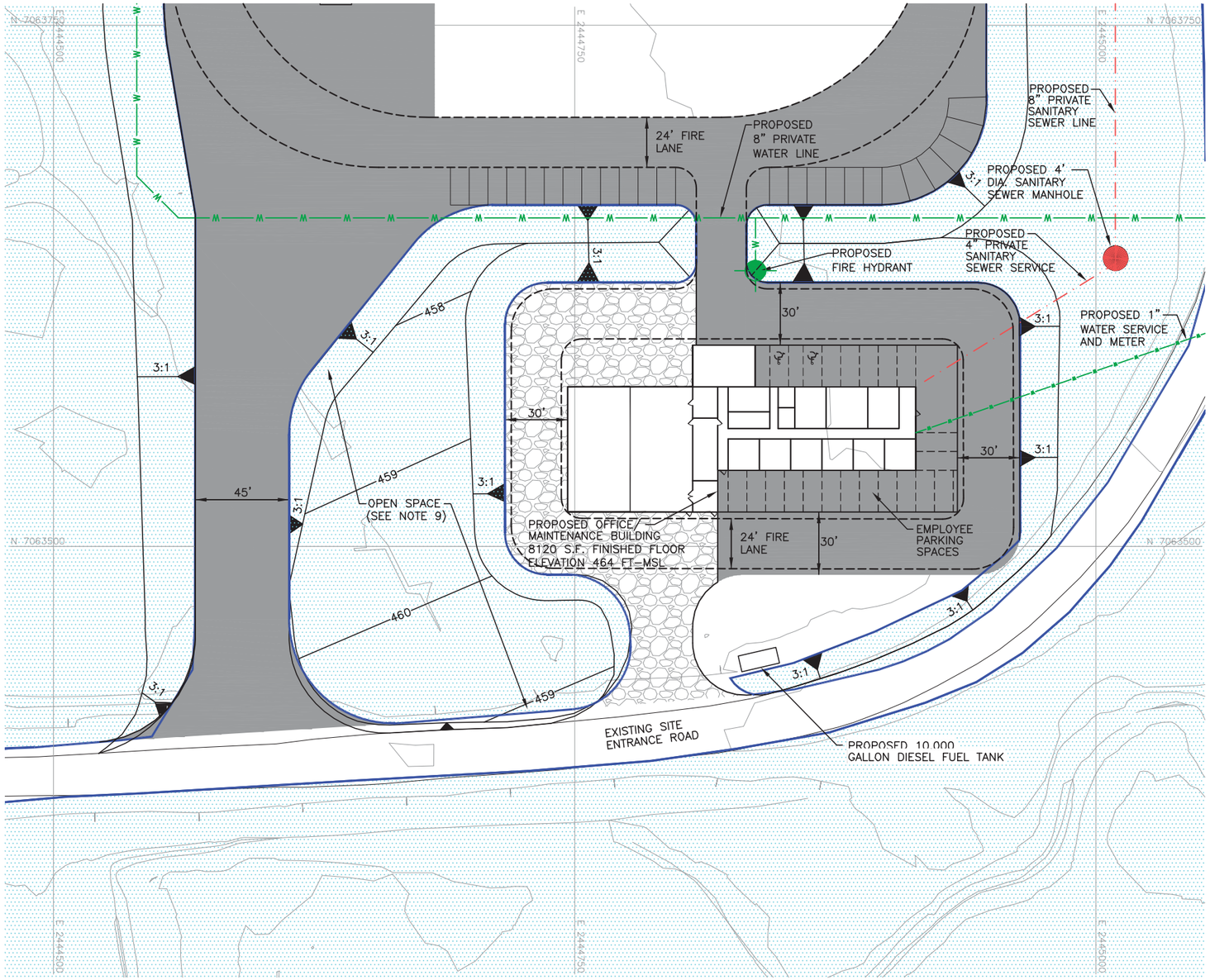

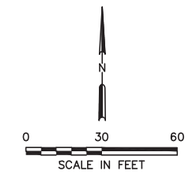

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- CELL BOUNDARY
- 430 — EXISTING CONTOUR
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- BUILDING SETBACK LINE (SEE NOTE 5)
- PROPOSED 100-YEAR FLOODPLAIN (SEE NOTE 2)
- W — W — PROPOSED WATER LINE
- PROPOSED SANITARY SEWER LINE
- PROPOSED CONCRETE OR ASPHALT PAVEMENT
- PROPOSED GRAVEL OR CRUSHED STONE PAVEMENT
- PROPOSED FIRE LANE

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. THE PROPOSED 100-YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM CLOMR CASSE NO. 11-06-3944R, APPROVED BY FEMA ON JANUARY 27, 2012.
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4. HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMODATE SITE OPERATIONS.
5. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
6. CONSTRUCTION OF THE PROPOSED SCALEHOUSE, SCALES, AND OFFICE/MAINTENANCE BUILDING WILL BE COMPLETED 6 MONTHS PRIOR TO THE ACCEPTANCE OF CORPORATE DRIVE BETWEEN IH-35E AND CARROLLTON PARKWAY.
7. THE PROPOSED OFFICE MAINTENANCE BUILDING MUST BE EQUIPPED WITH FIRE SPRINKLERS.
8. A DETAILED ENGINEERING SITE PLAN WILL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
9. OPEN SPACE AREAS WILL INCORPORATE GRASSES, XERISCAPING, AND/OR DROUGHT-RESISTANT PLANTS.
10. MAINTENANCE BUILDING ACTIVITIES INCLUDING USED OIL STORAGE, SECONDARY CONTAINMENT, ETC. SHALL COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.
b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.
c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.
d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.
e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.
f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.
g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

PARKING TABLE
TOTAL BUILDING AREA = 8120 SF @ 1 SPC/200 SF = 41 SPACES
PARKING PROVIDED = 45 SPACES
HANDICAP PARKING PROVIDED = 2 SPACES
PARKING DIMENSIONS = 9' X 18'
PARKING SURFACE = CONCRETE OR ASPHALT

PROPOSED ENTRANCE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 06/2016
FILE: 1339-351-11
CAD: 22-PROPOSED ENT.DWG

DRAWN BY: RDM
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 22

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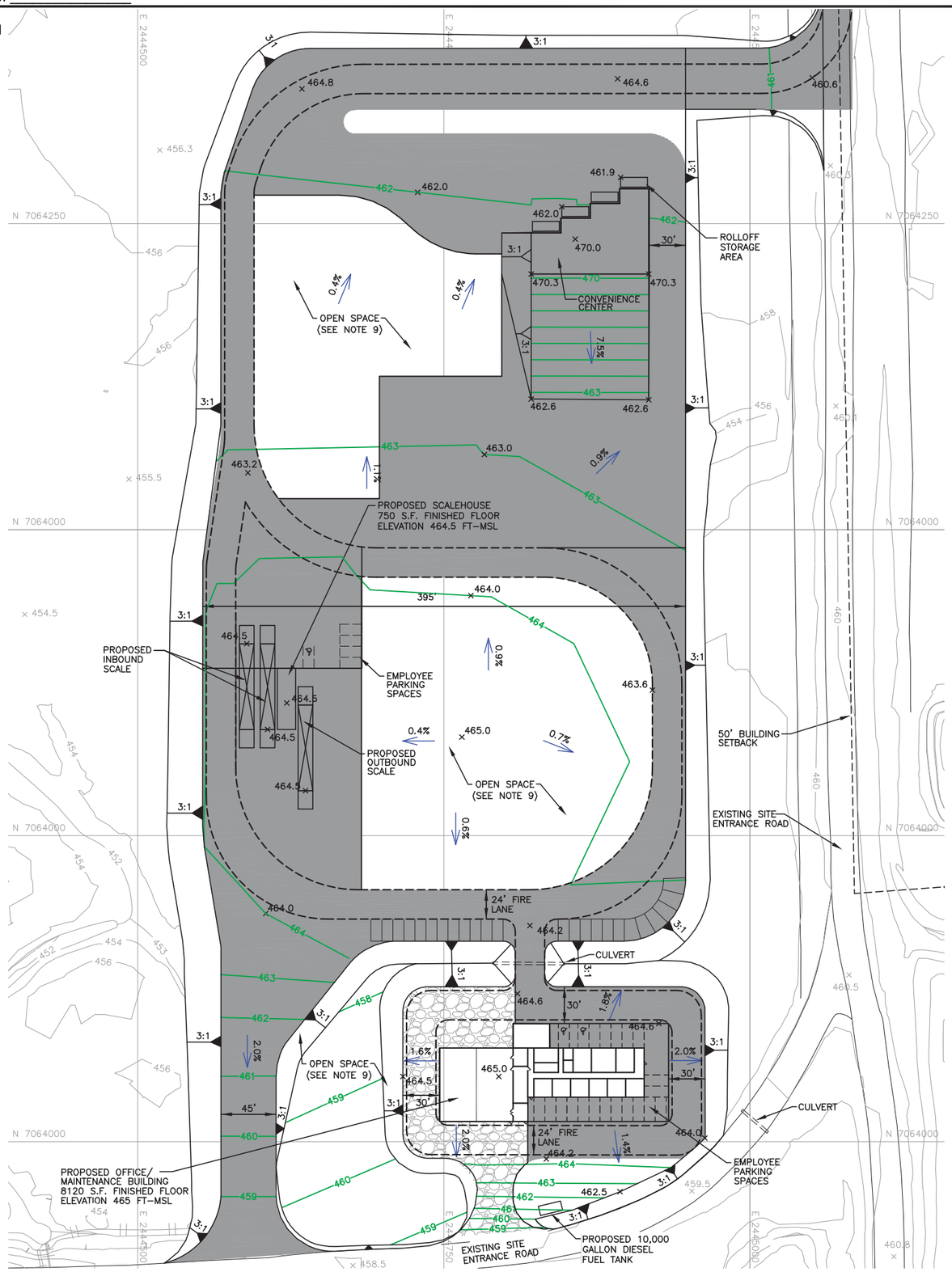

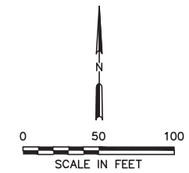

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- CELL BOUNDARY
- 430 — EXISTING CONTOUR
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- BUILDING SETBACK LINE (SEE NOTE 5)
- PROPOSED CONCRETE OR ASPHALT PAVEMENT
- PROPOSED GRAVEL OR CRUSHED STONE PAVEMENT
- PROPOSED FIRE LANE
- 460 — PROPOSED CONTOUR
- SLOPE DIRECTION

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. THE PROPOSED 100-YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM CLOMR CASSE NO. 11-06-3944R, APPROVED BY FEMA ON JANUARY 27, 2012.
3. BUILDING SETBACKS ARE 25-FEET OR 35-FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10-FEET ALONG THE NORTH, 50-FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
4. HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMODATE SITE OPERATIONS.
5. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
6. CONSTRUCTION OF THE PROPOSED SCALEHOUSE, SCALES, AND OFFICE/MAINTENANCE BUILDING WILL BE COMPLETED 6 MONTHS PRIOR TO THE ACCEPTANCE OF CORPORATE DRIVE BETWEEN IH-35E AND CARROLLTON PARKWAY.
7. THE PROPOSED OFFICE MAINTENANCE BUILDING MUST BE EQUIPPED WITH FIRE SPRINKLERS.
8. A DETAILED ENGINEERING SITE PLAN WILL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
9. OPEN SPACE AREAS WILL INCORPORATE GRASSES, XERISCAPING, AND/OR DROUGHT-RESISTANT PLANTS.
10. MAINTENANCE BUILDING ACTIVITIES INCLUDING USED OIL STORAGE, SECONDARY CONTAINMENT, ETC. SHALL COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS.

SITE BENCHMARK INFORMATION

MONUMENT	NORTHING	EASTING	ELEVATION (FT-MSL)
1	7062483.83	2445210.12	455.46

BENCHMARK WAS ESTABLISHED ON AUGUST 13, 2004.
ELEVATION IS BASED ON NAVD 88.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.
b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.
c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.
d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.
e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.
f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.
g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

PROPOSED ENTRANCE GRADING AND PAVING PLAN

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 06/2016
FILE: 1339-351-11
CAD: 22A-GRADING PLAN.DWG

DRAWN BY: RDM
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

ENTRANCE GRADING PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 22A

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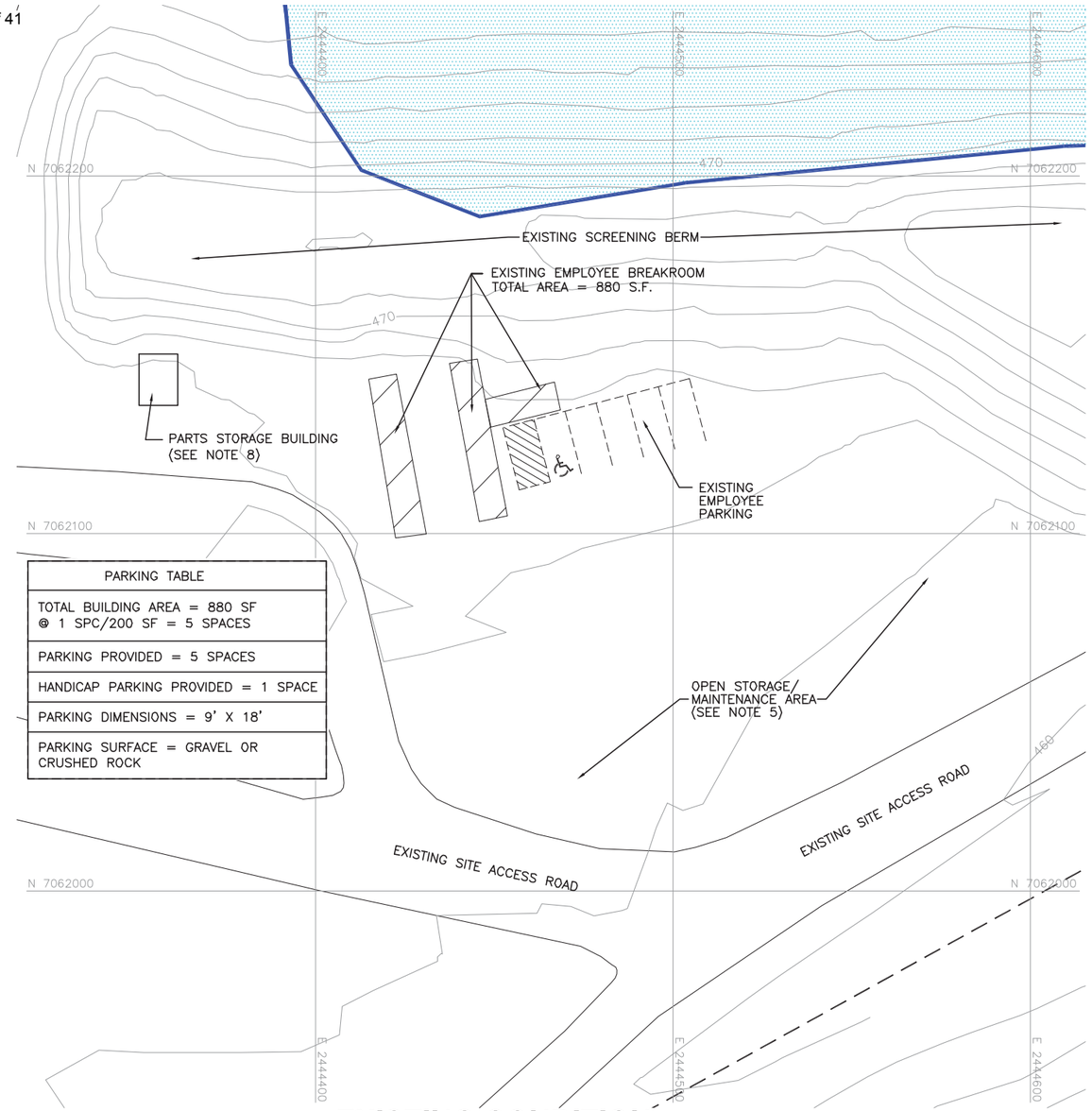
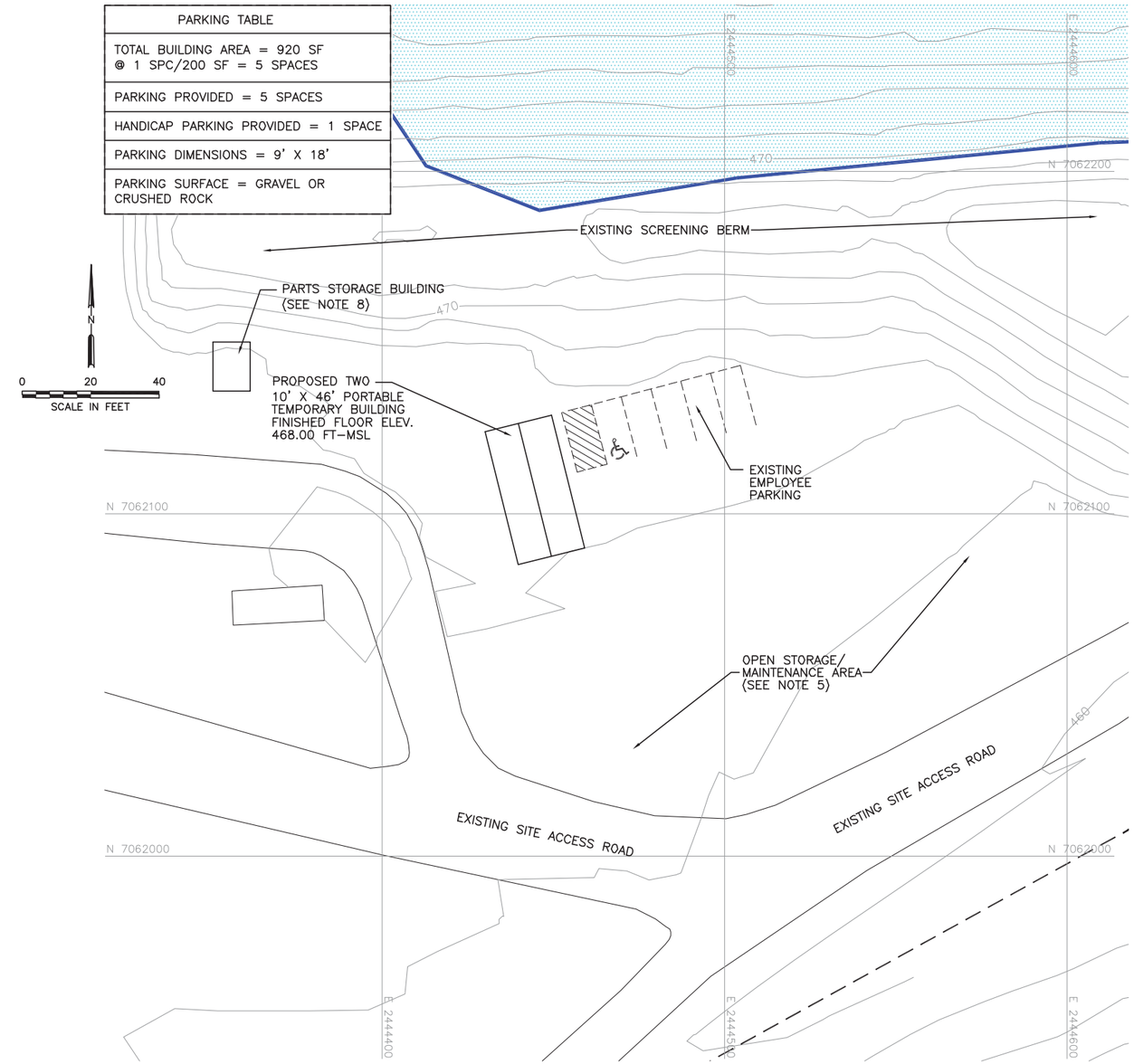


PARKING TABLE
TOTAL BUILDING AREA = 880 SF @ 1 SPC/200 SF = 5 SPACES
PARKING PROVIDED = 5 SPACES
HANDICAP PARKING PROVIDED = 1 SPACE
PARKING DIMENSIONS = 9' X 18'
PARKING SURFACE = GRAVEL OR CRUSHED ROCK

EXISTING CONDITION



PARKING TABLE
TOTAL BUILDING AREA = 920 SF @ 1 SPC/200 SF = 5 SPACES
PARKING PROVIDED = 5 SPACES
HANDICAP PARKING PROVIDED = 1 SPACE
PARKING DIMENSIONS = 9' X 18'
PARKING SURFACE = GRAVEL OR CRUSHED ROCK

PROPOSED CONDITION

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. THE EFFECTIVE 100-YEAR FLOODPLAIN IS REPRODUCED FROM FEMA FIRM NUMBER 48121C0565G, EFFECTIVE DATE APRIL 18, 2011.
3. THE UNDEVELOPED FOOTPRINT WILL CONTINUE TO BE DEVELOPED UNDER TEXAS COMMISSION ON ENVIRONMENTAL QUALITY MUNICIPAL SOLID WASTE PERMIT NUMBER 1312B.
4. ROADS WILL BE UNPAVED EXCEPT AS SHOWN ON DRAWING 21 AND 22. ADDITIONALLY, HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMMODATE THE SITE OPERATIONS.
5. THE MAINTENANCE AREA MAY BE RELOCATED WITHIN THE SITE TO ACCOMODATE SITE OPERATIONS UNTIL COSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.
6. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
7. NO DOMESTIC WATER IS SUPPLIED TO THE TEMPORARY BREAK ROOM.
8. ONE ADDITIONAL PORTABLE STORAGE BUILDING MAY BE USED FOR PARTS STORAGE AS SHOWN ON THIS DRAWING.
9. TEMPORARY MAINTENANCE, EMPLOYEE BREAKROOM AND PARTS STORAGE BUILDINGS WILL BE REMOVED AFTER CONSTRUCTION OF THE PERMANENT OFFICE/MAINTENANCE BUILDING IS COMPLETE.

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VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

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b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.
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g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

LEGEND:

- 430 — EXISTING CONTOUR
- LIMITS OF WASTE
- N 7062000 — STATE PLANE COORDINATE SYSTEM
- EFFECTIVE 100-YEAR FLOODPLAIN (SEE NOTE 2)
- EXISTING LANDFILL ACCESS ROAD

MAINTENANCE AND TEMPORARY EMPLOYEE BREAK ROOM PLAN

- [ ] 90% REVIEW
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION

DATE: 04/2016
FILE: 1339-351-11
CAD: 23-TEMPORARY BUILDING.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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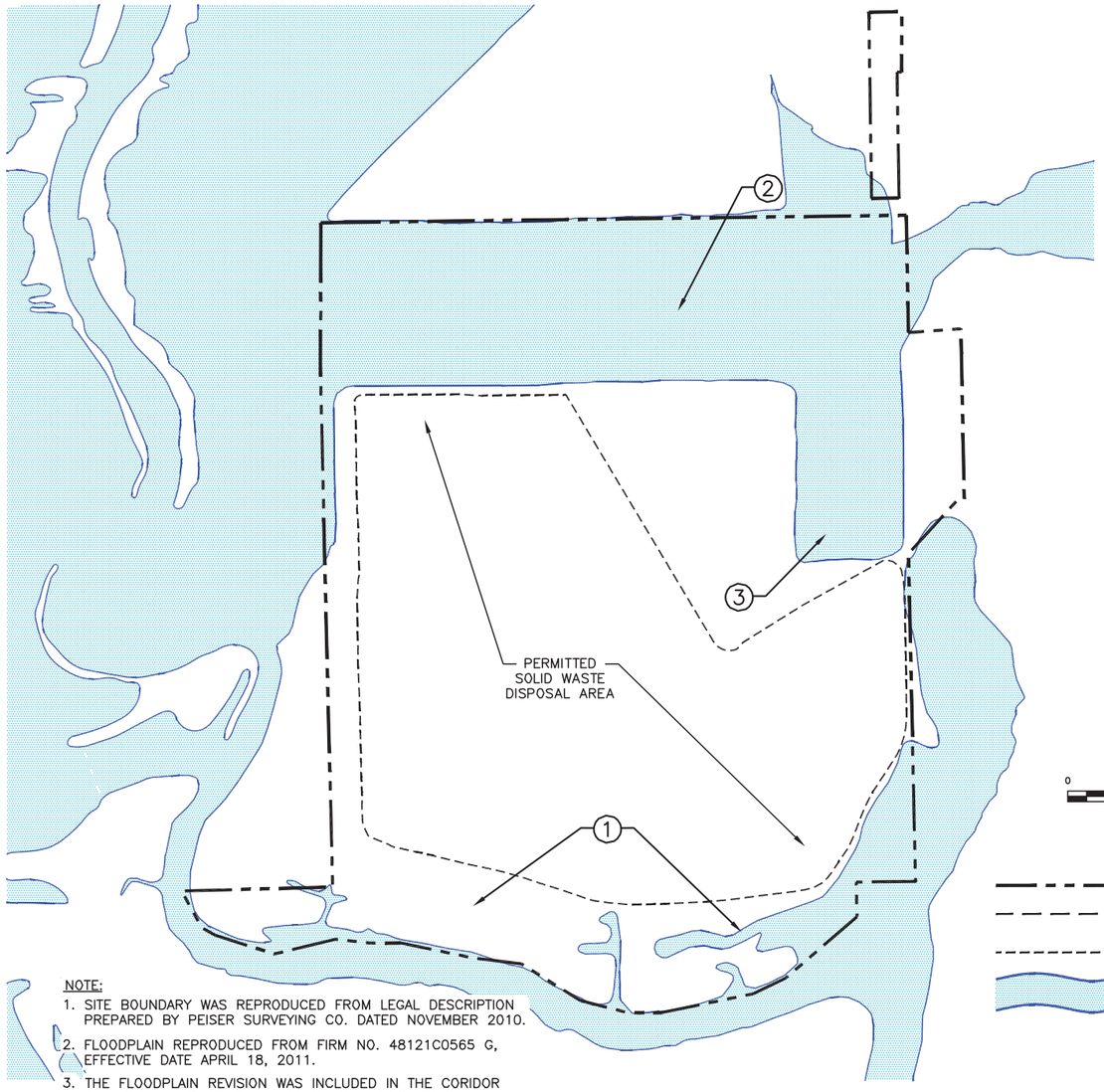
DRAWING 23

DUPLICATE EFFECTIVE CLOMR CONDITION

(SEE NOTE 2)



NOTE:

1. SITE BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PEISER SURVEYING CO. DATED NOVEMBER 2010.
2. FLOODPLAIN REPRODUCED FROM FIRM NO. 48121C0565 G, EFFECTIVE DATE APRIL 18, 2011.
3. THE FLOODPLAIN REVISION WAS INCLUDED IN THE CORIDOR DEVELOPMENT CERTIFICATE APPLICATION APPROVED ON FEBRUARY 27, 2012, TRACKING CODE LEW063011-1.

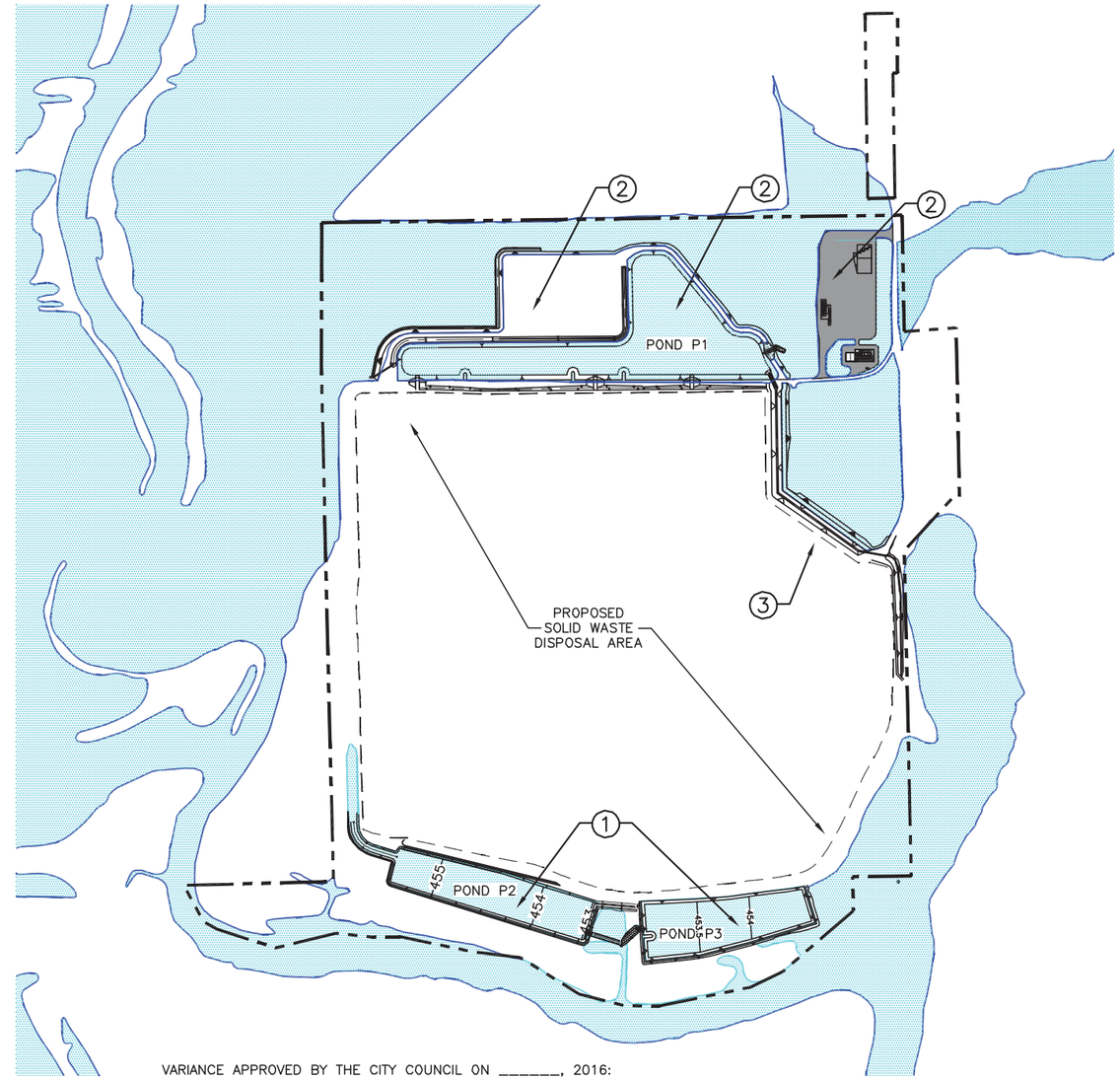
N

0 500 1000
SCALE IN FEET

LEGEND

- SITE BOUNDARY
- POST-DEVELOPMENT LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- 100-YEAR FLOODPLAIN

APPROVED POST-DEVELOPMENT CLOMR CONDITION



VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

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CHANGES FROM DUPLICATE EFFECTIVE TO POST-DEVELOPMENT

(1) ADDITION OF DETENTION PONDS THE SOUTHWEST POND (POND P2) WAS CONSTRUCTED AS AUTHORIZED BY THE CLOMR APPLICATION (CASE NO. 02-06-1950R APPROVED BY FEMA ON NOVEMBER 18, 2002-REFER TO APPENDIX F FOR ADDITIONAL INFORMATION). THE SOUTHEAST POND (POND P3) WILL FUNCTION SIMILAR TO THE PREVIOUSLY-PERMITTED SOUTHWEST POND.

(2) NORTHERN AREA DEVELOPMENT. TO ALLOW FOR THE DEVELOPMENT OF FACILITIES TO SUPPORT THE OPERATION OF THE LANDFILL, THIS PROJECT INCLUDES THE REMOVAL OF TWO AREAS FROM THE FLOODPLAIN IN THE NORTHERN PORTION OF THE SITE. THESE TWO AREAS WILL BE USED FOR (1) OFFICES AND MAINTENANCE FACILITIES, INCLUDING ACCESS ROADS AND (2) A 16-ACRE AREA THAT WILL BE USED TO SUPPORT OPERATIONS, SUCH AS EQUIPMENT STORAGE, A CITIZEN CONVENIENCE CENTER, ENTRANCE FACILITIES, ACCESS ROADS, AND/OR A WOOD WASTE PROCESSING AREA.

(3) REMOVAL OF NORTHEAST AREA FROM FLOODPLAIN TO ALLOW FOR THE CONTINUED DEVELOPMENT OF THE LANDFILL. THIS AREA IS PROPOSED TO BE REMOVED FROM THE INEFFECTIVE FLOW AREA OF THE 100-YEAR FLOODPLAIN.

FLOODPLAIN COMPARISON MAP

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 05/2016
FILE: 1339-351-11
CAD: 24-FLOODPLAIN COMPARISON.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JAE

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 24

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VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD–SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

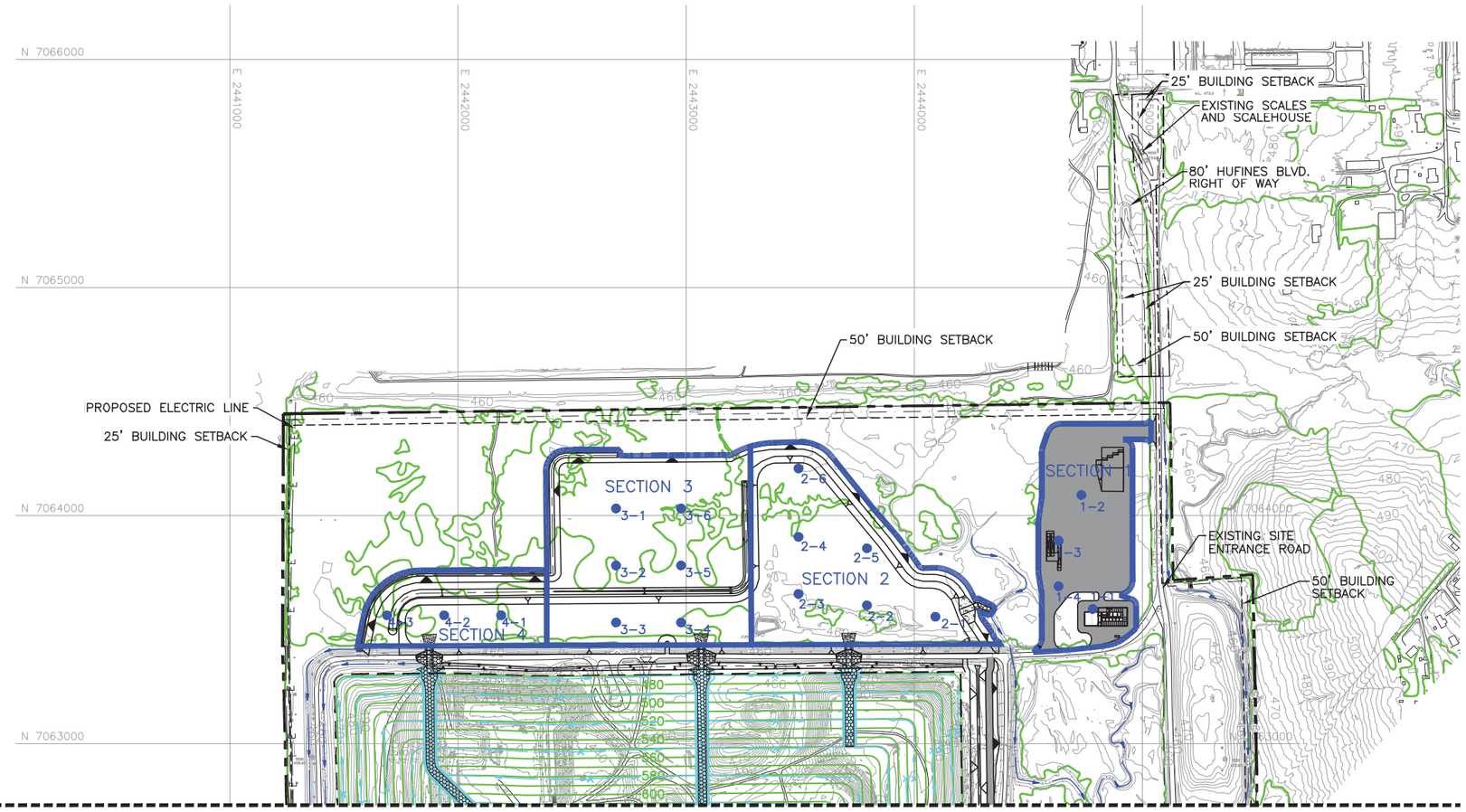
g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

N

0 300 600
SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- PROPERTY BOUNDARY
- 430 EXISTING CONTOUR
- LIMIT OF WASTE
- N 7063000 STATE PLANE COORDINATE SYSTEM
- 600 FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- E E ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 2)
- EXISTING TREES/ VEGETATED AREAS
- TREE SURVEY SECTION BOUNDARY
- 2–1 PLOT DESIGNATION



MATCH LINE- SEE DRAWING 26

TREE SURVEY INFORMATION:

THE TREE SURVEY WAS SPLIT INTO SIX SECTIONS AS SHOWN ON DRAWINGS 25 AND 26. FOR SECTIONS 1 THROUGH 5, A SERIES OF ONE–TENTH ACRE PLOTS WERE ESTABLISHED TO TAKE REPRESENTATIVE SAMPLES OF THE NUMBER, SIZE, AND SPECIES OF PROTECTED TREES IN EACH SECTION. THE PLOTS WERE AVERAGED AND MULTIPLIED BY THE ACREAGE OF THAT SECTION TO CALCULATE THE NUMBER OF PROTECTED TREES IN EACH SECTION. ALL PROTECTED TREES IN SECTION 6 WERE IDENTIFIED.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.
2. BUILDING SETBACKS ARE 25–FEET OR 35–FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10–FEET ALONG THE NORTH, 50–FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
3. ALL PROTECTED TREES SHOWN ON THIS PLAN WILL REMAIN UNDISTURBED UNTIL CONSTRUCTION BEGINS IN EACH AREA. A TREE MITIGATION PLAN WILL BE SUBMITTED TO THE CITY OF LEWISVILLE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
4. TREE SURVEY DATA COLLECTED IN MARCH 2016 BY URBAN RUNWALL, INC. A LICENSED ARBORIST CONSULTING FIRM.
5. ALLOWANCE OF HUFFINES ESCROW AND TREE MITIGATION BY SETTLEMENT AGREEMENT, AS AMENDED ON _____.

Tree Survey Data Section 1 - 7.6 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 1-1	39	0	0	0
Plot 1-2	2	1	0	0
Plot 1-3	14	1	0	0
Plot 1-4	24	4	0	0
Total	79	6	0	0
1/10 Acre Average	19.75	1.5	0	0
Average Per Acre	197.5	15	0	0
Total Protected Trees in Section 1	**1,501**	**114**	**0**	**0**

TOTAL TREE REMOVAL COST: $864,500

[1] ALL PROTECTED TREES LISTED IN SECTION 1 ARE CEDAR ELM.

[2] ACREAGE FOR SECTION 1 DOES NOT INCLUDE THE AREAS WITHIN THE BUILDING PADS OR FIRELANE.

Tree Survey Data Section 2 - 14.3 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 2-1	36	0	0	0
Plot 2-2	24	2	0	0
Plot 2-3	14	5	0	0
Plot 2-4	13	2	0	0
Plot 2-5	2	0	0	0
Plot 2-6	1	0	0	0
Total	90	9	0	0
1/10 Acre Average	15	1.5	0	0
Average Per Acre	150	15	0	0
Total Protected Trees in Section 2	**2,145**	**215**	**0**	**0**

TOTAL TREE REMOVAL COST: $1,287,500

[1] ALL PROTECTED TREES LISTED IN SECTION 2 ARE CEDAR ELM.

Tree Survey Data Section 3 - 17.3 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 3-1	2	0	0	0
Plot 3-2	1	1	0	0
Plot 3-3	2	0	0	0
Plot 3-4	6	1	0	0
Plot 3-5	4	0	0	0
Plot 3-6	21	0	0	0
Total	36	2	0	0
1/10 Acre Average	6	0.3	0	0
Average Per Acre	60	3	0	0
Total Protected Trees in Section 3	**1,038**	**52**	**0**	**0**

TOTAL TREE REMOVAL COST: $571,000

[1] ALL PROTECTED TREES LISTED IN SECTION 3 ARE CEDAR ELM.

Tree Survey Data Section 4 - 5.9 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 4-1	2	0	0	0
Plot 4-2	4	0	0	0
Plot 4-3	0	0	0	0
Total	6	0	0	0
1/10 Acre Average	2	0	0	0
Average Per Acre	20	0	0	0
Total Protected Trees in Section 4	**118**	**0**	**0**	**0**

TOTAL TREE REMOVAL COST: $59,000

[1] ALL PROTECTED TREES LISTED IN SECTION 4 ARE CEDAR ELM.

LANDSCAPE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

PREPARED FOR
CITY OF FARMERS BRANCH

DATE: 05/2016
FILE: 1339–351–11
CAD: 25–LANDSCAPE PLAN.DWG

DRAWN BY: CCJ
DESIGN BY: CRM
REVIEWED BY: JAE

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 25

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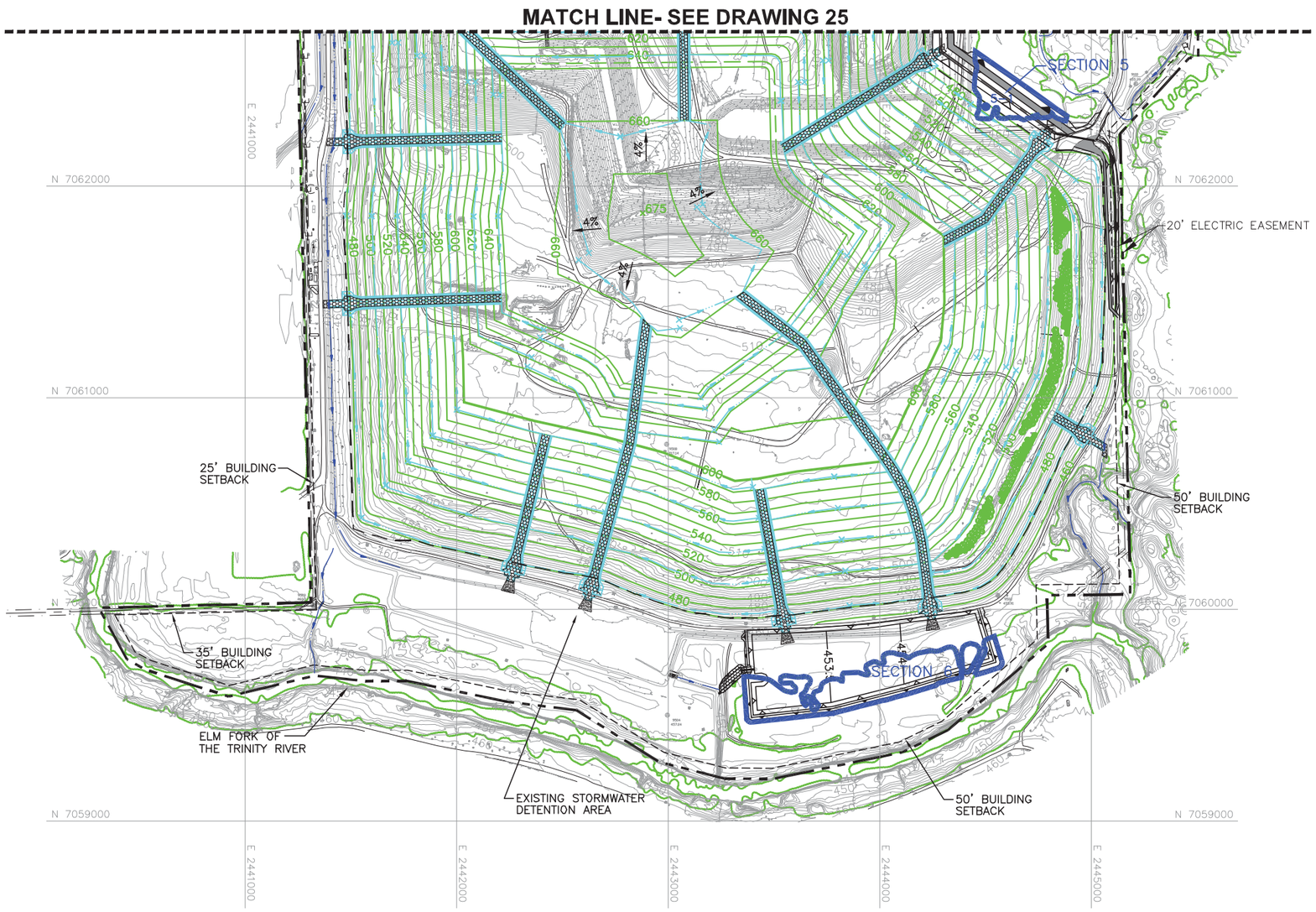

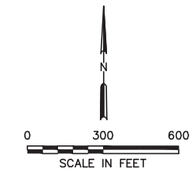

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- PROPERTY BOUNDARY
- 430 — EXISTING CONTOUR
- LIMIT OF WASTE
- N 7063000 — STATE PLANE COORDINATE SYSTEM
- 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- E — E — ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 2)
- EXISTING TREES/ VEGETATED AREAS
- TREE SURVEY SECTION BOUNDARY
- 2–1 — PLOT DESIGNATION

TREE SURVEY INFORMATION:

THE TREE SURVEY WAS SPLIT INTO SIX SECTIONS AS SHOWN ON DRAWINGS 25 AND 26. FOR SECTIONS 1 THROUGH 5, A SERIES OF ONE–TENTH ACRE PLOTS WERE ESTABLISHED TO TAKE REPRESENTATIVE SAMPLES OF THE NUMBER, SIZE, AND SPECIES OF PROTECTED TREES IN EACH SECTION. THE PLOTS WERE AVERAGED AND MULTIPLIED BY THE ACREAGE OF THAT SECTION TO CALCULATE THE NUMBER OF PROTECTED TREES IN EACH SECTION. ALL PROTECTED TREES IN SECTION 6 WERE IDENTIFIED.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.
2. BUILDING SETBACKS ARE 25–FEET OR 35–FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10–FEET ALONG THE NORTH, 50–FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
3. ALL PROTECTED TREES SHOWN ON THIS PLAN WILL REMAIN UNDISTURBED UNTIL CONSTRUCTION BEGINS IN EACH AREA. A TREE MITIGATION PLAN WILL BE SUBMITTED TO THE CITY OF LEWISVILLE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
4. TREE SURVEY DATA COLLECTED IN MARCH 2016 BY URBAN RUNWALL, INC. A LICENSED ARBORIST CONSULTING FIRM.
5. ALLOWANCE OF HUFFINES ESCROW AND TREE MITIGATION BY SETTLEMENT AGREEMENT, AS AMENDED ON _____.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.
b. TO ALLOW METAL OR WOOD–SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.
c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.
d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.
e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.
f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.
g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

Tree Survey Data Section 5 - 1.6 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 5-1	2	5	0	0
1/10 Acre Average	2	5	0	0
Average Per Acre	20	50	0	0
Total Protected Trees in Section 5	**32**	**80**	**0**	**0**

TOTAL TREE REMOVAL COST: $96,000

[1] ALL PROTECTED TREES LISTED IN SECTION 5 ARE CEDAR ELM.

Tree Survey Data Section 6 - 4.4 Acres

Tree Number	Species	Caliper (in.)	Condition
1	Pecan	35	--
2	Cedar Elm	22	Broken Top
3	Cedar Elm	24	Broken Top
4	Cedar Elm	23	Broken Top
5	Cedar Elm	23.5	Broken Top
6	Cedar Elm	5	--
7	Cedar Elm	5.5	--
8	Cedar Elm	6	--
9	Cedar Elm	5	--
10	Cedar Elm	7	--
11	Cedar Elm	5.5	--
12	Cedar Elm	5.5	--
13	Cedar Elm	29	Broken Top

TOTAL TREE REMOVAL COST: $13,500

LANDSCAPE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 08/2016
FILE: 1339–351–11
CAD: 26–LANDSCAPE PLAN.DWG

DRAWN BY: CCJ
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 26

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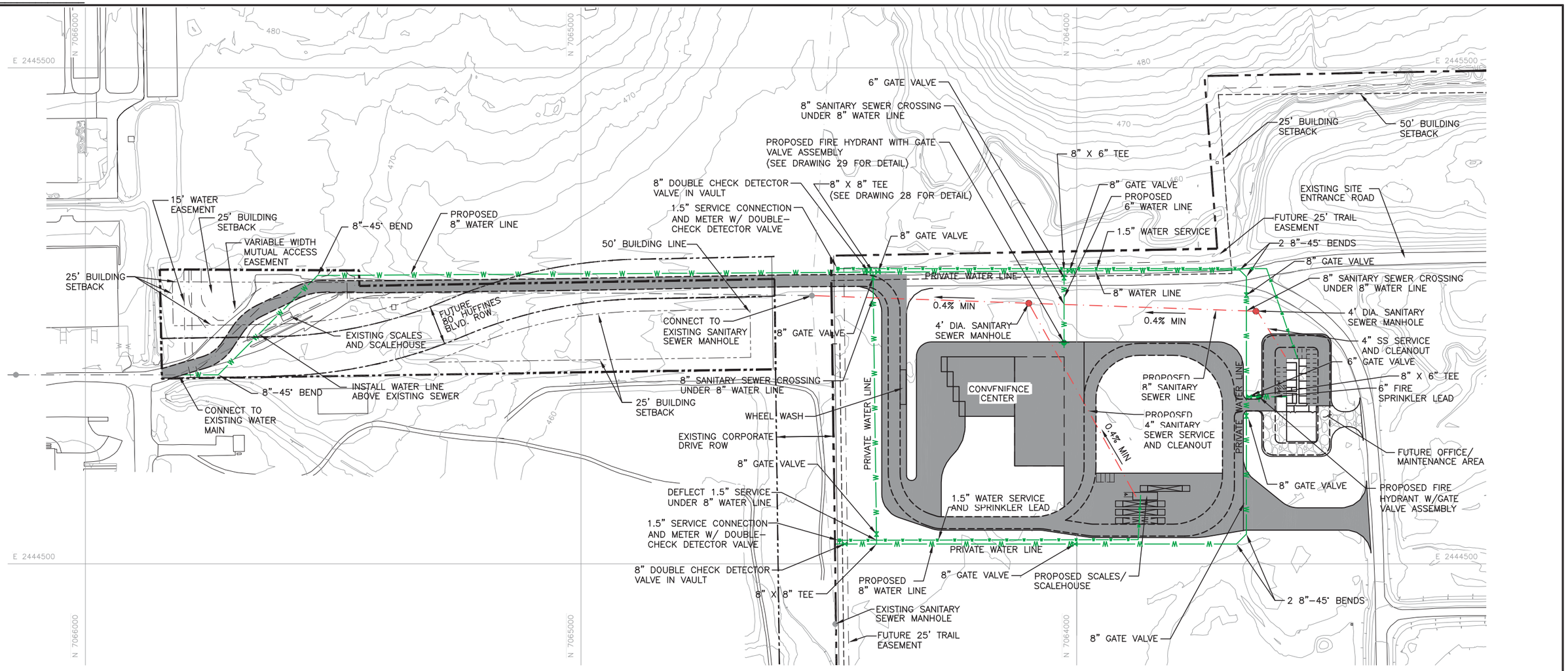

0 100 200
SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- RIGHT OF WAY
- 430 EXISTING CONTOUR
- N 7062000 STATE PLANE COORDINATE SYSTEM
- BUILDING SETBACK LINE (SEE NOTE 5)
- EASEMENT
- W W PROPOSED WATER LINE
- PROPOSED WATER SERVICE
- PROPOSED SANITARY SEWER LINE AND MANHOLE
- PROPOSED CONCRETE OR ASPHALT PAVEMENT
- PROPOSED GRAVEL OR CRUSHED STONE PAVEMENT
- PROPOSED FIRE LANE

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD-SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2-14-2015.
2. BUILDING SETBACKS ARE 25-FEET OR 35-FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10-FEET ALONG THE NORTH, 50-FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
3. HAUL ROADS MAY BE RELOCATED WITHIN THE SITE AS NEEDED TO ACCOMODATE SITE OPERATIONS.
4. STORMWATER RUN-ON AND RUN-OFF WILL BE HANDLED CONSISTENT WITH TCEQ REGULATIONS AND MSW PERMIT NUMBER 1312B.
5. CONSTRUCTION OF THE PROPOSED SCALEHOUSE, SCALES, AND OFFICE/MAINTENANCE BUILDING WILL BE COMPLETED 6 MONTHS PRIOR TO THE ACCEPTANCE OF CORPORATE DRIVE BETWEEN IH-35E AND CARROLLTON PARKWAY.
6. CANOPIES MAY BE INSTALLED OVER THE CONVENIENCE CENTER UNLOADING AREAS.
7. THE WATER LINE SHALL TIE INTO A PUBLIC LINE AT CORPORATE DRIVE IF ONE IS AVAILABLE AT THE TIME OF CONSTRUCTION.
8. CONVENIENCE CENTER CONSISTS OF ROLLOFF CONTAINERS WHERE CITIZENS CAN UNLOAD WASTE AWAY FROM THE WORKING FACE.
9. A DETAILED ENGINEERING SITE PLAN OF THE SCALEHOUSE, OFFICE/MAINTENANCE BUILDING, AND UTILITIES WILL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
10. FIRE DEPARTMENT CONNECTIONS FOR BUILDINGS SHALL BE INSTALLED WITHIN 100' OF THE NEAREST FIRE HYDRANT.
11. MAINTENANCE BUILDING ACTIVITIES INCLUDING USED OIL STORAGE, SECONDARY CONTAINMENT, ETC. SHALL COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS.

UTILITY PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 07/2016
FILE: 1339-351-11
CAD: 27-PROPOSED WATER SEWER.DWG

DRAWN BY: RDM
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F-3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3 & 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT - LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 27

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MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of an Ordinance Granting a Zone Change Request From Light Industrial District (LI) to Warehouse District (WH); on 17.007 Acres Legally Described as Lots 1A, 1B, 1C and 2, Kealy Park Addition; Located on the East Side of North Mill Street Approximately 550 Feet South of Valley Ridge Boulevard, at 902 North Mill Street; as Requested by Robert Schneeberg of Gonzalez & Schneeberg, Engineers & Surveyors, Inc. on Behalf of Chris Holmes, Builders FirstSource, the Property Owner (Case No. PZ-2016-09-25).**

BACKGROUND

The 17.007-acre property is located on the east side of North Mill Street, between the DCTA rail line and Prairie Creek. Although the site has a North Mill Street address, the only part of the site that fronts North Mill Street is the driveway. Other lots and businesses have actual frontage along North Mill Street. The existing site is divided into four lots. Three of the four lots are developed and contain parking, buildings, lumber sheds and outside storage. The construction boom of the past several years has led to an increase in the demand of lumber for this business. The applicant is proposing to expand the current facility to incorporate the remaining lot to accommodate the increase in demand.

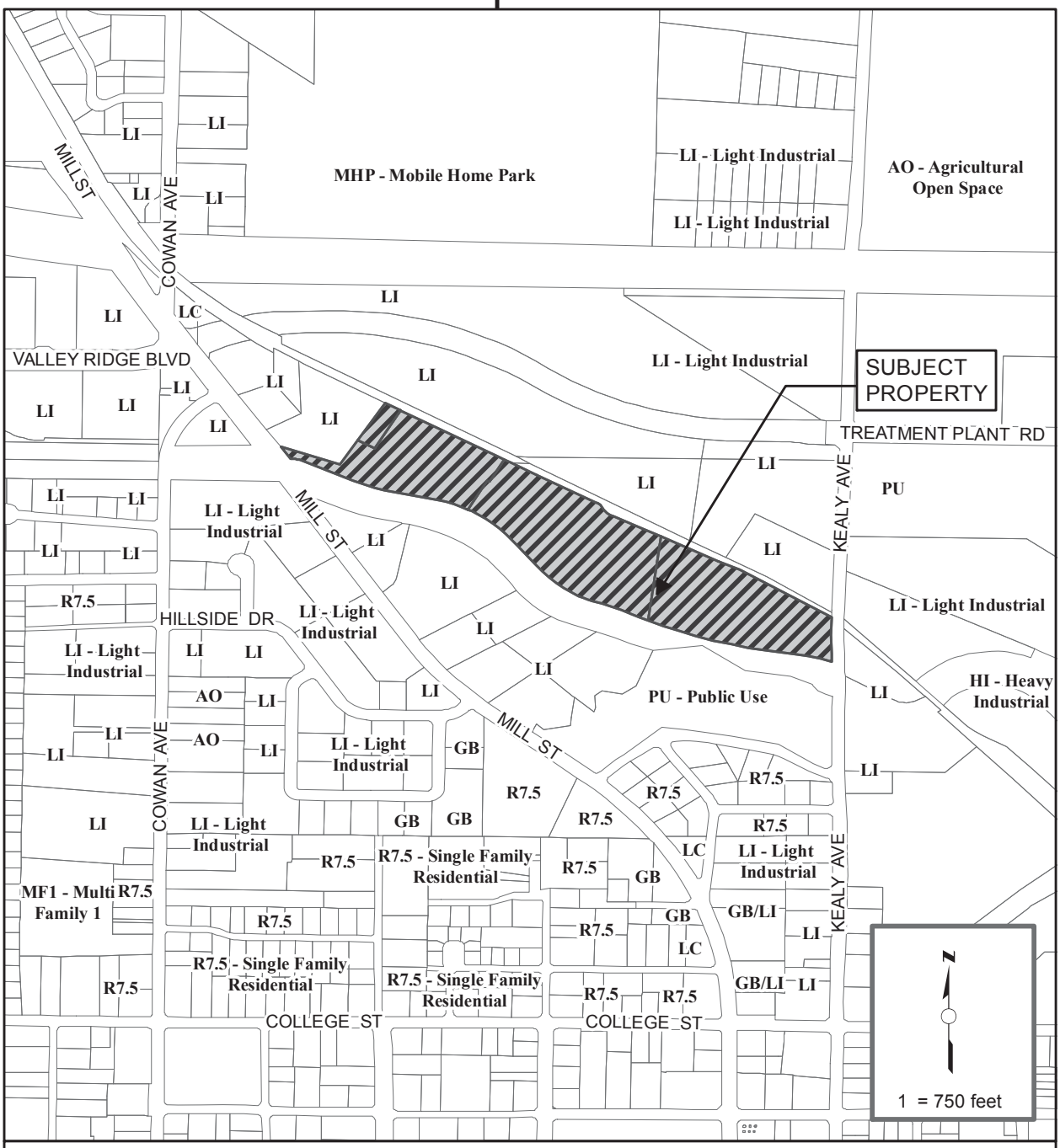
ANALYSIS

The proposed zoning classification of Warehouse District (WH) is in keeping with the use of the property as a wholesale lumber yard. The location of the facility is surrounded by light industrial zoning. The facility receives and delivers lumber for the construction industry. The facility location at this site is ideal in that it has access not only to I-35E and SH 121, but also to the adjacent rail line since the business receives delivery of lumber by rail as well. Staff has been working with the applicant on a Special Use Permit submittal that is a companion item to the zone change request. If the zoning and SUP are approved, the next step in the process is the submittal of the engineering site plan. Staff is in favor of the proposed zone change request and expansion. The expansion will include a new driveway on North Kealy Avenue which will provide improved access to the site. The soon to be completed Valley Ridge Boulevard extension will also provide improved access to the site from SH 121 and I-35E. The Planning and Zoning Commission recommended unanimous approval (5-0) of the zone change request at their meeting of September 20, 2016.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed ordinance as set forth in the caption above.

Location Map - 902 N. Mill St



ZONING CASE NO.PZ-2016-09-25

PROPERTY OWNER: BUILDERS FIRSTSOURCE

APPLICANT: ROBERT SCHNEEBERG, GONZALEZ & SCHNEEBERG, ENGINEERS & SURVEYORS, INC.

PROPERTY LOCATION: 902 NORTH MILL STREET (17.007-ACRES)

CURRENT ZONING: LIGHT INDUSTRIAL (LI)

REQUESTED ZONING: WAREHOUSE (WH)

Aerial Map - 902 N. Mill St

MINUTES
PLANNING AND ZONING COMMISSION
SEPTEMBER 20, 2016

Item 4:

Public Hearing – Zoning and Special Use Permits were the next item on the agenda. There were three items for consideration:

B. **Public Hearing:** Consideration of a Zone Change Request From Light Industrial District (LI) to Warehouse District (WH), on 17.007 Acres Legally Described as Kealy Park Addition, Lots 1A, 1B, 1C and 2, Further Identified as 902 North Mill Street, as Requested by Robert Schneeberg of Gonzalez & Schneeberg, Engineers & Surveyors, Inc. on Behalf of Chris Holmes, Builders FirstSource, the Property Owner. (Case No. PZ-2016-09-25).

Items 4B and 4C were presented and discussed together; however, separate public hearings were held and the items were voted on separately. Staff gave an overview of the proposed zone change request as well as the current uses of the site. The public hearing was then opened by Chairman Davis. There being no public comment, the public hearing was then closed. *A motion was made by MaryEllen Miksa to recommend approval of the zone change request, seconded by William Meredith. The motion passed unanimously (5-0)*. Staff indicated that this item would be going before the City Council on October 17th for a second public hearing and a final decision.

SECTION 17-23. - "LI" LIGHT INDUSTRIAL DISTRICT REGULATIONS

(a) *Use*. Buildings and premises may be used for retail, wholesale, office and service uses and campus style light manufacturing and industrial uses provided there is no dust, fumes, gas, noxious odor, smoke, glare, or other atmospheric influence beyond the boundaries of the property on which such use is located, and which produces no noise exceeding in intensity at the boundary of the property the average intensity of noise of street traffic at that point, and no more than ten percent (10%) of the total lot is used for outside storage, and further provided that such use does not create fire or explosive hazards on adjacent property.

(1) Any use permitted in districts "LC" and "GB" as regulated in said districts.
(2) Apparel and other products assembled from finished textiles.
(3) Bottling works.
(4) Warehouse distribution facilities.
(5) Airport/Heliport (SUP required).
(6) Auto repair shops including body shops (SUP required).
(7) Church worship facilities.
(8) Buildings and uses owned or operated by public governmental agencies.
(9) Cemetery, mausoleum, crematorium & accessory uses (SUP required).
(10) Cosmetic manufacturer.
(11) Drugs and pharmaceutical products manufacturing.
(12) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(13) Electronic products manufacturing.
(14) Fur good manufacture, but not including tanning or dyeing (SUP required).
(15) Gas and oil drilling accessory uses (SUP required).
(16) Glass products, from previously manufactured glass.
(17) Heavy equipment – outdoor rental/sales/display/service (SUP required).
(18) Household appliance products assembly and manufacture from prefabricated parts.
(19) Industrial and manufacturing plants including the processing or assembling of parts for production of finished equipment.
(20) Musical instruments assembly and manufacture.
(21) Paint, shellac and varnish manufacture (SUP required).
(22) Plastic products manufacture, but not including the processing of raw materials.
(23) Racing facilities (SUP required).
(24) Recreational Vehicle (RV) Park. (Private) (SUP required).
(25) Self storage/mini warehouse facility (SUP required).
(26) Shooting Range (indoor or outdoor) (SUP required.).
(27) Sporting and athletic equipment manufacture.
(28) Testing and research laboratories.
(29) Auction yard (vehicle) (SUP required).
(30) Communication towers (SUP required).
(31) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(32) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, smoke, noise, vibration or similar nuisance. Open storage shall be considered an accessory use but no more than ten percent (10%) of the platted lot may be used for outside storage, including access and maneuvering areas for moving the stored items.
(33) Cemetery, columbarium, mausoleum and accessory uses (SUP required).
(34) Other uses similar to the above listed uses are allowed by special use permit (SUP) only, except that the following uses are specifically prohibited:
    a. Acetylene gas manufacture or storage.
    b. Acid manufacture.
    c. Alcohol manufacture.
    d. Ammonia, bleaching powder or chlorine manufacture.
    e. Arsenal.
    f. Asphalt manufacture or refining.
    g. Blast furnace.
    h. Bag cleaning, unless clearly accessory to the manufacture of bags.

i. Boiler works.
j. Brick, tile, pottery or terra cotta manufacture other than the manufacture of handcraft or concrete products.
k. Reserved.
l. Celluloid manufacture or treatment.
m. Cement, lime, gypsum, or plaster of paris manufacture.
n. Central mixing plant for cement.
o. Coke ovens.
p. Cotton gins.
q. Cottonseed oil manufacture.
r. Creosote manufacture or treatment.
s. Disinfectants manufacture.
t. Distillation of bones, coal or wood.
u. Dyestuff manufacture.
v. Exterminator and insect poison manufacture.
w. Emery cloth and sandpaper manufacture.
x. Explosives or fireworks manufacture or storage.
y. Fat rendering.
z. Fertilizer manufacture.
aa. Fish smoking and curing.
bb. Forge plant.
cc. Garbage, offal or dead animals reduction or dumping.
dd. Gas manufacture or storage, for heating or illuminating purposes.
ee. Glue, size or gelatine manufacture.
ff. Hatchery.
gg. Iron, steel, brass or copper foundry or fabrication plant.
hh. Junk, iron or rag storage or baling.
ii. Match manufacture.
jj. Lampblack manufacture.
kk. Oilcloth or linoleum manufacture.
ll. Oiled rubber goods manufacture.
mm. Ore reduction.
nn. Oil or turpentine manufacture.
oo. Paper and pulp manufacture.
pp. Petroleum or its products, refining or wholesale storage of.
qq. Pickle manufacturing.
rr. Planing mills.
ss. Potash works.
tt. Pyroxline manufacture.
uu. Rock crusher.
vv. Rolling mill.
ww. Rubber or gutta-percha manufacture or treatment but not the making of articles out of rubber.
xx. Sauerkraut manufacture.
yy. Salt works.
zz. Shoe polish manufacture.
aaa. Smelting of tin, copper, zinc, or iron ores.
bbb. Soap manufacture other than liquid soap.
ccc. Soda and compound manufacture.
ddd. Stock yard or slaughter of animals or fowls.
eee. Stone mill or quarry.
fff. Storage yard.
ggg. Stove polish manufacture.
hhh. Tallow grease or lard manufacture or refining from or of animal fat.
iii. Tanning, curing or storage of raw hides or skins.
jjj. Tar distillation or manufacture.
kkk. Tar roofing or water-proofing manufacture.
lll. Tobacco (chewing) manufacture or treatment.
mmm. Vinegar manufacture.

nnn. Wool pulling or scouring.
ooo. Yeast plant.

(b) *Height*. No building shall exceed in height the width of the street right-of-way on which it faces plus the depth of the front yard. In no event, however, shall the portion of a building located within one hundred fifty (150) feet of any property zoned for residential purposes exceed the height allowed in that residential zoning district.

(c) *Area*.

(1) *Size of yards*.

a. *Front yard*. There shall be a front yard having a minimum depth of twenty-five (25) feet. No parking, storage or similar use shall be allowed in required front yards in district "LI", except that automobile parking (including automobile dealer display parking) will be permitted in such yards if separated by at least twenty-five (25) feet from any residential district.

b. *Side yard*. A side yard of not less than fifteen (15) feet in width shall be provided on the side of a lot adjoining a side street. A side yard of not less than ten (10) feet in width shall be provided on the side of a lot adjoining a residential district. The required side yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the screening device when that portion of the building exterior is constructed of the same materials as the screening device. No parking, storage or similar use shall be allowed in any required side yard or in any side street yard adjoining a residential district.

c. *Rear yard.* No rear yard is required except that a rear yard of not less than fifty (50) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. No parking, storage or similar use shall be allowed in required rear yards in district "LI" within twenty-five (25) feet of the rear property line.

(2) *Reserved*.

(d) *Outside storage regulations*. In all zoning districts where outside storage yards are allowed, such storage yards shall be screened from view in accordance with the standards outlined in the city's general development ordinance. This provision applies to all outside storage which began after the original date of passage of this provision (April 4, 1994). Any variance request involving the requirements or standards relating to such required screening devices shall be considered by the city council in accordance with the city's general development ordinance. Areas which are used for infrequent and temporary storage for a period of thirty (30) days or less per year shall not be deemed as "storage yards".

SECTION 17-24. - "WH" WAREHOUSE DISTRICT REGULATIONS

(a) *Use*. A building or premises shall be used only for the following purposes:

(1) Bakery or bottling works, if fully enclosed in a building.
(2) Wholesale establishments, if fully enclosed in a building.
(3) Storage warehouses with open storage yards (SUP required).
(4) Contractor's yard (SUP required).
(5) Manufacturing uses - outside storage is limited to ten (10) percent of the lot for storage of equipment, materials or products.
(6) Truck parking lot (SUP required).
(7) Offices.
(8) Laboratory.
(9) Auto repair shops, including body shops (SUP required).
(10) Church worship facilities.
(11) Travel trailer/boat/RV storage (Outdoor) (SUP required).
(12) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(13) Gas and oil drilling accessory uses (SUP required).
(14) Cemetery, mausoleum, crematorium and accessory uses (SUP required).
(15) Buildings and uses owned or operated by public governmental agencies.
(16) Communication towers (SUP required).
(17) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(18) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, excessive light, smoke, dust, noise, vibration or similar nuisances. Open storage shall be considered an accessory use but no more than ten percent (10%) of the platted lot may be used for outside storage, including access and maneuvering areas for moving the stored items. Any use requiring more than 10% outside storage shall require a special use permit (SUP).
(19) Motor Freight Terminal (SUP required).

(b) *Height*. No building shall exceed in height the width of the street on which it faces plus the depth of the front yard. On a lot adjoining a residential district, no building shall exceed forty-five (45) feet in height, except that this height may be increased up to the maximum of twelve (12) stories, or one hundred eighty (180) feet, at the rate of two (2) feet of additional height for each one (1) foot of additional setback from required yard lines. In no event, however, shall any building exceed two (2) stories when any portion of the building is located within one hundred fifty (150) feet of any property zoned for residential purposes.

(c) *Area*.

(1) *Size of yards*.

a. *Front yard*. There shall be a front yard having a minimum depth of twenty-five (25) feet. No parking, storage or similar use shall be allowed in required front yards in district "WH", except that automobile parking (including automobile dealer display parking) will be permitted in such yards if separated by at least twenty-five (25) feet from any residential district.

b. *Side yard*. A side yard of not less than fifteen (15) feet in width shall be provided on the side of a lot adjoining a side street. A side yard of not less than ten (10) feet in width shall be provided on the side of a lot adjoining a residential district. The required side yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the screening device when that portion of the building exterior is constructed of the same materials as the screening device. No parking, storage or similar use shall be allowed in any required side yard or in any side street yard adjoining a residential district.

c. *Rear yard*. No rear yard is required except that a rear yard of not less than fifty (50) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. No parking, storage or similar use shall be allowed in required rear yards in district "WH" within twenty-five (25) feet of the rear property line.

(2) *Reserved*.

(d) *Outside storage regulations*. In all zoning districts where outside storage yards are allowed, such storage yards shall be screened from view in accordance with the standards outlined in the city's general development ordinance. This provision applies to all outside storage which began after the original date of passage of this provision (April 4, 1994). Any variance request involving the requirements or standards relating to such required screening devices shall be considered by the city council in accordance with the city's general development ordinance. Areas which are used for infrequent and temporary storage for a period of thirty (30) days or less per year shall not be deemed as storage yards.

This Section (Office Use Only)	
Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE

ZONE CHANGE APPLICATION

Owner/s (name): Chris Holmes	
Company Name: Builders FirstSource	
Mailing Address: 2230 Avenue J, Arlington, TX 76006	
Work #: 817-822-0917	**Cell #:**
E-Mail: Chris.Holmes@bldr.com	
Owner Signature:	**Date:** 6-23-2016
Printed Name: Chris Holmes	

Applicant/Agent (name): Robert W. Schneeberg	
Company Name: Gonzalez & Schneeberg, Engineers & Surveyors, Inc.	
Mailing Address: 660 North Central Expressway, Suite 250, Plano, TX 75074	
Work #: 972-516-8855	**Cell #:** 214-543-5552
E-Mail: robert.schneeberg@gs-engineers.com	
Applicant/Agent Signature Robert W. Schneeberg	**Date:** 6-23-2016
Printed Name: Robert W Schneeberg	

Current Zoning: LI- Light Industrial **Requested Zoning:** W- Warehouse **Acres:** 17.007

Legal Description (Lot/ Block/Tract/Abstract): Lots 1A, 1B, 1C and 2, Block A, Kealy Park Addition

Address/Location: 902 N. Mill Street

Application and Sign Fees:

	Less than 1/2 acre	$ 150.00
	1/2 acre up to 4.99 acres	$ 250.00
X	5 acres up to 24.99 acres	$ 400.00

	25 acres up to 49.99 acres	$ 750.00
	50 acres up to 99.99 acres	$1,000.00
	100 acres and more	$1,500.00

Qty: 2	**Zone Change Signs - $35 each.** 1 sign required for each 5 acres (max. 5 per site)	$ 70.00

Sign(s) must be posted a minimum of ten (10) days prior to the Planning & Zoning hearing date.

Amount Due (application & sign fee)	$ 470.00

LEWISVILLE

REQUIRED:

Fully describe the plans for the property

Use as a lumber yard with unlimited outside storage.

NOTE:

Items must be staff approved and deemed complete before they will be placed on an agenda.

TRACT 1
LEGAL DESCRIPTION

Description of a 17.007 acre tract of land situated in the J.W. King Survey, Abstract No. 696 and the J. Wagner Survey, Abstract No. 1399, City of Lewisville, Denton County, Texas, and being all of Lots 1A, 1B and 1C, Block A, Kealy Park Addition, an addition to the City of Lewisville according to the plat thereof recorded in Cabinet F, Slide 111, Plat Records, Denton County, Texas and the remainder of Lot 2, Block A, Kealy Park Addition, an addition to the City of Lewisville according to the plat thereof recorded in Cabinet E, Slide 57, Plat Records, Denton County, Texas following the conveyance of a 0.0386 acre tract of land to the City of Lewisville by Right-of-Way Deed recorded in Volume 5024, Page 64, Deed Records, Denton County, Texas; said 17.007 acre tract being more particularly described as follows:

BEGINNING, at a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for corner at the intersection of the south line of said Lot 2 with the west right-of-way line of Kealy Avenue (variable width public right-of-way) as created by said 0.0386 acre right-of-way take; said point being on a curve to the left having a radius of 497.25 feet; said point being also on the north line of a called 6.680 acre tract conveyed to the City of Lewisville by deed recorded in Volume 783, Page 770, Deed Records, Denton County, Texas;

THENCE, with the common line between said City of Lewisville 6.680 acre tract and said Kealy Park Additions, the following metes and bounds:

northwesterly, with said curve to the left through central angle of 15 degrees 07 minutes 55 seconds, an arc distance of 131.33 feet (chord bears North 79 degrees 35 minutes 38 seconds West, 130.94 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 87 degrees 09 minutes 35 seconds West, a distance of 83.86 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the beginning of a tangent circular curve to the right having a radius of 430.40 feet;

northwesterly, with said curve to the right, through a central angle of 16 degrees 52 minutes 55 seconds, an arc distance of 126.82 feet (chord bears North 78 degrees 43 minutes 07 seconds West, 126.36 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 70 degrees 16 minutes 40 seconds West, a distance of 694.04 feet to a 2-inch iron pipe found for the beginning of a tangent circular curve to the right having a radius of 275.00 feet;

northwesterly, with said curve to the right, through a central angle of 33 degrees 53 minutes 00 seconds, an arc distance of 162.63 feet (chord bears North 53 degrees 20 minutes 10 seconds West, 160.27 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 36 degrees 23 minutes 40 seconds West, a distance of 120.00 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the beginning of a tangent circular curve to the left having a radius of 675.00 feet;

northwesterly, with said curve to the left, through a central angle of 41 degrees 54 minutes 00 seconds, an arc distance of 493.62 feet (chord bears North 57 degrees 20 minutes 40 seconds West, 482.70 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 78 degrees 17 minutes 40 seconds West, a distance of 136.54 feet to a 1/2-inch iron rod found for the beginning of a tangent circular curve to the right having a radius of 625.00 feet;

northwesterly, with said curve to the right, through a central angle of 11 degrees 36 minutes 25 seconds, an arc distance of 126.61 feet (chord bears North 72 degrees 29 minutes 27 seconds West, 126.40 feet) to a 1/2-inch iron rod found for the end of said curve;

North 66 degrees 41 minutes 15 seconds West, a distance of 311.44 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the most westerly southwest corner of said Lot 1A; said point being also on the easterly right-of-way line North Mill Street (a 100-foot wide public right-of-way);

THENCE, North 33 degrees 23 minutes 00 seconds West, with the said easterly right-of-way line, a distance of 69.82 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the most westerly northwest corner of said Lot 1A; said point being also the southwest corner of Lot 3, Block A, Watson Properties Addition; an addition to the City of Lewisville according to the plat thereof recorded in Cabinet O, Page 3, Plat Records, Denton County, Texas;

THENCE, with the common line between said Kealy Park Addition and said Watson Properties Addition, the following metes and bounds:

South 71 degrees 03 minutes 10 seconds East, a distance of 280.36 feet to a 1/2-inch iron rod with plastic cap stamped "Arthur Surveying" found for an interior corner of said Lot 1A and the southeast corner of said Watson Properties Addition;

North 30 degrees 47 minutes 40 seconds East, a distance of 353.82 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the northerly corner of said Lot 1C and the northeast corner of said Watson Properties Addition; said point being also on the centerline of the M.K.T. Railroad;

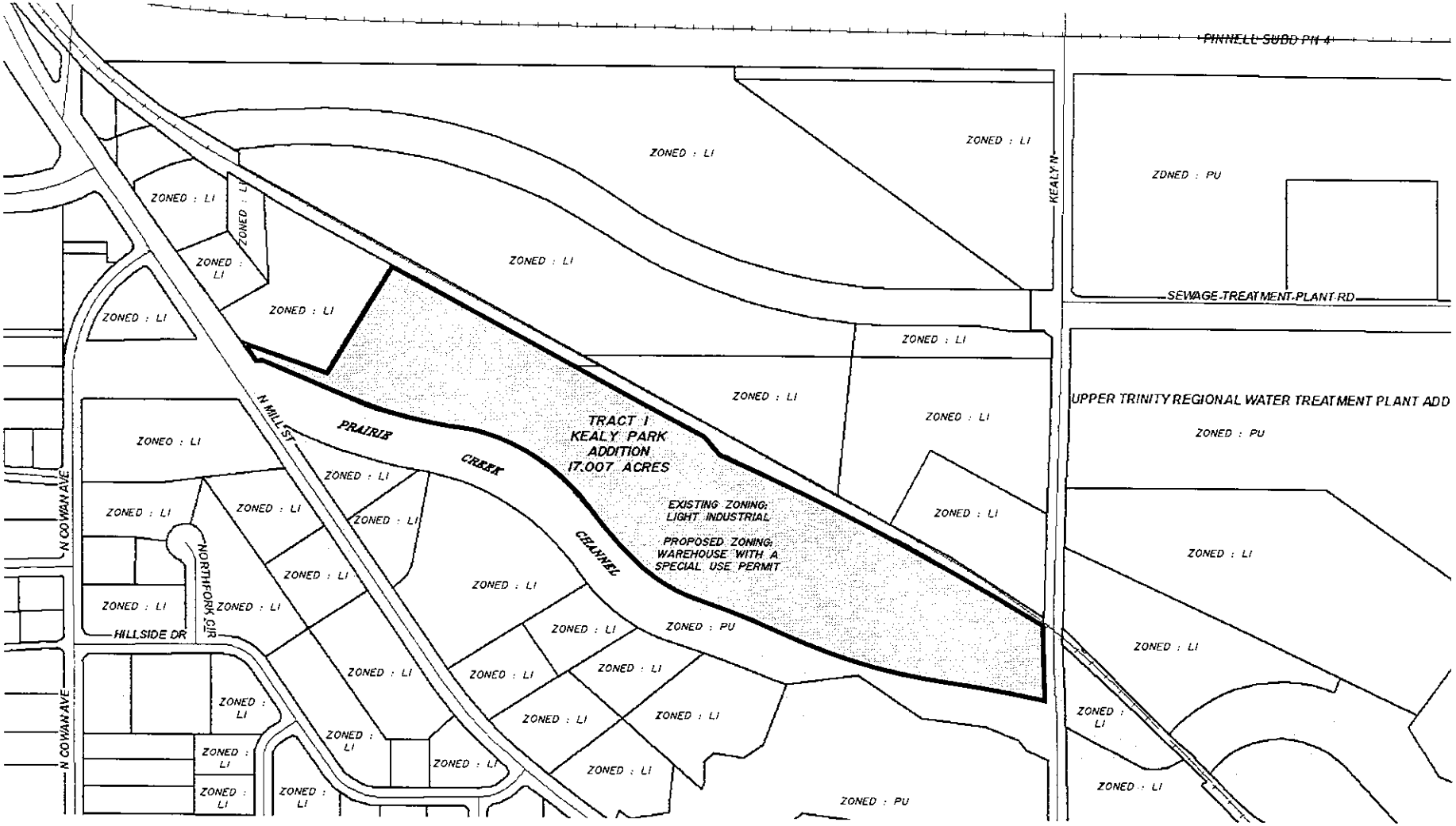
THENCE, South 60 degrees 48 minutes 10 seconds East, with the centerline of the M.K.T. Railroad, a distance of 1,641.68 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the beginning of a tangent circular curve to the right having a radius of 2,162.36 feet;

THENCE, southeasterly, with said curve to the right, through a central angle of 09 degrees 21 minutes 13 seconds, an arc distance of 353.00 feet (chord bears South 56 degrees 07 minutes 34 seconds East, 352.61 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for corner at the intersection of said centerline with the extended west right-of-way line of Kealy Avenue;

THENCE, South 00 degrees 37 minutes 58 seconds East, with said west right-of-way line, at a distance of 36.75 feet, past the northwest corner of said 0.0386 acre tract, continuing with said west right-of-way line, in all, a distance of 119.43 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for an angle point of said west right-of-way line;

THENCE, South 00 degrees 46 minutes 47 seconds East, with said west right-of-way line, at a distance of 82.88 feet to the POINT OF BEGINNING;

CONTAINING, 740,840 square feet or 17.007 acres of land, more or less.



ZONING EXIBIT
FOR
17.007 ACRES
OUT OF THE
J. W. KING SURVEY, ABSTARCT No. 696
AND THE
J. WAGNER SURVEY, ABSTARCT No. 1399
CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

LEGEND

ZONED : LI	LIGHT INDUSTRIAL
ZONED : PU	PUBLIC USE
ZONED : W\S.U.P.	WAREHOUSE \ SPECIAL USE PERMIT

OWNER / DEVELOPER:
BUILDER'S FIRSTSOURCE
MR. CHRIS HOLMES
2230 AVENUE J
ARLINGTON, TEXAS 76006
(817) 822-0917

PROJ. NO.: 6299-14-05-02

Gonzalez & Schneeberg 560 N. Central Expressway Suite 250, Plano, Texas 75074
engineers - surveyors (972) 516-8855 Fax:(972) 516-8901

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
GSES	GSES	JUNE 2016	NOT TO SCALE			

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL, AMENDING THE ZONING ORDINANCE BY REZONING APPROXIMATELY 17.007 ACRES LEGALLY DESCRIBED AS LOTS 1A, 1B, 1C AND 2, KEALY PARK ADDITION, LOCATED ON THE EAST SIDE OF NORTH MILL STREET APPROXIMATELY 550 FEET SOUTH OF VALLEY RIDGE BOULEVARD, AT 902 NORTH MILL STREET; FROM LIGHT INDUSTRIAL DISTRICT (LI) ZONING TO WAREHOUSE DISTRICT (WH) ZONING; CORRECTING THE OFFICIAL ZONING MAP; PRESERVING ALL OTHER PORTIONS OF THE ZONING ORDINANCE; DETERMINING THAT THE PUBLIC INTERESTS AND GENERAL WELFARE DEMAND THIS ZONING CHANGE AND AMENDMENT THEREIN MADE; PROVIDING FOR A REPEALER, SEVERABILITY, AND A PENALTY; AND DECLARING AN EMERGENCY.

WHEREAS, applications were made to amend the Official Zoning Map of Lewisville, Texas by making applications for same with the Planning and Zoning Commission of the City of Lewisville, Texas, as required by State statutes and the Zoning Ordinances of the City of Lewisville, Texas, said Planning and Zoning Commission has recommended that rezoning of the approximately 17.007-acre property described in the attached Exhibit "A" (the "Property") be **approved**, and all the legal requirements, conditions and prerequisites having been complied with, the case having come before the City Council of the City of Lewisville, Texas, after all legal notices, requirements, conditions and prerequisites having been complied with; and,

WHEREAS, the City Council of the City of Lewisville, Texas, at a public hearing called by the City Council of the City of Lewisville, Texas, did consider the following factors in making a determination as to whether this requested change should be granted or denied: effect on the congestion of the streets; the fire hazards, panics and other dangers possibly present in the securing

of safety from same; the effect on the promotion of health and the general welfare; effect on adequate light and air; the effect on the overcrowding of the land; the effect of the concentration on population; the effect on the transportation, water, sewerage, schools, parks and other public facilities; and,

WHEREAS, the City Council further considered among other things the character of the district and its peculiar suitability for particular uses and with the view to conserve the value of buildings, encourage the most appropriate use of land throughout this City; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that there is a public necessity for the zoning change, that the public interest clearly requires the amendment, that the zoning changes do not unreasonably invade the rights of adjacent property owners; and,

WHEREAS, the City Council of the City of Lewisville, Texas, does find that the change in zoning lessens the congestion in the streets; helps secure safety from fire, panic and other dangers; promotes health and the general welfare; provides adequate light and air; prevents the overcrowding of land; avoids undue concentration of population; facilitates the adequate provisions of transportation, water, sewerage, schools, parks and other public requirements; and,

WHEREAS, the City Council of the City of Lewisville, Texas, has determined that there is a necessity and need for this change in zoning and has also found and determined that there has been a change in the conditions of the property surrounding and in close proximity to the Property since it was originally classified and, therefore, feels that a change in zoning classification for the Property is needed, is called for, and is in the best interest of the public at large, the citizens of the City of Lewisville, Texas, and helps promote the general health, safety, and welfare of this community.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The Zoning Ordinance of the City of Lewisville, Texas, be, and the same is hereby amended and changed in that the zoning of the Property is hereby changed to **WAREHOUSE DISTRICT (WH) ZONING**.

SECTION 2. The City Manager, or her designee, is hereby directed to correct the official zoning map of the City of Lewisville, Texas, to reflect this change in zoning.

SECTION 3. That in all other respects the use of the tract or tracts of land hereinabove described shall be subject to all the applicable regulations contained in said City of Lewisville Zoning Ordinance and all other applicable and pertinent ordinances of the City of Lewisville, Texas.

SECTION 4. That the zoning regulations and districts as herein established have been made in accordance with the comprehensive plan for the purpose of promoting health, safety, and the general welfare of the community. They have been designed with respect to both present conditions and the conditions reasonably anticipated to exist in the foreseeable future, to lessen congestion in the streets; to secure safety from fire, panic, flood and other dangers; provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population; facilitate the adequate provisions of transportation, water, sewage, parks and other public requirements, and to make adequate provisions for the normal business, commercial needs and development of the community. They have been made with reasonable consideration, among other things of the character of the district, and its peculiar suitability for the particular uses and with a view of conserving the value of buildings and encouraging the most appropriate use of land throughout the community.

SECTION 5. This Ordinance shall be cumulative of all other ordinances of the City of Lewisville, Texas, affecting zoning and shall not repeal any of the provisions of said ordinances, except in those instances where provisions of those ordinances which are in direct conflict with the provisions of this Ordinance.

SECTION 6. That the terms and provisions of this Ordinance shall be deemed to be severable and that if the validity of the zoning affecting any portion of the Property shall be declared to be invalid, the same shall not affect the validity of the zoning of the balance of the tract or tracts of land described herein.

SECTION 7. Any person, firm or corporation who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof in the Municipal Court, shall be subject to a fine of not more than $2,000.00 for each offense, and each and every day such offense is continued shall constitute a new and separate offense.

SECTION 8. The fact that the present Zoning Ordinance and regulations of the City of Lewisville, Texas are inadequate to properly safeguard the health, safety, peace and general welfare of the inhabitants of the City of Lewisville, Texas, creates an emergency for the immediate preservation of the public business, property, health, safety and general welfare of the public which requires that this Ordinance shall become effective from and after the date of its final passage, and it is accordingly so ordained.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Exhibit A
Property Description

EXHIBIT A

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LEGAL DESCRIPTION

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BEGINNING, at a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for corner at the intersection of the south line of said Lot 2 with the west right-of-way line of Kealy Avenue (variable width public right-of-way) as created by said 0.0386 acre right-of-way take; said point being on a curve to the left having a radius of 497.25 feet; said point being also on the north line of a called 6.680 acre tract conveyed to the City of Lewisville by deed recorded in Volume 783, Page 770, Deed Records, Denton County, Texas;

THENCE, with the common line between said City of Lewisville 6.680 acre tract and said Kealy Park Additions, the following metes and bounds:

northwesterly, with said curve to the left through central angle of 15 degrees 07 minutes 55 seconds, an arc distance of 131.33 feet (chord bears North 79 degrees 35 minutes 38 seconds West, 130.94 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

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THENCE, North 33 degrees 23 minutes 00 seconds West, with the said easterly right-of-way line, a distance of 69.82 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the most westerly northwest corner of said Lot 1A; said point being also the southwest corner of Lot 3, Block A, Watson Properties Addition; an addition to the City of Lewisville according to the plat thereof recorded in Cabinet O, Page 3, Plat Records, Denton County, Texas;

THENCE, with the common line between said Kealy Park Addition and said Watson Properties Addition, the following metes and bounds:

South 71 degrees 03 minutes 10 seconds East, a distance of 280.36 feet to a 1/2-inch iron rod with plastic cap stamped "Arthur Surveying" found for an interior corner of said Lot 1A and the southeast corner of said Watson Properties Addition;

North 30 degrees 47 minutes 40 seconds East, a distance of 353.82 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the northerly corner of said Lot 1C and the northeast corner of said Watson Properties Addition; said point being also on the centerline of the M.K.T. Railroad;

THENCE, South 60 degrees 48 minutes 10 seconds East, with the centerline of the M.K.T. Railroad, a distance of 1,641.68 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the beginning of a tangent circular curve to the right having a radius of 2,162.36 feet;

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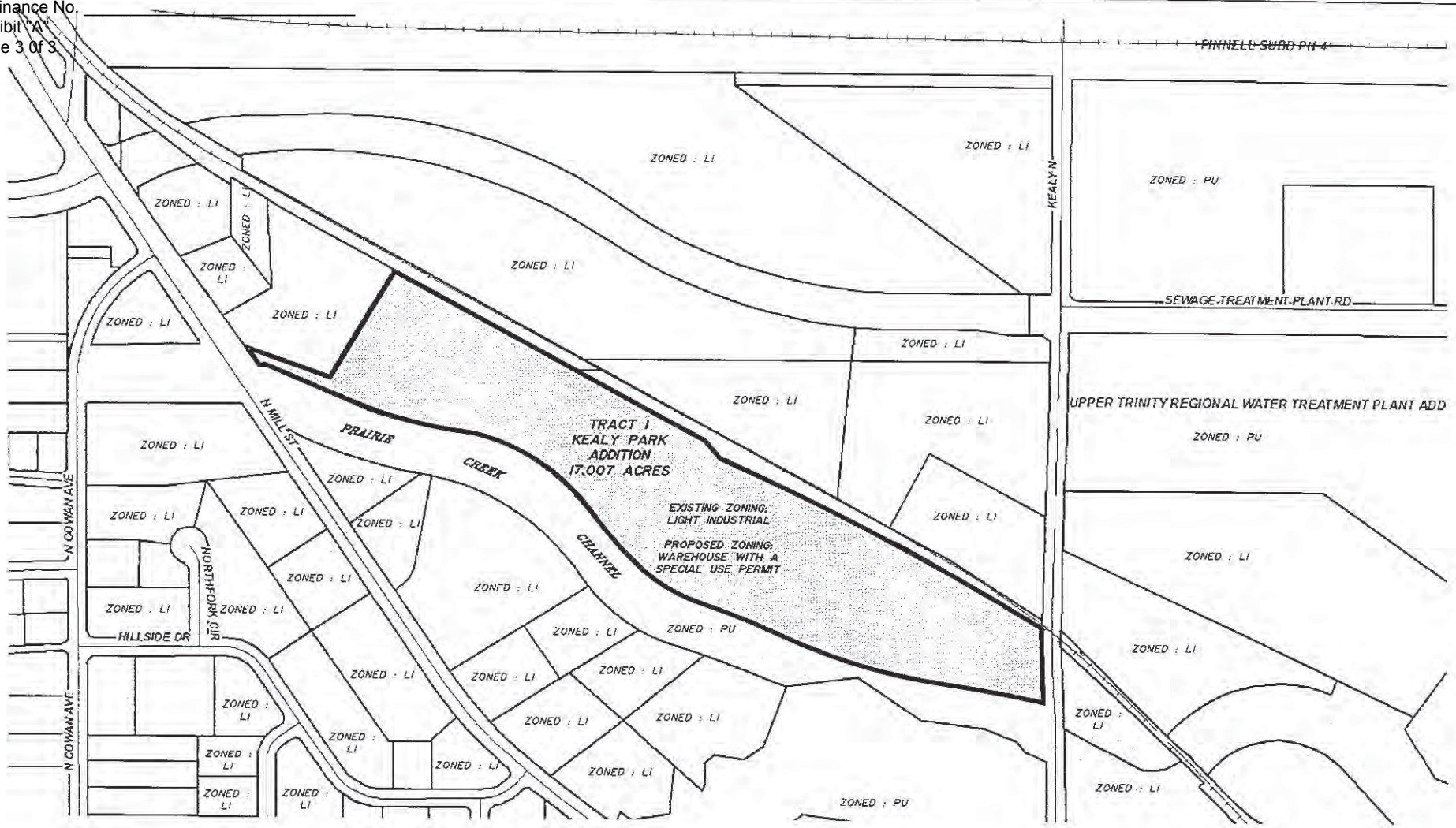


ZONING EXIBIT
FOR
17.007 ACRES
OUT OF THE
J. W. KING SURVEY, ABSTARCT No. 696
AND THE
J. WAGNER SURVEY, ABSTARCT No. 1399
CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

LEGEND

ZONED : LI	LIGHT INDUSTRIAL
ZONED : PU	PUBLIC USE
ZONED : W\S.U.P.	WAREHOUSE \ SPECIAL USE PERMIT

OWNER / DEVELOPER:
BUILDER'S FIRSTSOURCE
MR. CHRIS HOLMES
2230 AVENUE J
ARLINGTON, TEXAS 76006
(817) 822-0917

PROJ. NO.: 6299-14-05-02

Gonzalez & Schneeberg 660 N. Central Expressway Suite 250, Plano, Texas 75074
engineers - surveyors (972) 516-8855 Fax:(972) 516-8901

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
GSES	GSES	JUNE 2016	NOT TO SCALE			

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of an Ordinance Granting a Special Use Permit for a Wholesale Establishment with Outside Storage on More Than Ten Percent of the Platted Lot on 17.007 Acres Legally Described as Lots 1A, 1B, 1C and 2, Kealy Park Addition, Located on the East Side of North Mill Street Approximately 550 South of Valley Ridge Boulevard, at 902 North Mill Street; as Requested by Robert Schneeberg of Gonzalez & Schneeberg, Engineers & Surveyors, Inc. on Behalf of Chris Holmes, Builders FirstSource, the Property Owner (Case No. SUP-2016-09-09).**

BACKGROUND

The 17.007-acre property is occupied by Builders FirstSource and located on the east side of North Mill Street, between the DCTA rail line and Prairie Creek. Although the site has a North Mill Street address, the only part of the site that fronts North Mill Street is the driveway. Other lots and businesses have actual frontage along North Mill Street. The existing site is divided into four lots. Three of the four lots are developed and contain parking, buildings, lumber sheds and outside storage. The construction boom of the past several years has led to an increase in the demand of lumber for this business. The applicant is proposing to expand the current operation to incorporate the remaining lot to accommodate the increase in demand. The location is ideal because the site has access not only to I-35E and SH 121, but also to the adjacent rail line where the business receives delivery of lumber as well. On September 20, 2016, the Planning and Zoning Commission recommended unanimous approval (5-0) of the SUP.

ANALYSIS

Building Improvements
The current building is a one story metal building. The west side of the building faces North Mill Street and the larger façade faces south toward Prairie Creek. The applicant is proposing to renovate the two visible sides (southern and western elevations) of the existing building with a stucco finish and a manufactured stone wainscot on a portion of the building that is visible outside of the proposed wooden fence. The remainder of the building will receive a fresh coat of paint. The building is approximately 18,000 square feet in size.

Screening & Improvements
Currently an existing chain link fence surrounds the entire perimeter of the site. The applicant is proposing to remove the chain link fence and replace it with a solid eight-foot wood fence. The main gate at the North Mill Street entrance leading into the storage yard will have a rolling gate that will be open during regular business hours. The expansion of

the operation will include the addition of a secondary access that will serve mainly as an exit onto North Kealy Avenue. This portion of the lot has approximately 200 linear feet of frontage and will have an eight-foot tall masonry screening wall parallel to North Kealy Avenue. A 36-foot wide rolling gate will be added to the North Kealy Avenue driveway to access the site and a continuation of the wood fence will be added along the south property line along Prairie Creek.

Landscape Improvements
The North Mill Street frontage is limited to a driveway entrance which will be landscaped with a red oak and four crepe myrtles. Seven red oak trees will be added to the interior parking lot behind the west side of the existing building. The new North Kealy Avenue driveway will have a 25-foot landscape buffer that will incorporate five red oak, five crepe myrtles, forty shrubs, grass and mulch. No landscaping is proposed along Prairie Creek or the DCTA rail right-of-way, which must remain clear for maintenance of the right-of-way. Landscaping is being exceeded in the landscape strips and the number of trees proposed exceeds the minimum requirements.

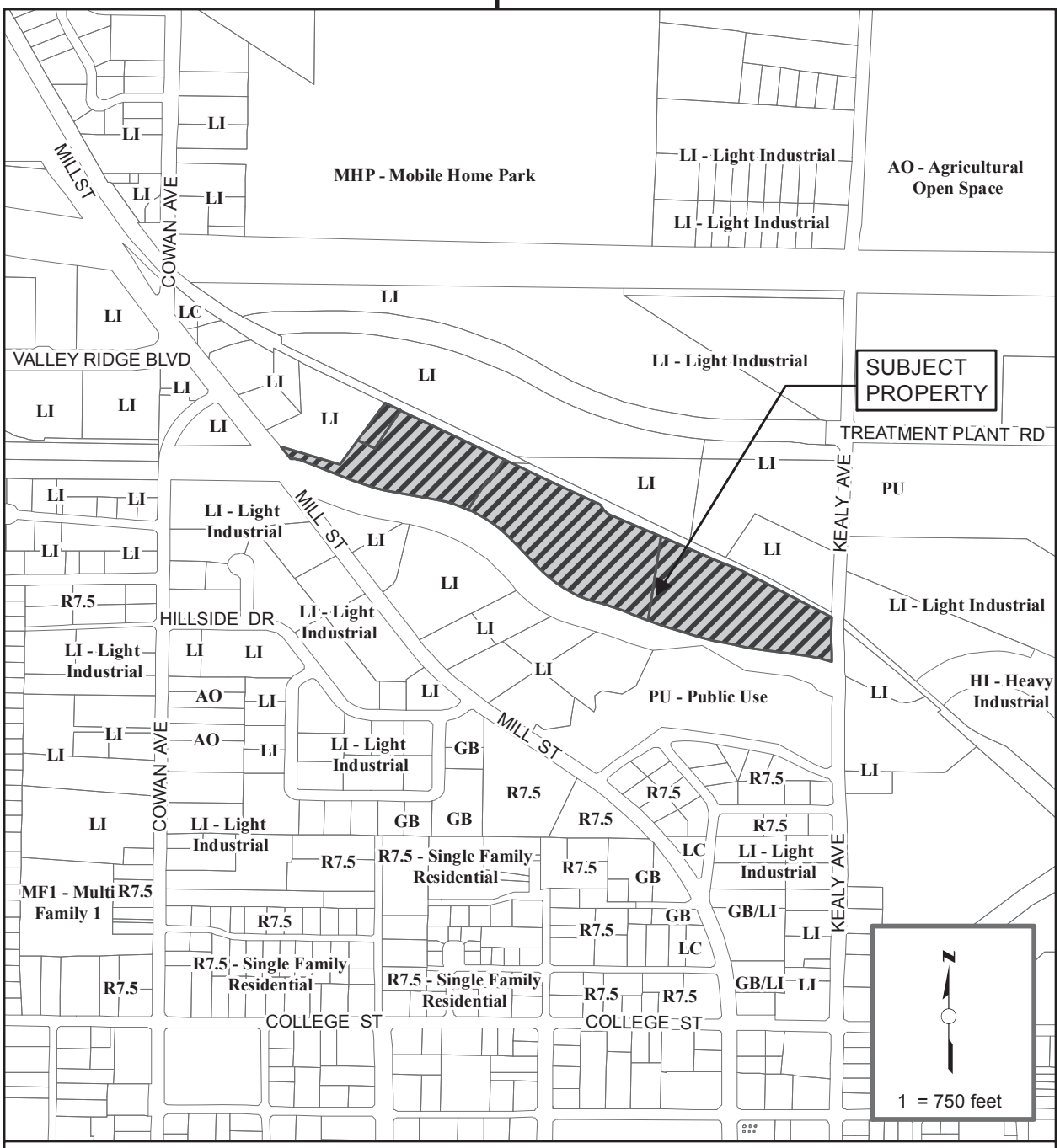
Signage
The existing building has a wall sign that is proposed to remain. Two new monument signs are proposed. The monument signs will be double sided with one placed at each of the street entrances. The monument sign is proposed to be constructed of brick with the Builders FirstSource logo and street address. The sign complies with city ordinances.

Summary
The site has been home to various lumber companies for several decades. Builders FirstSource has been in business in Lewisville at this location for almost 20 years. Their services are in high demand with all of the construction taking place in the North Texas region. The SUP for expansion of the existing operation provides significant improvements to the building exterior, substantial landscaping and effective screening in addition to improved access to and from the site.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed ordinance and associated variance as set forth in the caption above.

Location Map - 902 N. Mill St



CASE NO. SUP-2016-09-09

PROPERTY OWNER: BUILDERS FIRSTSOURCE

APPLICANT NAME: ROBERT SCHNEEBERG, GONZALEZ & SCHNEEBERG, ENGINEERS & SURVEYORS, INC.

PROPERTY LOCATION: 902 NORTH MILL STREET (17.007 ACRES)

CURRENT ZONING: LIGHT INDUSTRIAL (LI), PROPOSED WAREHOUSE (WH)

REQUESTED USE: A SPECIAL USE PERMIT (SUP) FOR A WHOLESALE ESTABLISHMENT WITH OUTSIDE STORAGE

Aerial Map - 902 N. Mill St

MINUTES
PLANNING AND ZONING COMMISSION
SEPTEMBER 20, 2016

Item 4:

Public Hearing – Zoning and Special Use Permits were the next item on the agenda. There were three items for consideration:

C. **Public Hearing:** Consideration of a Special Use Permit for a Wholesale Establishment with Outside Storage, on 17.007 Acres Legally Described Kealy Park Addition, Lots 1A, 1B, 1C and 2, Further Identified as 902 North Mill Street, as Requested by Robert Schneeberg of Gonzalez & Schneeberg, Engineers & Surveyors, Inc. on Behalf of Chris Holmes, Builders FirstSource, the Property Owner. (Case No. SUP-2016-09-09).

Staff gave a brief presentation on the proposed Special Use Permit request to expand the lumber yard's warehouse storage. Staff further explained the proposed improvements and renovations to the site, such as screening devices, landscaping and exterior building enhancements. Chairman Davis asked what was planned for the Light Industrial properties north of the rail line. Staff answered that the area is expected to be an industrial park, so there would be no significant impact. The public hearing was then opened by Chairman Davis. There being no public comment, the public hearing was then closed. *A motion was made by Kristin Green to recommend approval of the Special Use Permit, seconded by Alvin Turner. The motion passed unanimously (5-0)*. Staff indicated that this item would be going before the City Council on October 17th for a second public hearing and a final decision.

SECTION 17-24. - "WH" WAREHOUSE DISTRICT REGULATIONS

(a) *Use*. A building or premises shall be used only for the following purposes:

(1) Bakery or bottling works, if fully enclosed in a building.
(2) Wholesale establishments, if fully enclosed in a building.
(3) Storage warehouses with open storage yards (SUP required).
(4) Contractor's yard (SUP required).
(5) Manufacturing uses - outside storage is limited to ten (10) percent of the lot for storage of equipment, materials or products.
(6) Truck parking lot (SUP required).
(7) Offices.
(8) Laboratory.
(9) Auto repair shops, including body shops (SUP required).
(10) Church worship facilities.
(11) Travel trailer/boat/RV storage (Outdoor) (SUP required).
(12) Private Utility Plants or Sub-stations (including alternative energy) (SUP required).
(13) Gas and oil drilling accessory uses (SUP required).
(14) Cemetery, mausoleum, crematorium and accessory uses (SUP required).
(15) Buildings and uses owned or operated by public governmental agencies.
(16) Communication towers (SUP required).
(17) Temporary buildings for uses incidental to construction work on the premises, which buildings shall be removed upon the completion or abandonment of construction work.
(18) Accessory buildings and uses customarily incidental to any of the above uses, provided that such not be objectionable because of odor, excessive light, smoke, dust, noise, vibration or similar nuisances. Open storage shall be considered an accessory use but no more than ten percent (10%) of the platted lot may be used for outside storage, including access and maneuvering areas for moving the stored items. Any use requiring more than 10% outside storage shall require a special use permit (SUP).
(19) Motor Freight Terminal (SUP required).

(b) *Height*. No building shall exceed in height the width of the street on which it faces plus the depth of the front yard. On a lot adjoining a residential district, no building shall exceed forty-five (45) feet in height, except that this height may be increased up to the maximum of twelve (12) stories, or one hundred eighty (180) feet, at the rate of two (2) feet of additional height for each one (1) foot of additional setback from required yard lines. In no event, however, shall any building exceed two (2) stories when any portion of the building is located within one hundred fifty (150) feet of any property zoned for residential purposes.

(c) *Area*.

(1) *Size of yards*.

a. *Front yard*. There shall be a front yard having a minimum depth of twenty-five (25) feet. No parking, storage or similar use shall be allowed in required front yards in district "WH", except that automobile parking (including automobile dealer display parking) will be permitted in such yards if separated by at least twenty-five (25) feet from any residential district.

b. *Side yard*. A side yard of not less than fifteen (15) feet in width shall be provided on the side of a lot adjoining a side street. A side yard of not less than ten (10) feet in width shall be provided on the side of a lot adjoining a residential district. The required side yard shall be waived when a screening device is installed in accordance with the city's general development ordinance. The building itself can serve as a portion of the screening device when that portion of the building exterior is constructed of the same materials as the screening device. No parking, storage or similar use shall be allowed in any required side yard or in any side street yard adjoining a residential district.

c. *Rear yard*. No rear yard is required except that a rear yard of not less than fifty (50) feet in depth shall be provided upon that portion of a lot abutting or across a rear street from a residential district, except that such yard requirement shall not apply where the property in the residential district also backs up to the rear street. No parking, storage or similar use shall be allowed in required rear yards in district "WH" within twenty-five (25) feet of the rear property line.

(2) *Reserved*.

(d) *Outside storage regulations*. In all zoning districts where outside storage yards are allowed, such storage yards shall be screened from view in accordance with the standards outlined in the city's general development ordinance. This provision applies to all outside storage which began after the original date of passage of this provision (April 4, 1994). Any variance request involving the requirements or standards relating to such required screening devices shall be considered by the city council in accordance with the city's general development ordinance. Areas which are used for infrequent and temporary storage for a period of thirty (30) days or less per year shall not be deemed as storage yards.

SECTION 17-29.5 - "SUP" SPECIAL USE PERMIT

(a) *Purpose.*

The special use permit (SUP) provides a means for evaluating land uses identified in this ordinance to ensure compatibility with adjacent properties. The intent of the special use permit process is to allow consideration of certain uses that would typically be incompatible or intensely dominate the area in which they are located, but may become compatible with the provision of certain conditions and restrictions.

(b) *Application submittal and approval process.*

(1) Application for an SUP shall be processed like an application for rezoning. An application shall not be complete and shall not be scheduled for a public hearing unless the following are submitted along with the application:

a. A scaled development plan depicting the items listed in Section 17-29.5(b)(2);
b. A meets and bounds description of the property boundary;
c. A narrative explaining how the property and use(s) will function;
d. Colored elevations of the building and other structures including dimensions and building materials;
e. A Landscaping Plan, meeting the requirements of Section 6-124 of the Lewisville Code of Ordinances;
f. A Tree Survey and Mitigation Plan if required by Section 6-125 of the Lewisville Code of Ordinances;
g. Detailed elevations and descriptions of proposed signage;
h. An exhibit illustrating any requested variances; and
i. Any other information, drawings, operating data or expert evaluations that city staff determines are necessary to evaluate the compatibility criteria for the proposed use and development.

(2) The development plan submitted along with an SUP application must include the following:

a. The layout of the site;
b. A north arrow;
c. A title block including project name, addition, lot, block, acreage, and zoning classification of the subject property;
d. Name, address, and phone number for applicant, developer, owner, builder, engineer, and/or surveyor;
e. Building location, property lines, and setbacks;
f. Summary tables listing building square footage, required parking, and required landscaping;
g. Locations of utility easements, if applicable;
h. Zoning and ownership of adjacent properties;
i. Easements, deed restrictions, or encumbrances that impact the property;
j. Median openings, traffic islands, turning lanes, traffic signals, and acceleration and deceleration lanes;
k. Streets, alleys, and easements adjacent to the site;
l. Driveways and sidewalks;
m. Parking configuration, including maneuvering lanes and loading areas;
n. Location and details of dumpsters and screening devices; and
o. Location of all proposed signage.

(3) Variances from the regulations of the city's General Development Ordinance may be granted at the discretion of the city council as part of the SUP approval. The granting of an SUP has no effect on uses permitted by right and does not waive the regulations of the underlying zoning district.

(4) The planning and zoning commission or the city council may require additional information or drawings, operating data or expert evaluation or testimony concerning the location and characteristics of any building or uses proposed.

(5) The planning and zoning commission, after holding a public hearing, shall recommend to the city council approval or denial of each SUP along with any recommended conditions. The city council shall review each case on its own merit, apply the compatibility criteria established herein, and if appropriate, grant the special use permit for said use(s).

(6) Completion of a development plan for the SUP does not waive the requirement to provide an engineering site plan in accordance with the General Development Ordinance.

(c) *Compatibility criteria for approval.*

The planning and zoning commission shall not recommend approval of, and the city council shall not grant an SUP for a use except upon a finding that the use will:

(1) complement or be compatible with the surrounding uses and community facilities and any adopted comprehensive plans or small area plans;

(2) contribute to, enhance, or promote the welfare of the area of request and adjacent properties;

(3) not be detrimental to the public health, safety, or general welfare; and

(4) conform in all other respects to all zoning regulations and standards.

(d) *SUP conditions.*

The planning and zoning commission may recommend and the city council may adopt reasonable conditions upon the granting of an SUP consistent with the purpose and compatibility criteria stated in this section. The development plan, however, shall always be attached to and made a condition of the SUP. The other documents submitted with the SUP application may also be made conditions of the SUP.

(e) *Amendments, enlargement, modifications or structural alterations.*

(1) Except for minor amendments, all amendments, enlargements, modifications or structural alterations or changes to the development plan shall require the approval of a new SUP. The city manager or his designee may authorize minor amendments to the development plan that otherwise comply with the SUP ordinance and the underlying zoning and do not:

a. Alter the basic relationship of the proposed development to adjacent property;
b. Increase the maximum density or height shown on the original development plan;
c. Decrease the number of off-street parking spaces shown on the original development plan; and/or
d. Reduce setbacks at the boundary of the site as specified by a building or setback line shown on the original development plan.

(2) For purposes of this subsection, "original development plan" means the earliest approved development plan that is still in effect, and does not mean a later amended development plan. For example, if a development plan was approved with the specific use permit and then amended through the minor amendment process, the original development plan would be the development plan approved with the specific use permit, not the development plan as amended through the minor amendment process. If, however, the development plan approved with the specific use permit was replaced through the zoning process, then the replacement development plan becomes the original development plan. The purpose of this definition is to prevent the use of several sequential minor amendments to circumvent the zoning amendment process.

(3) Although the city manager or his designee has the authority to grant minor amendments to the development plan, they are not obligated to do so. The city manager or his designee shall always maintain the discretion to require city council approval if he feels that it is within the public's interest that city council consider the amendment, enlargement, modifications, or structural changes at a public hearing.

(f) *Compliance mandatory with written requirements.*

(1) No special use permit shall be granted unless the applicant, owner, and grantee shall be willing to accept and agree to be bound by and comply with the written requirements attached to the development plan drawings and approved by the city council.

(2) A special use permit shall be transferable from one owner or owners of the subject property to a new owner or occupant of the subject property, however all regulations and conditions of the SUP shall remain in effect and shall be applicable to the new owner or occupant of the property.

(g) *Timing.*

All development plans submitted for review will be on the city's active list for a period of 90 days from the date of each submittal. After the 90-day period, a project will be considered abandoned and removed from the file. A building permit shall be applied for and secured within 180 days from the time of approval of the special use permit provided that the city may allow a one-time extension of the SUP for another 180 days. A SUP shall expire six months after its approval or extension date if no building permits have been issued for the site or if a building permit has been issued but has subsequently lapsed. Work must be completed and operations commenced within 18 months of approval.

(h) *Zoning map.*

When the city council authorizes granting of a special use permit the official zoning district map shall be amended according to its legend to indicate that the affected area has conditions and limited uses, said amendment to indicate the appropriate zoning district for the approved use, and suffixed by an "SUP" designation. A log of all special use permits shall be kept by the city.

(i) *Rescind and terminate a special use permit.*

City council may rescind and terminate an SUP after a public hearing if any of the following occur:

(1) That one or more of the conditions imposed by the SUP has not been met or has been violated.

(2) The SUP was obtained through fraud or deception.

(3) Ad valorem taxes on the property are delinquent by six months or more.

(4) Disconnection or discontinuance of water and/or electrical services to the property.

(5) Abandonment of the structure, lease space, lot, or tract of land for 180 days or more. (For the purpose of this section, "abandon" shall mean to surrender occupancy by vacating or ceasing to operate or inhabit such property.)

This Section (Office Use Only)	
Case:	
PZ:	CC:
Sign/s Picked Up By:	

LEWISVILLE

SPECIAL USE PERMIT (SUP) APPLICATION

Owner/s (name): Chris Holmes	
Company Name: Builders FirstSource	
Mailing Address: 2230 Avenue J, Arlington, TX 76006	
Work #: 817-822-0917	Cell #:
E-Mail: Chris.Holmes@bldr.com	
Owner Signature:	Date: June 23, 2016
Printed Name: Chris Holmes	

Applicant/Agent (name): Robert W. Schneeberg	
Company Name: Gonzalez & Schneeberg, Engineers & Surveyors, Inc.	
Mailing Address: 660 North Central Expressway, Suite 250, Plano, TX 75074	
Work #: 972-516-8855	Cell #: 214-543-5552
E-Mail: robert.schneeberg@gs-engineers.com	
Applicant/Agent Signature	Date: June 23, 2016
Printed Name: Robert W. Schneeberg	

Current Zoning: LI- Light Industrial **Requested Zoning: W - Warehouse** **Acres:** 17.007

Legal Description (Lot/ Block/Tract/Abstract): Lots 1A, 1B, 1C and 2, Kealy Park Addition

Address/Location: 902 North Mill Street

Application and Sign Fees:

	Less than 1/2 acre	$ 150.00
	1/2 acre up to 4.99 acres	$ 250.00
X	5 acres up to 24.99 acres	$ 400.00

	25 acres up to 49.99 acres	$ 750.00
	50 acres up to 99.99 acres	$1,000.00
	100 acres and more	$1,500.00

Qty: 2	**SUP Signs - $35 each.** 1 sign required for each 5 acres (max. 5 per site)	$ 470.00

Sign(s) must be posted a minimum of ten (10) days prior to the Planning & Zoning hearing date.

Amount Due (application & sign fee)	$

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

REQUIRED:

Fully describe the plans for the property

Lumber Yard with unlimited outside storage

NOTE:

Items must be staff approved and deemed complete before they will be placed on an agenda.

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL, AMENDING THE ZONING ORDINANCE BY GRANTING A SPECIAL USE PERMIT FOR A WHOLESALE ESTABLISHMENT WITH OUTSIDE STORAGE ON MORE THAN TEN PERCENT OF THE PLATTED LOT ON APPROXIMATELY 17.007 ACRES LEGALLY DESCRIBED AS LOTS 1A, 1B, 1C AND 2, KEALY PARK ADDITION, LOCATED ON THE EAST SIDE OF NORTH MILL STREET APPROXIMATELY 550 FEET SOUTH OF VALLEY RIDGE BOULEVARD AT 902 NORTH MILL STREET AND ZONED WAREHOUSE DISTRICT (WH); PROVIDING FOR A REPEALER, SEVERABILITY, AND A PENALTY; AND DECLARING AN EMERGENCY.

WHEREAS, applications were made requesting approval of a Special Use Permit for a wholesale establishment with outside storage on more than ten percent (10%) of the platted lot by making applications for same with the Planning and Zoning Commission of the City of Lewisville, Texas, as required by state statutes and the Zoning Ordinances of the City of Lewisville, Texas; and said Planning and Zoning Commission has recommended that the Special Use Permit on the 17.007-acre property, as described in the attached Exhibit "A" (the "Property"), be **approved**; and

WHEREAS, this application for a Special Use Permit comes before the City Council of the City of Lewisville, Texas (the "City Council") after all legal notices, requirements, conditions and prerequisites have been met; and

WHEREAS, the City Council at a public hearing has determined that the proposed use, subject to the condition(s) stated herein: (1) complements or is compatible with the surrounding uses and community facilities; (2) contributes to, enhances, or promotes the welfare of the area of request and adjacent properties; (3) is not detrimental to the public health, safety, or general welfare; and (4) conforms in all other respects to all zoning regulations and standards.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. FINDINGS INCORPORATED. The findings set forth above are incorporated into the body of this ordinance as if fully set forth herein.

SECTION 2. SPECIAL USE PERMIT GRANTED. Subject to the conditions provided for herein, applicant is granted a Special Use Permit to allow a wholesale establishment with outside storage on the Property, which is zoned Warehouse District (WH).

SECTION 3. CONDITIONS OF SPECIAL USE PERMIT. The Property shall be developed and maintained:

1. in compliance with the narrative, development plan, landscape plan, building elevations and illustrative exterior color and material samples attached hereto as Exhibit "B"; and
2. in accordance with all federal, state, and local laws and regulations.

SECTION 4. CORRECTING OFFICIAL ZONING MAP. The City Manager, or her designee, is hereby directed to correct the official zoning map of the City of Lewisville, Texas, to reflect this Special Use Permit.

SECTION 5. COMPLIANCE WITH ALL OTHER MUNICIPAL REGULATIONS. The Property shall comply with all applicable municipal ordinances, as amended. In no way shall this Special Use Permit be interpreted to be a variance to any municipal ordinance.

SECTION 6. RESCINDING AND TERMINATION. The City Council may rescind and terminate the Special Use Permit after a public hearing if any of the following occur:

1. One or more of the conditions imposed by the Special Use Permit have not been met or have been violated.
2. The Special Use Permit was obtained through fraud or deception.
3. Ad valorem taxes on the property are delinquent by six months or more.
4. Disconnection or discontinuance of water and/or electrical services to the property.
5. Abandonment of the structure, lease space, lot, or tract of land for 180 days or more.

SECTION 7. REPEALER. Every ordinance or parts of ordinances found to be in conflict herewith are here by repealed.

SECTION 8. SEVERABILITY. If any section, sentence, clause, or phrase of this ordinance shall for any reason be held to be invalid, such decision shall not affect the validity of the remaining sections, sentences, clauses, or phrases of this ordinance, but they shall remain in effect.

SECTION 9. PENALTY. Any person, firm or corporation who violates any provisions of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof in the Municipal Court, shall be subject to a fine of not more than $2,000.00 for each offense, and each and every day such offense is continued shall constitute a new and separate offense.

SECTION 10. EFFECTIVE DATE. This Ordinance shall take effect and be in full force and effect from and after the date of its passage and publication as required by law.

SECTION 11. EMERGENCY. It being for the public welfare that this Ordinance be passed creates an emergency and public necessity and the rule requiring this Ordinance be read on three separate occasions be, and the same is hereby, waived and this Ordinance shall be in full force and effect from and after its passage and approval and publication, as the law in such cases provides.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Exhibit A
Property Description

Exhibit B
Narrative
Development Plan
Landscape Plan
Building Elevations
Illustrative Exterior Color and Material Samples

EXHIBIT A

TRACT 1
LEGAL DESCRIPTION

Description of a 17.007 acre tract of land situated in the J.W. King Survey, Abstract No. 696 and the J. Wagner Survey, Abstract No. 1399, City of Lewisville, Denton County, Texas, and being all of Lots 1A, 1B and 1C, Block A, Kealy Park Addition, an addition to the City of Lewisville according to the plat thereof recorded in Cabinet F, Slide 111, Plat Records, Denton County, Texas and the remainder of Lot 2, Block A, Kealy Park Addition, an addition to the City of Lewisville according to the plat thereof recorded in Cabinet E, Slide 57, Plat Records, Denton County, Texas following the conveyance of a 0.0386 acre tract of land to the City of Lewisville by Right-of-Way Deed recorded in Volume 5024, Page 64, Deed Records, Denton County, Texas; said 17.007 acre tract being more particularly described as follows:

BEGINNING, at a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for corner at the intersection of the south line of said Lot 2 with the west right-of-way line of Kealy Avenue (variable width public right-of-way) as created by said 0.0386 acre right-of-way take; said point being on a curve to the left having a radius of 497.25 feet; said point being also on the north line of a called 6.680 acre tract conveyed to the City of Lewisville by deed recorded in Volume 783, Page 770, Deed Records, Denton County, Texas;

THENCE, with the common line between said City of Lewisville 6.680 acre tract and said Kealy Park Additions, the following metes and bounds:

northwesterly, with said curve to the left through central angle of 15 degrees 07 minutes 55 seconds, an arc distance of 131.33 feet (chord bears North 79 degrees 35 minutes 38 seconds West, 130.94 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 87 degrees 09 minutes 35 seconds West, a distance of 83.86 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the beginning of a tangent circular curve to the right having a radius of 430.40 feet;

northwesterly, with said curve to the right, through a central angle of 16 degrees 52 minutes 55 seconds, an arc distance of 126.82 feet (chord bears North 78 degrees 43 minutes 07 seconds West, 126.36 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 70 degrees 16 minutes 40 seconds West, a distance of 694.04 feet to a 2-inch iron pipe found for the beginning of a tangent circular curve to the right having a radius of 275.00 feet;

northwesterly, with said curve to the right, through a central angle of 33 degrees 53 minutes 00 seconds, an arc distance of 162.63 feet (chord bears North 53 degrees 20 minutes 10 seconds West, 160.27 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 36 degrees 23 minutes 40 seconds West, a distance of 120.00 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the beginning of a tangent circular curve to the left having a radius of 675.00 feet;

northwesterly, with said curve to the left, through a central angle of 41 degrees 54 minutes 00 seconds, an arc distance of 493.62 feet (chord bears North 57 degrees 20 minutes 40 seconds West, 482.70 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the end of said curve;

North 78 degrees 17 minutes 40 seconds West, a distance of 136.54 feet to a 1/2-inch iron rod found for the beginning of a tangent circular curve to the right having a radius of 625.00 feet;

northwesterly, with said curve to the right, through a central angle of 11 degrees 36 minutes 25 seconds, an arc distance of 126.61 feet (chord bears North 72 degrees 29 minutes 27 seconds West, 126.40 feet) to a 1/2-inch iron rod found for the end of said curve;

North 66 degrees 41 minutes 15 seconds West, a distance of 311.44 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the most westerly southwest corner of said Lot 1A; said point being also on the easterly right-of-way line North Mill Street (a 100-foot wide public right-of-way);

THENCE, North 33 degrees 23 minutes 00 seconds West, with the said easterly right-of-way line, a distance of 69.82 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the most westerly northwest corner of said Lot 1A; said point being also the southwest corner of Lot 3, Block A, Watson Properties Addition; an addition to the City of Lewisville according to the plat thereof recorded in Cabinet O, Page 3, Plat Records, Denton County, Texas;

THENCE, with the common line between said Kealy Park Addition and said Watson Properties Addition, the following metes and bounds:

South 71 degrees 03 minutes 10 seconds East, a distance of 280.36 feet to a 1/2-inch iron rod with plastic cap stamped "Arthur Surveying" found for an interior corner of said Lot 1A and the southeast corner of said Watson Properties Addition;

North 30 degrees 47 minutes 40 seconds East, a distance of 353.82 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the northerly corner of said Lot 1C and the northeast corner of said Watson Properties Addition; said point being also on the centerline of the M.K.T. Railroad;

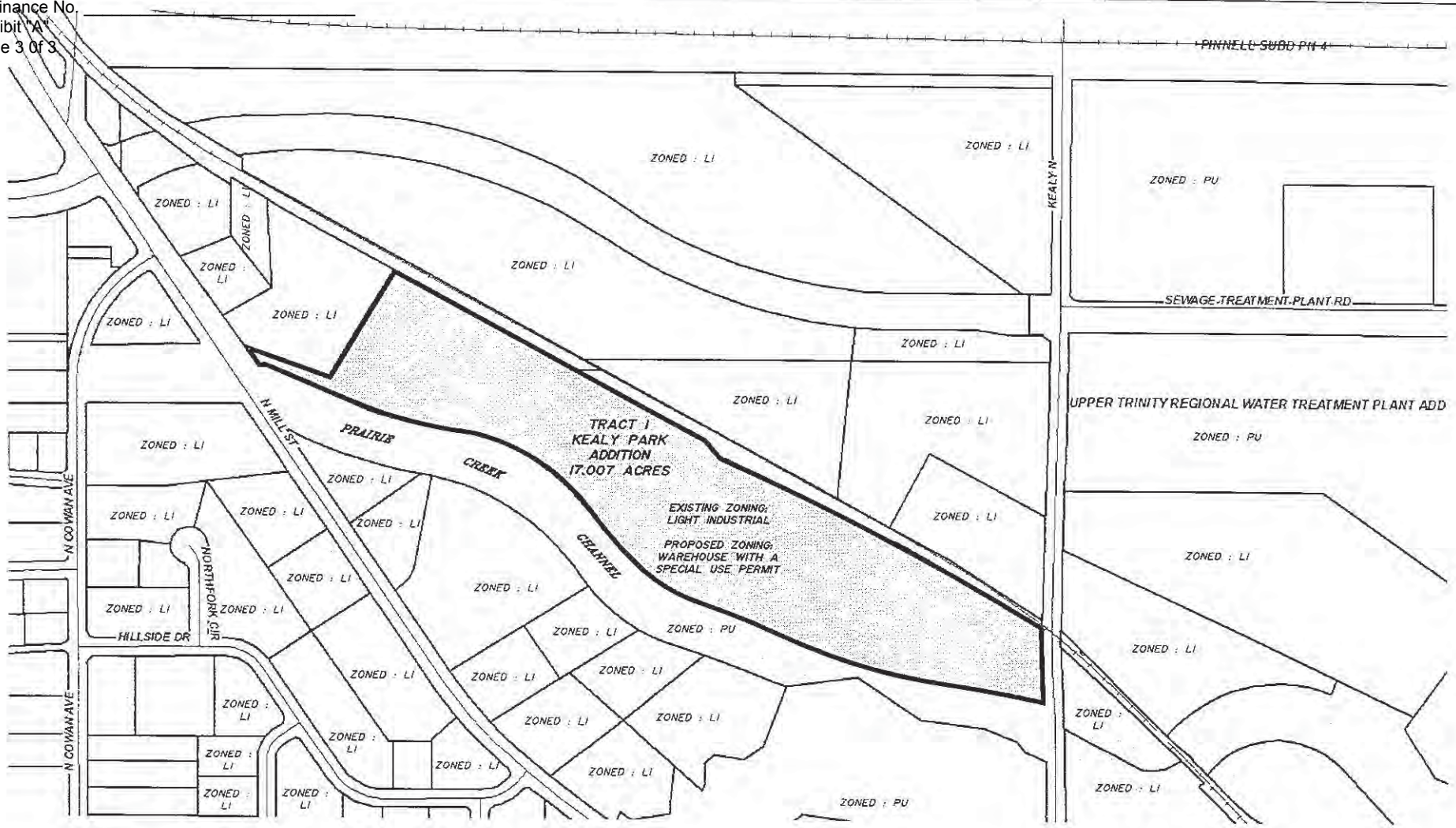
THENCE, South 60 degrees 48 minutes 10 seconds East, with the centerline of the M.K.T. Railroad, a distance of 1,641.68 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for the beginning of a tangent circular curve to the right having a radius of 2,162.36 feet;

THENCE, southeasterly, with said curve to the right, through a central angle of 09 degrees 21 minutes 13 seconds, an arc distance of 353.00 feet (chord bears South 56 degrees 07 minutes 34 seconds East, 352.61 feet) to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for corner at the intersection of said centerline with the extended west right-of-way line of Kealy Avenue;

THENCE, South 00 degrees 37 minutes 58 seconds East, with said west right-of-way line, at a distance of 36.75 feet, past the northwest corner of said 0.0386 acre tract, continuing with said west right-of-way line, in all, a distance of 119.43 feet to a 5/8-inch iron rod with yellow plastic cap stamped "GSES INC. RPLS 4804" set for an angle point of said west right-of-way line;

THENCE, South 00 degrees 46 minutes 47 seconds East, with said west right-of-way line, at a distance of 82.88 feet to the POINT OF BEGINNING;

CONTAINING, 740,840 square feet or 17.007 acres of land, more or less.



ZONING EXIBIT
FOR
17.007 ACRES
OUT OF THE
J. W. KING SURVEY, ABSTARCT No. 696
AND THE
J. WAGNER SURVEY, ABSTARCT No. 1399
CITY OF LEWISVILLE, DENTON COUNTY, TEXAS

LEGEND

ZONED : LI	LIGHT INDUSTRIAL
ZONED : PU	PUBLIC USE
ZONED : W\S.U.P.	WAREHOUSE \ SPECIAL USE PERMIT

OWNER / DEVELOPER:
BUILDER'S FIRSTSOURCE
MR. CHRIS HOLMES
2230 AVENUE J
ARLINGTON, TEXAS 76006
(817) 822-0917

PROJ. NO.: 6299-14-05-02

Gonzalez & Schneeberg 660 N. Central Expressway Suite 250, Plano, Texas 75074
engineers - surveyors (972) 516-8855 Fax:(972) 516-8901

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
GSES	GSES	JUNE 2016	NOT TO SCALE			

EXHIBIT A

NARRATIVE

Builders FirstSource
2001 Bryan Street
Suite 1600
Dallas, TX 75201
214.880.3500

August 23, 2016

To Whom It May Concern:

Headquartered in Dallas, Texas, Builders FirstSource is the largest supplier of building products, prefabricated components, and value-added services to the professional market segment, for new residential construction and repair and remodeling, in the U.S. We provide customers an integrated homebuilding solution, offering manufacturing, supply, delivery and installation of a full range of structural and related building products. We operate in 40 states with 399 locations and have a market presence in 74 of the top 100 Metropolitan Statistical Areas. We service customers from strategically located distribution facilities and manufacturing facilities that produce value-added products such as roof and floor trusses, wall panels, stairs, vinyl windows, custom millwork and pre-hung doors. Builders FirstSource also distributes dimensional lumber and lumber sheet goods, millwork, windows, interior and exterior doors, and other building products.

The Builders FirstSource distribution facility in Lewisville, TX is located at:

902 North Mill Street
Lewisville, Texas, 75067

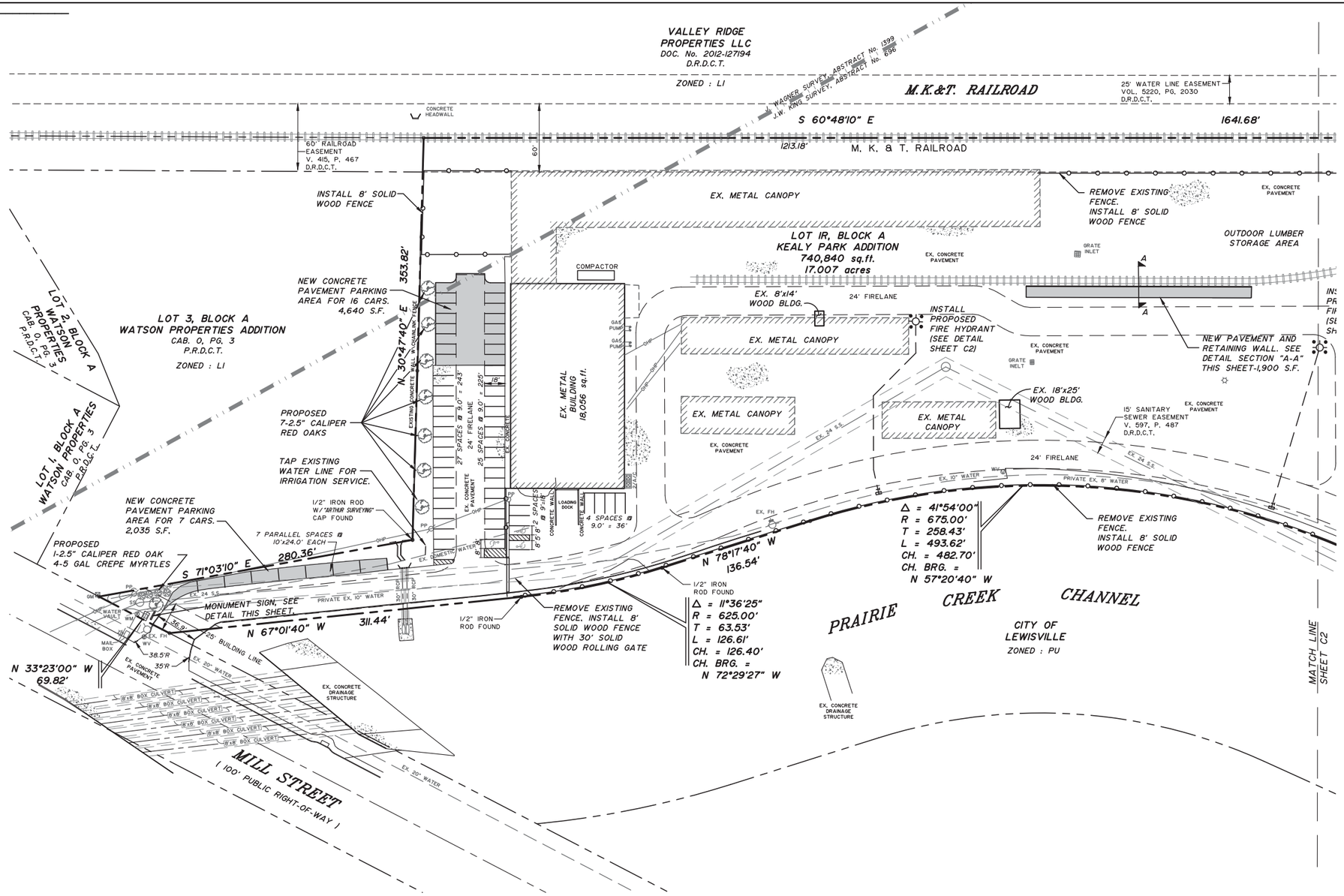
The Lewisville TX facility distributes dimensional lumber and lumber sheet goods, millwork, windows, interior and exterior doors, and other building products throughout the Dallas/Fort Worth market and also provides installation services for many of those product lines. Normal hours of operation are Monday through Friday from 7:00 AM to 5:00 PM. There are currently 55 employees working at the Lewisville TX site. Additionally, the Lewisville TX facility currently generates taxable annual revenues in excess of $70 million.

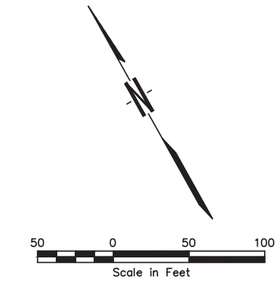
Thank you and best regards,

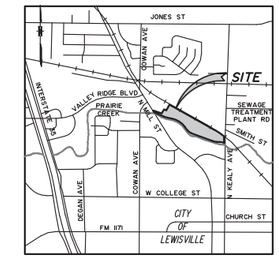
Paul W. Dunn
Director of Real Estate

Builders FirstSource

(w) 214.880.3512
(m) 817.456.6110







VICINITY MAP
NTS

SITE DATA SUMMARY TABLE - BUILDERS FIRST SOURCE

LOT AREA = 17.007 ACRES

MAIN BUILDING SQUARE FOOTAGE = 18,056 SQUARE FEET
WAREHOUSE SPACE = 14,056 SQUARE FEET
OFFICE SPACE = 4,000 SQUARE FEET
BUILDING HEIGHT = 25 FEET
STORIES = ONE

WOODEN BUILDING "A"= 112 SQUARE FEET
WOODEN BUILDING "B"= 450 SQUARE FEET

OUTSIDE STORAGE = 270,000 SQUARE FEET (36.5%)

REQUIRED SETBACKS:
FRONT = 25 FEET
SIDE = 0 FEET
REAR = 0 FEET

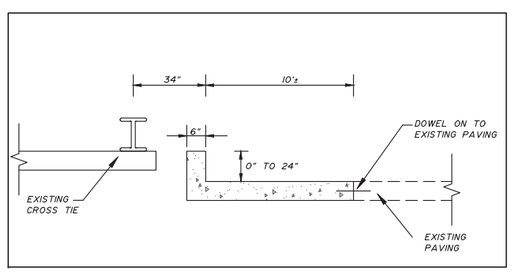
PARKING REQUIRED:
WAREHOUSE: 14,056/1,000 (1 SPACE PER 1,000 S.F.) = 15 SPACES
OFFICE: 4,000 + 112 + 450 = 4562/200 (1 SPACE PER 200 S.F.) = 23 SPACES
TOTAL REQUIRED = 38 SPACES
PARKING PROVIDED = 68 SPACES TOTAL (INCLUDES 3 HANDICAPPED SPACES)

IMPERVIOUS AREAS:
BUILDING = 18,618 SQUARE FEET
CANOPIES = 38,100 SQUARE FEET
PAVEMENT = 416,000 SQUARE FEET
TOTAL = 472,718 SQUARE FEET

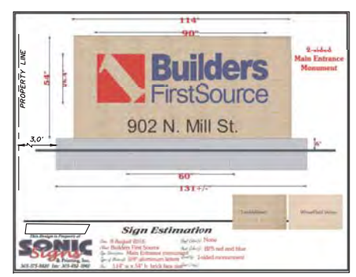
INTERIOR LANDSCAPING REQUIRED:
23,092 SQUARE FEET OF PAVING X 8% = 1,847 SQUARE FEET
INTERIOR LANDSCAPING PROVIDED = 3,750 SQUARE FEET

LEGEND

- PROPERTY LINE
- NEW LOT LINE
- EASEMENT LINE
- PROPOSED 8' SOLID WOOD FENCE.
- LIGHT STANDARD
- EX. FH — EXISTING FIRE HYDRANT
- NEW CONCRETE PAVEMENT 6" THICK 3,500 PSI CONCRETE PAVEMENT ON COMPACTED AND PROOF-ROLLED SUBGRADE WITH No. 3 REBAR @ 18" EWOC
- EXISTING CONCRETE PAVEMENT



SECTION "A"–"A"
NTS



OWNER / DEVELOPER:
BUILDERS FIRSTSOURCE
MR. CHRIS HOLMES
2230 AVENUE J
ARLINGTON, TEXAS 76006
(817) 822-0917

APPLICANT/ENGINEER/SURVEYOR:
GONZALEZ & SCHNEEBERG
MR. ROBERT SCHNEEBERG
660 N. CENTRAL, SUITE 250
PLANO, TEXAS 75074
(972) 516-8855

DEVELOPMENT PLAN
FOR
BUILDERS FIRSTSOURCE
KEALY PARK ADDITION
PROPOSED LOT 1R, BLOCK A
CONTAINING
17.007 ACRES
EXISTING ZONING: LIGHT INDUSTRIAL
PROPOSED ZONING: WAREHOUSE WITH S.U.P.

C1

PROJ. NO.: 6299-14-06-02

Gonzalez & Schneeberg engineers ▪ surveyors
660 N. Central Expressway
Suite 250, Plano, Texas 75074
(972) 516-8855 Fax:(972) 516-8901

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
GSES	GSES	MAY 2016	1" = 50'			

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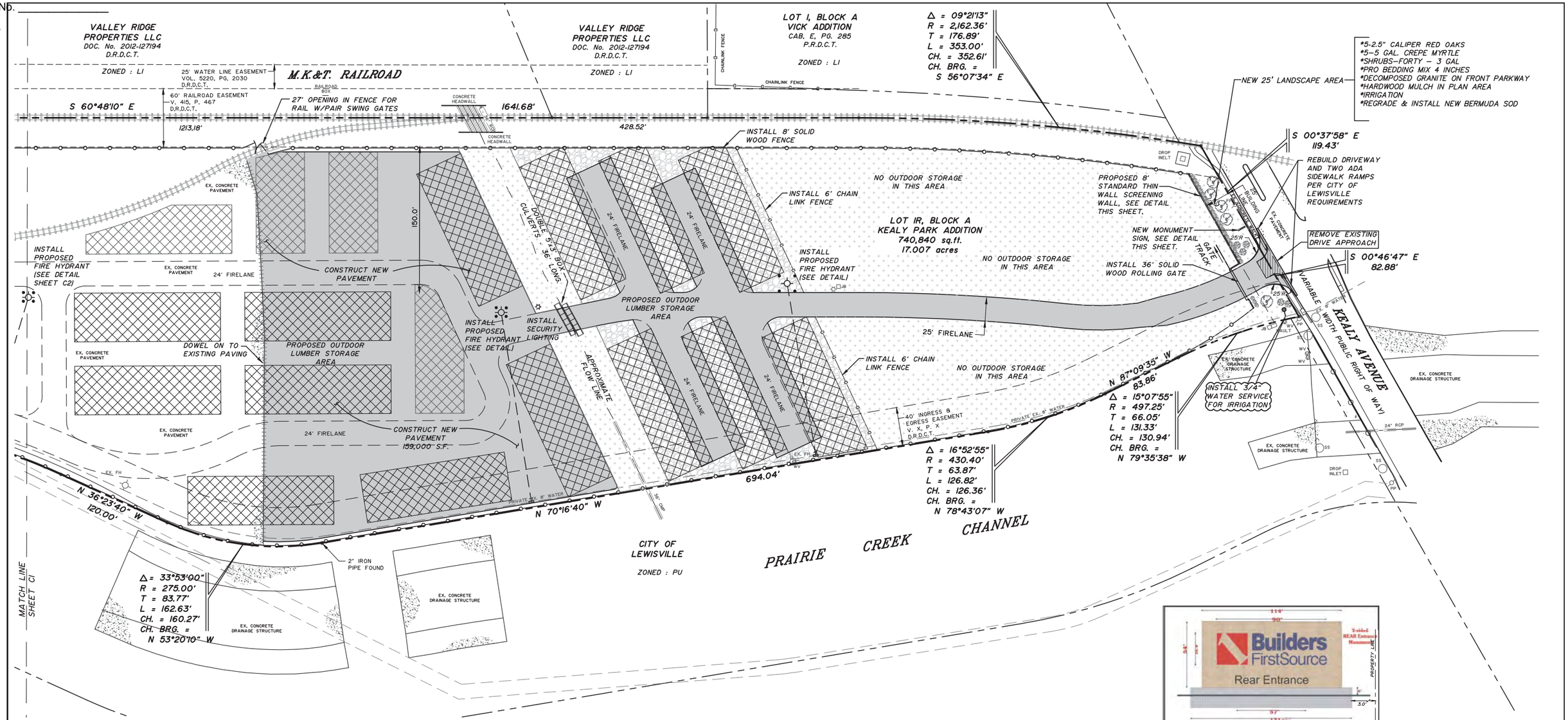
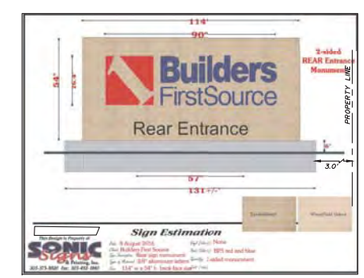
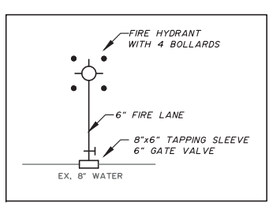




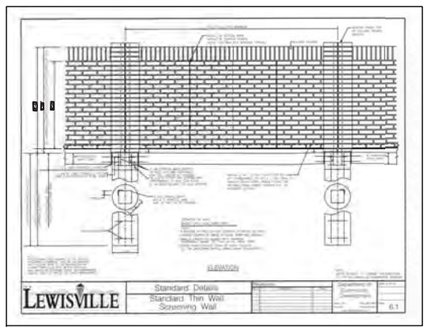


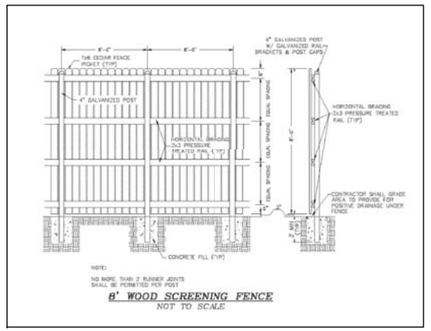
DETAIL OF FIRE HYDRANT

NTS

LEGEND

- PROPERTY LINE
- NEW LOT LINE
- EASEMENT LINE
- PROPOSED 8' SOLID WOOD FENCE.
- LIGHT STANDARD
- EX. FH — EXISTING FIRE HYDRANT
- NEW CONCRETE PAVEMENT 6" THICK 3,500 PSI CONCRETE PAVEMENT ON COMPACTED AND PROOF-ROLLED SUBGRADE WITH No. 3 REBAR @ 18" EWOC
- EXISTING CONCRETE PAVEMENT
- PROPOSED LUMBER STACKS 50'x150'x20' HIGH (MAXIMUM).
- GRASS AREA
- 8" FLEX BASE





50 0 50 100
Scale in Feet

DEVELOPMENT PLAN
FOR
BUILDERS FIRSTSOURCE
KEALY PARK ADDITION
PROPOSED LOT 1R, BLOCK A
CONTAINING
17.007 ACRES
EXISTING ZONING: LIGHT INDUSTRIAL
PROPOSED ZONING: WAREHOUSE WITH S.U.P.

C2

PROJ. NO.: 6299-14-06-02

Gonzalez & Schneeberg
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(972) 516-8855 Fax:(972) 516-8901

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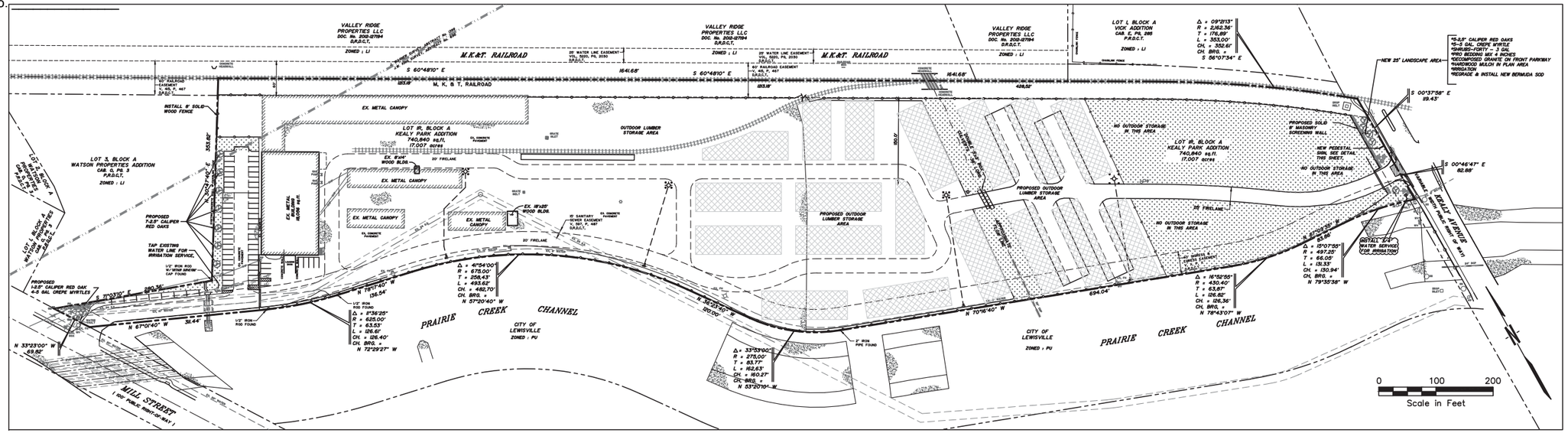
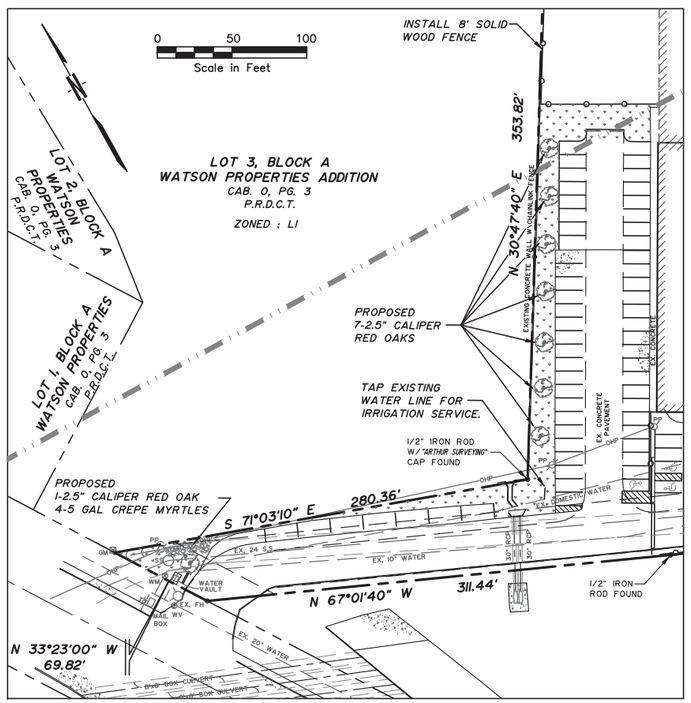
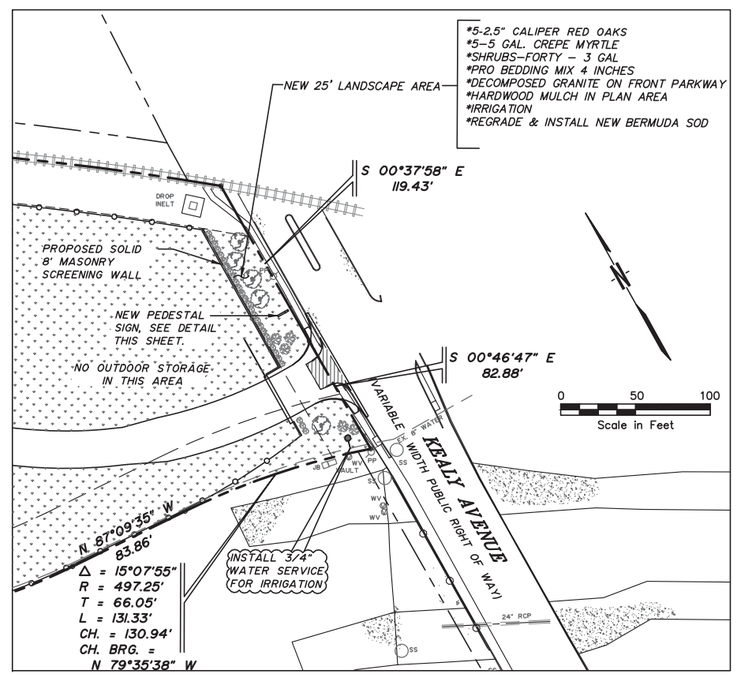


OVERALL SITE PLAN



MILL STREET DETAIL



KEALY AVENUE DETAIL

CITY OF LEWISVILLE LANDSCAPE REQUIREMENTS COMPLIANCE

A LANDSCAPE STRIP SHALL BE PROVIDED ADJACENT TO ALL PUBLIC AND PRIVATE STREETS. THE LANDSCAPE STRIP SHALL BE A MINIMUM OF 10 FEET, EXCLUSIVE OF STREET RIGHT-OF-WAY.
LANDSCAPE STRIP REQUIRED - MINIMUM 10' WIDTH
PROVIDED - 25' WIDTH

WITHIN THE LANDSCAPED STRIP, ONE SHADE TREE (2.5" CALIPER MINIMUM SHALL BE PROVIDED PER FIVE HUNDRED SQUARE FEET OF REQUIRED LANDSCAPE STRIP.
STREET TREES: REQUIRED - 272' FRONTAGE (TIMES) 10' (DIVIDED BY) 500 S.F.= 6 TREES
PROVIDED - 6 TREES (2.5" CAL MIN.)

WHERE PARKING LOTS AND DRIVES ABUT THE LANDSCAPE STRIP ALONG STREET RIGHT-OF-WAY, EVERGREEN SHRUBS MUST BE PROVIDED FOR SCREENING. THE SCREENING MUST BE A MINIMUM OF 3' HIGH AND EXTEND ALONG THE ENTIRE STREET FRONTAGE OF THE PARKING LOT.
PARKING LOT SCREENING: NOT APPLICABLE

INTERIOR PARKING AREAS SHALL BE LANDSCAPED IN ADDITION TO THE REQUIRED LANDSCAPED STRIP. TREES MUST BE PROVIDED IN EACH PARKING LOT AT A MINIMUM AVERAGE DENSITY OF ONE SHADE TREE (2.5" CALIPER MINIMUM) FOR EACH 15 PARKING SPACES.
PARKING LOT TREES: REQUIRED- 68 PARKING SPACES (DIVIDED BY) 15 = 5 TREES
PROVIDED- 7 TREES (2.5" CAL.)

ADDITIONALLY, INTERIOR PARKING LOT LANDSCAPING SHALL BE PROVIDED. TO CALCULATE THE TOTAL PARKING AREA AND THE SUBSEQUENT PERCENTAGE OF REQUIRED INTERIOR LOT LANDSCAPING, TOTAL THE SQUARE FOOTAGE OF PARKING SPACES, PLANTING ISLANDS, CURBED AREAS AND ALL INTERIOR DRIVEWAYS AND AISLES EXCEPT THOSE WITH NO PARKING SPACES LOCATED ON EITHER SIDE.
INTERIOR LANDSCAPING: REQUIRED: PARKING AREA WITH DRIVEWAY = 23,092 SF X 0.08 = 1,847 SF
PROVIDED: 3,750 S.F.

SITE DATA SUMMARY TABLE - BUILDERS FIRST SOURCE

LOT AREA = 17.007 ACRES

MAIN BUILDING SQUARE FOOTAGE = 18,056 SQUARE FEET
WAREHOUSE SPACE = 14,056 SQUARE FEET
OFFICE SPACE = 4,000 SQUARE FEET
BUILDING HEIGHT = 25 FEET
STORIES = ONE

WOODEN BUILDING "A"= 112 SQUARE FEET
WOODEN BUILDING "B"= 450 SQUARE FEET

OUTSIDE STORAGE = 270,000 SQUARE FEET (36.5%)

REQUIRED SETBACKS:
FRONT = 25 FEET
SIDE = 0 FEET
REAR = 0 FEET

PARKING REQUIRED:
WAREHOUSE: 14,056/1,000 (1 SPACE PER 1,000 S.F.) = 15 SPACES
OFFICE: 4,000 + 112 + 450 = 4562/200 (1 SPACE PER 200 S.F.) = 23 SPACES
TOTAL REQUIRED = 38 SPACES
PARKING PROVIDED = 68 SPACES TOTAL (INCLUDES 3 HANDICAPPED SPACES)

IMPERVIOUS AREAS:
BUILDING = 18,618 SQUARE FEET
CANOPIES = 38,100 SQUARE FEET
PAVEMENT = 416,000 SQUARE FEET
TOTAL = 472,718 SQUARE FEET

INTERIOR LANDSCAPING REQUIRED:
23,092 SQUARE FEET OF PAVING X 8% = 1,847 SQUARE FEET
INTERIOR LANDSCAPING PROVIDED = 3,750 SQUARE FEET

PLANT LEGEND

COMMON NAME:	SCIENTIFIC NAME:	SIZE:
SHUMARD RED OAK	QUERCUS SHUMARDII	2.5" CAL.
CREPE MYRTLE	---	3 GALLON
DWARF BURFORD	ILEX CORNUTA BURFORD NANA	3 GAL.-36" O.C.
GROUNDCOVER: BERMUDA	CYNODON DACTYLON	HYDROMULCH

GONZALEZ & SCHNEEBERG ENGINEERS & SURVEYORS, INC. REGISTRATION F-9316
STATE OF TEXAS
ROBERT W. SCHNEEBERG
65352
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ROBERT W. SCHNEEBERG, P.E. 65352 ON 06/28/2016 . ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

PRELIMINARY
NOT FOR CONSTRUCTION
THIS DOCUMENT IS ISSUED FOR THE PURPOSE OF REVIEW, PERMITTING AND BIDDING. IT HAS NOT BEEN APPROVED FOR CONSTRUCTION BY THE CITY OF LEWISVILLE.

PLANS PREPARED UNDER THE DIRECT SUPERVISION OF ROBERT W. SCHNEEBERG, P.E. TEXAS REGISTRATION NO. 65352
DATE: 06/28/2016

APPLICANT/ENGINEER/SURVEYOR:
GONZALEZ & SCHNEEBERG
MR. ROBERT SCHNEEBERG
660 N. CENTRAL, SUITE 250
PLANO, TEXAS 75074
(972) 516-8855

OWNER / DEVELOPER:
BUILDERS FIRSTSOURCE
MR. CHRIS HOLMES
2230 AVENUE J
ARLINGTON, TEXAS 76006
(817) 822-0917

LANDSCAPE PLAN
FOR
BUILDERS FIRSTSOURCE
KEALY PARK ADDITION
PROPOSED LOT 1R, BLOCK A
CONTAINING
17.007 ACRES
EXISTING ZONING: LIGHT INDUSTRIAL
PROPOSED ZONING: WAREHOUSE WITH S.U.P.

L1

PROJ. NO.: 6293-14-05-16

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engineers ▪ surveyors
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Suite 250, Plano, Texas 75074
(972) 516-8855 Fax:(972) 516-8901

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
GSES	GSES	JUNE 2016	NOTED			

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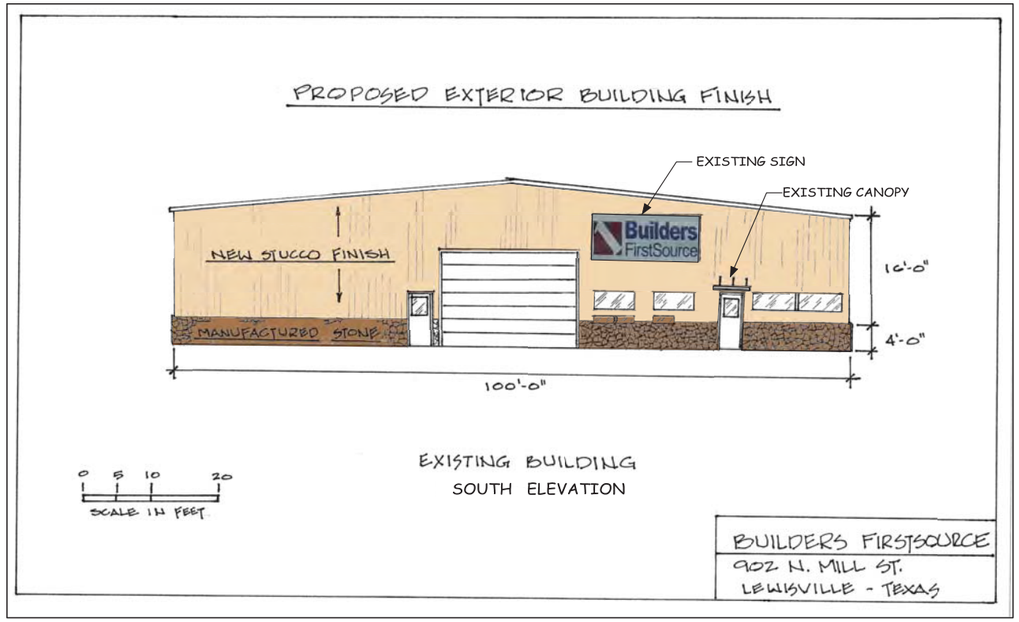
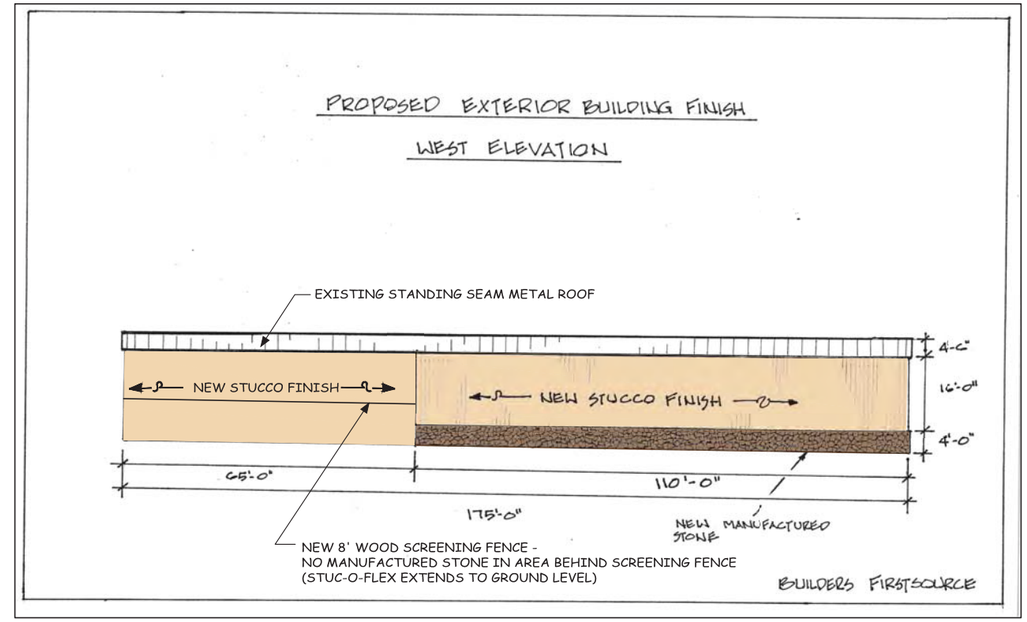




SPECIFICATION FOR NEW STUCCO FINISH

Stuc-O-Flex Elastomeric Acrylic Finish

STUC-O-FLEX®

Description:

Stuc-O-Flex is a highly resilient 100% Acrylic Polymer compound that looks and feels like traditional stucco. Its thermo-plastic and elastomeric nature allows building movement while maximizing resistance against cracks. It can be applied over traditional and one coat stucco, prepared concrete, masonry, brick, primed metal, EIFS, and Fiber-Cement sheathings. Stuc-O-Flex is available in virtually any color desired.

Stuc-O-Flex comes in 4 different textures; Fine, Sand, Modified, and Putz. Aggregate size in each finish as well as application method determines the texture and coverage of each product. See Colors and Textures for samples.

Color:

20 standard colors, see color chart for specifics. Special colors available upon request, virtually no limit to selection; see color chart for special color formulation policy.

Use:

Stuc-O-Flex is used as a weathering membrane, finishing texture and color coat on the Waterway Drainable Stucco Assembly, as well as stucco, EIFS, direct-applied systems, and a wide variety of surfaces including metal, cementitious sheathings, block, brick, masonry, etc. Stuc-O-Flex can also be used over a variety of other common substrate materials.

Mixing:

Mix at a low speed with paddle type mixer and 1/2" drill to assure uniform consistency prior to use. Small amounts of clean potable water can be added to the Stuc-O-Flex finish to aid workability (maximum 16 oz.) Spraying the finish may require thinning with water, approximately 8 -16 ounces of water per pail.

Physical Properties:

TEST	METHOD	RESULT
ELONGATION % (FINISH)		150 Percent
WATER VAPOR TRANSMISSION	ASTM-E96	11 GRAMS PER HOUR / SQ. FT. (AVERAGE)
SALT SPRAY RESISTANCE	B-117	300 HOURS NO DELETERIOUS EFFECT
ACCELERATED WEATHERING	D-25-91	2000 HOURS NO DELETERIOUS EFFECTS
ABSORPTION FREEZE/ THAW	D-CYCLES	NO CRACKING, CHECKING
TENSILE BOND	ASTM C-297	122 lb PSI
WATER PENETRATION TEST	ASTM-E-331	NO WATER PENETRATION OCCURRED ON SUBSTRATE
WATER RESISTANCE TEST	ASTM D-2247	NO CRACKING, BLISTERING, PEELING OR COMPOUNDS
MILDEW / FUNGUS RESISTANCE	810 B	NO MILD OR MILDEW GROWTH DURING TEST
WIND DRIVEN RAIN	-	NO DELAMINATION, NO WATER INTRUSION
FIRE TESTING TUNNEL TEST	ASTM E-84	FLAME SPREAD = 25 SMOKE DEVELOPED = 450 CLASS "A" FIRE RATED

Adhesion:

Excellent adhesion to properly prepared approved surfaces.

Coverage Rates:

Approximately 125 - 150 square feet per pail for sand finish @ a nominal 1/16 inch. Heavier textures will affect coverage rates.

Drying Time:

Typical dry time is 24 hours, depending on climate. Drying time can be greatly affected by low temperatures and/or high humidity. Do not allow product to freeze or allow exposure to rain while drying. Allow additional time during humid and/or cold temperatures.

Storage:

Protect from freezing. Store in a cool, dry area out of direct sunlight in tightly sealed containers. Recommended storage temperature between 40-90°F.

Clean-up:

Water soluble when wet. Clean tools and equipment with water immediately after use. Dried material is very difficult to remove.

Shelf Life:

One year, if protected from direct sunlight and freezing temperatures.

Limitations:

1. Ambient and surface temperatures must be above 40°F during application and drying period.
2. Stuc-O-Flex should never be used on horizontal surfaces.
3. Product performance is directly related to substrate integrity.
4. Stuc-O-Flex is a vertical wall coating. Small areas can be sloped; those surfaces shall be minimum 4 in 12 pitch.

Never cover Stuc-O-Flex finish with solvent based materials.
Never use below grade or on horizontal surfaces. (exceptions – ceilings, soffits, etc.)

Container:

60 pounds net weight / 5-gallon pail

Surface Preparation:

Substrate must be clean, dry, above freezing and free from all loose or foreign materials prior to application, including rust, mildew, dust, dirt and oils. Remove all loose surface materials using high pressure wash (>3000 psi), sandblast or mechanical bristle brush.

Application:

Apply only to clean, dry and prepared surfaces. Application of Stuc-O-Flex varies greatly depending on the desired texture. Usually, the finish is troweled on and textured with plastic floats. Stuc-O-Flex can also be sprayed on with proper equipment. Minimum thickness shall be 1/16 inch without voids. Apply in color and texture as approved by Architect and/or Client with sufficient manpower and equipment to ensure a continuous operation without cold joints, scaffolding lines, etc. Work from a wet edge or break to prevent cold joints. Avoid application of different batches side by side (always box pails from different batch numbers). Always check color for proper match prior to application. Ambient temperatures shall be 40°F or greater at time of installation, and will remain so for a minimum 24 hours or protection and heat must be supplemented to ensure proper drying.

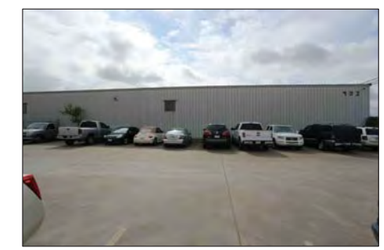
Stuc-O-Flex International can not be held responsible for color variations from batch to batch, fading resulting from natural causes, substrate or application deficiencies.

Manufacturer:

Stuc-O-Flex International, Inc.
17639 NE 67th Court
Redmond, WA 98052
1-800-305-1045
1-425-885-5085
1-425-869-0107 Fax
Info@stucoflex.com (E-mail)
www.stucoflex.com (Web page)

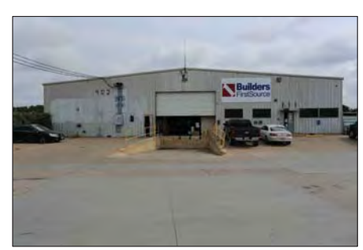
EXISTING

WEST



ELEVATION

EXISTING EAST ELEVATION



EXISTING SOUTH ELEVATION

EXISTING NORTH ELEVATION

BUILDING ELEVATIONS
FOR
BUILDERS FIRSTSOURCE
KEALY PARK ADDITION
PROPOSED LOT 1R, BLOCK A
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17.007 ACRES
EXISTING ZONING: LIGHT INDUSTRIAL
PROPOSED ZONING: WAREHOUSE WITH S.U.P.

C3

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DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
GSES	GSES	MAY 2016	1" = 50'			

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Illustrative Exterior Color and Material Samples

- Whetstone

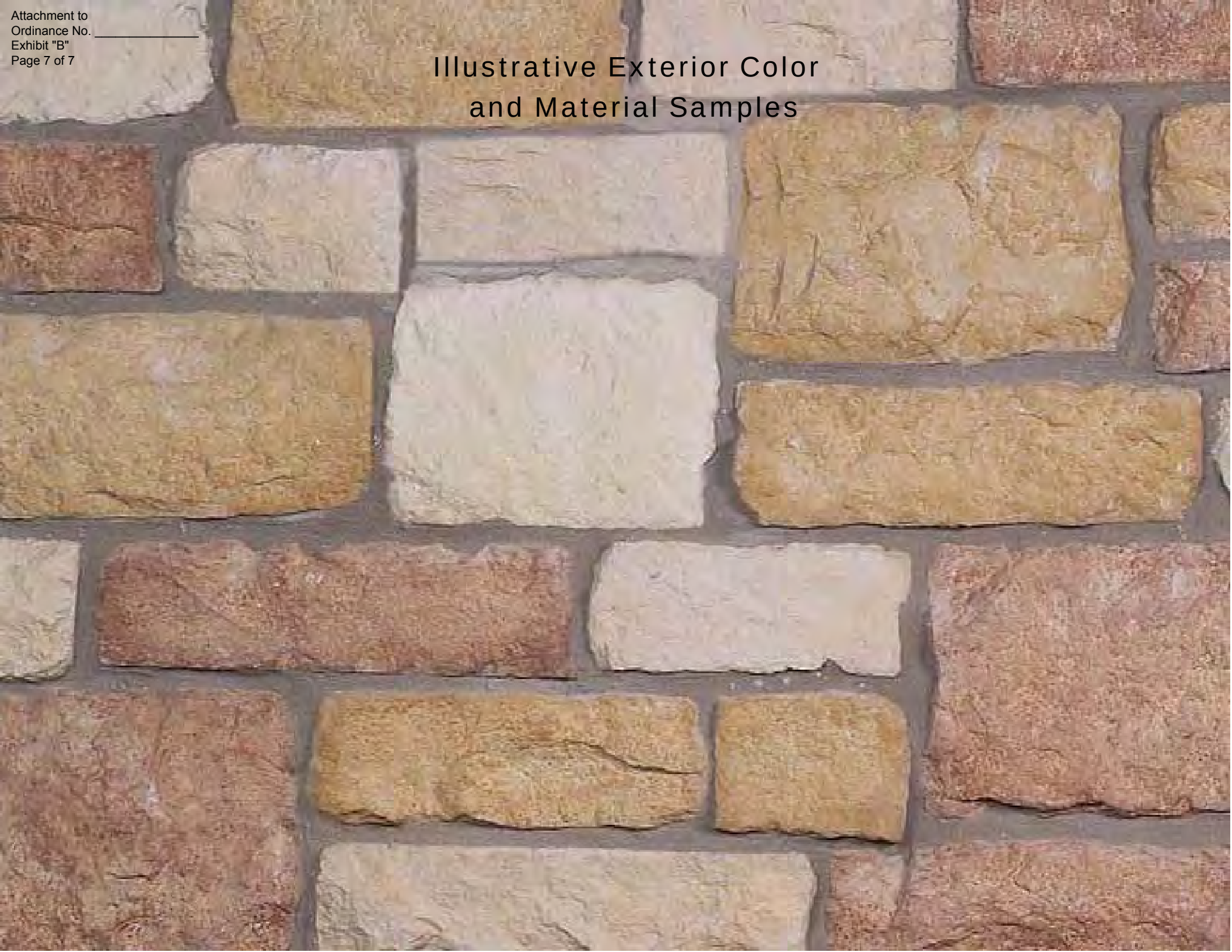
315

- Sandstone

317

- Autumn

Illustrative Exterior Color and Material Samples



MEMORANDUM

TO: Donna Barron, City Manager

FROM: Cleve Joiner, Director of Neighborhood Services

VIA: Claire Swann, Assistant City Manager

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of Deeming Substandard a Single Family Dwelling Located at 729 Red Wing Drive, Timberbrook 4 Subdivision, Block A, Lot 2, Lewisville, Texas.**

BACKGROUND

On October 18, 2015, a two-alarm fire substantially damaged a single family residence located at 729 Red Wing Drive. The Building Official has determined that the structure is substandard. The Lewisville City Code requires that a public hearing be held in order for City Council to deem the structure as substandard. The previous owner of record is Melva J. McFerren, who is deceased. Patricia (daughter) and Patrick Malone are the current owners of the property, although the property is now in foreclosure by Bank of America.

After the fire, the owners never made needed repairs and the structure was left burned-out with no roof for a year. Due to continued deterioration and exposure to the elements, the condition of the structure has worsened. The structure cannot be brought up to minimum code standards without costly remodeling or demolition. The Owners have represented that they are willing to demolish the property, but only after City Council deems the structure substandard. Bank of America's attorney has verbally stated that they do not have any objections to demolition.

ANALYSIS

The Lewisville City Code, Article VII. Substandard Buildings-Section 4-241 states in part:

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in Section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

The following conditions were found to exist in violation of minimum standards of the Lewisville City Code, Article VI, Section 4-311 (13) and are submitted as evidence of the structure's substandard condition:

1. General dilapidation and improper maintenance of exterior materials.
2. Deteriorated or ineffective waterproofing of exterior walls, roof, foundations or floors, including broken windows or doors.
3. Defective or lack of weather protection for exterior wall coverings, including lack of paint, or weathering due to lack of paint or other approved protective covering.
4. Broken, rotten, split or buckled exterior wall coverings or roof coverings.

Required notices have been provided to the owner and all lienholders. Contact has been made with the owners by certified letters, phone, and email. Letters notifying the property owners of substandard conditions on their property were sent on the following dates:

1. March 24, 2016 (substandard notice)
2. June 23, 2016 (2nd substandard notice)
3. October 10, 2016 (Public Hearing Notice)

The time between the fire, the initial substandard notification letter, and subsequent letters is due to the discovery that the owner of record was deceased. Then, once the new homeowners were identified, they were making progress with the insurance company to bring the property out of substandard condition. Although an insurance check has now been issued to the owners, the property is in foreclosure and the owner has advised that hold-ups are due to continued negotiations with the lienholder (Bank of America). Although this particular case has been difficult given the many moving parts, staff has recently worked with the legal department to develop a more stream-lined substandard process. We expect to bring these substandard cases to you more quickly in the future.

RECOMMENDATION

It is City staff's recommendation that the single family structure be deemed substandard as set forth in the caption above.

Sub Standard Property
729 Red Wing Dr - Burnout
41 Violations

Sub Standard Property
729 Red Wing Dr - Burnout
41 Violations

NOTICE OF
PUBLIC HEARING

NOTICE is hereby given to all interested parties that the Lewisville City Council will hold a Public Hearing to determine if the residential structure located at Consideration of Deeming Substandard a Single Family Dwelling Located at 729 Red Wing Drive, Timberbrook 4 Subdivision, Block A, Lot 2, Lewisville, Texas Denton County is substandard as defined in the City of Lewisville Code of Ordinances, Chapter 4, Article VII.

The Public Hearing will be held at 7:00 PM on Monday, October 17, 2016 at the Lewisville City Hall building located at 151 West Church Street, in the City Council Chambers.

Cleve Joiner
Director of Neighborhood Services
972-219-3471

Denton Publishing Company

Order Confirmation

Customer:	LEWISVILLE CITY LEGAL	**Customer Account:**	100042771
Ad Order #:	0001562447	**PO Number:**	
Sales Rep:	Julie Hammond	**Order Taker:**	Julie Hammond

Net Amount:	$24.10	**Tax Amount:**	$0.00	**Total Amount:**	$24.10
Payment Method:	Check/Money Order	**Payment Amount:**	$0.00	**Amount Due:**	$24.10

Ad Order #: 0001562447

Ad Number: 0001562447-01

Color:

Ad Size: 1 X 33 li

WYSIWYG Content

CITY OF LEWISVILLE

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Cleve Joiner
Director of
Neighborhood Services
972-219-3471

drc 10/6/2016

Run Dates		Product	Placement/Classification - Position
			Sort Text
Publish Date:	10/06/2016	DP Denton Record	DP C-Legals - DP LG Legals
Stop Date:	10/06/2016		LGL-729 RED WING DRIVE, TIMBERBROOK 4
Publish Date:	10/06/2016	DP Denton RC.com	DP C-Legals - DP LG Legals
Stop Date:	11/05/2016		LGL-729 RED WING DRIVE, TIMBERBROOK 4

October 4, 2016

TO: **E-MAIL: classads@dentonrc.com**
jhammond@dentonrc.com
pmadewell@dentonrc.com

FROM: **Cleve Joiner, CITY OF LEWISVILLE**
(972)219-3471 (OFFICE)
(972)219-3772 (FAX)

NO. OF PAGES: **2 – Three separate Notices**

PLEASE NOTE: PER CITY POLICY, IF THE COST OF A PUBLIC NOTICE TOTALS $1,000 OR MORE, A PURCHASE ORDER MUST BE OBTAINED; THEREFORE, PLEASE NOTIFY ME UPON RECEIPT OF THIS NOTICE, IF THE COST OF THIS ADVERTISEMENT WILL BE $1,000 OR MORE, SO I CAN PROVIDE YOU WITH A PURCHASE ORDER NUMBER FOR BILLING AND PAYMENT PURPOSES.

THANK YOU FOR YOUR COOPERATION.

PLEASE PUBLISH THE FOLLOWING NOTICE IN DENTON RECORD CHRONICLE AT LEAST 10 DAYS PRIOR TO October 17, 2016

NOTICE OF

PUBLIC HEARING

NOTICE is hereby given to all interested parties that the Lewisville City Council will hold a Public Hearing to determine if the residential structure located at 810 Foxwood Place, Serendipity Village Subdivision, Block 5, Lot 23, Lewisville, Texas Denton County is substandard as defined in the City of Lewisville Code of Ordinances, Chapter 4, Article VII.

The Public Hearing will be held at 7:00 PM on Monday, October 17, 2016 at the Lewisville City Hall building located at 151 West Church Street, in the City Council Chambers.

Cleve Joiner

Director of Neighborhood Services

972-219-3471

NOTICE OF
PUBLIC HEARING

NOTICE is hereby given to all interested parties that the Lewisville City Council will hold a Public Hearing to determine if the residential structure located at Consideration of Deeming Substandard a Single Family Dwelling Located at 729 Red Wing Drive, Timberbrook 4 Subdivision, Block A, Lot 2, Lewisville, Texas Denton County is substandard as defined in the City of Lewisville Code of Ordinances, Chapter 4, Article VII.

The Public Hearing will be held at 7:00 PM on Monday, October 17, 2016 at the Lewisville City Hall building located at 151 West Church Street, in the City Council Chambers.

Cleve Joiner
Director of Neighborhood Services
972-219-3471

NOTICE OF
PUBLIC HEARING

NOTICE is hereby given to all interested parties that the Lewisville City Council will hold a Public Hearing to determine if the residential structure located at Consideration of Deeming Substandard a Single Family Dwelling Located at 401 Village Drive, Serendipity Village Subdivision Block E, Lot 1, Lewisville, Texas, Denton County is substandard as defined in the City of Lewisville Code of Ordinances, Chapter 4, Article VII.

The Public Hearing will be held at 7:00 PM on Monday, October 17, 2016 at the Lewisville City Hall building located at 151 West Church Street, in the City Council Chambers.

Cleve Joiner
Director of Neighborhood Services
972-219-3471

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

City of Lewisville
Code Enforcement Division
151 W. Church Street • PO Box 299002
Lewisville, Texas 75029-9002
www.cityoflewisville.com

March 24, 2016 **CERTIFIED MAIL** 9314 8699 0430 0021 6454 13

MCFERREN, MELVA JOYCE
549 SURF ST
LEWISVILLE, TX 75067

Location: 729 RED WING DR **1ST Letter **

TIMBERBROOK 4 PH A BLK D LOT 2

As you may be aware, the Building Inspections Division is assigned the responsibility of enforcing the regulations contained in the Code of City of Lewisville. In that regard, for the health and safety of our community, it has come to our attention that the above described property is in violation of the following City of Lewisville ordinance(s). The purpose for this notice is to educate and achieve your voluntary compliance.

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

This property as described herein will be inspected on or after the following date to determine if the conditions have been corrected:

04/25/2016

Please be advised, failure to comply with City code requirements may result in the issuance of citations for the violation and such citations may be issued each and every day for which the violation exists.

If you have any questions, please contact me at the number listed below. Your prompt attention is greatly appreciated.

Respectfully,

Jim Daniel
Building Inspector
CONTACT NUMBER: (972)219-5029

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

City of Lewisville
Building Inspection Division
151 W. Church Street • PO Box 299002
Lewisville, Texas 75029-9002
www.cityoflewisville.com

June 23, 2016 **CERTIFIED MAIL** 9314 8699 0430 0024 3354 96

9314 8699 0430 0024 3354 96
PATRICIA AND PATRICK MALONE
1804 MORNING MIST TRAIL
FLOWER MOUND TEXAS 75028

Location: 729 RED WING DR—FINAL NOTICE

TIMBERBROOK 4 PH A BLK D LOT 2

As you may be aware, the Building Inspections Division is assigned the responsibility of enforcing the regulations contained in the Code of City of Lewisville. In that regard, for the health and safety of our community, it has come to our attention that the above described property is in violation of the following City of Lewisville ordinance(s). The purpose for this notice is to educate and achieve your voluntary compliance.

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As the result of a structure fire the roof is destroyed. The structure has no utilities: Water, Gas, or Electric.

This property as described herein will be inspected on or after the following date to determine if the conditions have been corrected:

07/25/2016

Please be advised, failure to comply with City code requirements may result in the issuance of citations for the violation and such citations may be issued each and every day for which the violation exists.

If you have any questions, please contact me at the number listed below. Your prompt attention is greatly appreciated.

Respectfully,

Jim Daniel
Building Inspector
CONTACT NUMBER: (972)219-5029

Certified Article Number

9314 8699 0430 0027 1057 06

SENDERS RECORD

LEWISVILLE

Deep Roots. Broad Wings. Bright Future.

October 4, 2016

Patricia and Patrick Malone
1804 Morning Mist Trail
Flower Mound, Texas 75028

Location: 729 Red Wing Dr.

SUBJECT: PUBLIC HEARING NOTICE (Copy Enclosed)

Please be advised, a public hearing will be held on October 17, 2016 at 7:00 p.m. as provided for in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. Substandard Structure.

At the public hearing, information will be presented to the City Council so that they may determine if the residential structure located at the above address is in fact substandard as defined in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. You will be required to submit at the hearing, proof of the scope of any work that may be required to comply with the ordinance and the time it will take to reasonably perform the work.

Demolish, rebuild or repairs to meet current codes and standards.

Due to the above stated conditions, the Building Inspection Division considers the structures substandard. If we can provide you with additional information please call 972-219-3470.

Sincerely,

Neighborhood Services Director
972-219-3470

City of Lewisville • Neighborhood Services
151 W. Church Street • Lewisville, TX 75057
972.219.3470 www.cityoflewisville.com

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Cleve Joiner, Director of Neighborhood Services

VIA: Claire Swann, Assistant City Manager

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of Deeming Substandard a Single Family Dwelling Located at 401 Village Drive, Serendipity Village Subdivision Block E, Lot 1, Lewisville, Texas.**

BACKGROUND

On September 17, 2015, a two-alarm fire substantially damaged a single family residence located at 401 Village Drive. The Building Official has deemed the structure substandard. The Lewisville City Code requires that a public hearing be held in order for City Council to deem the structure as substandard. The owner of record is Mark Kelly. Mr. Kelly has left the structure largely untouched since the fire. Code enforcement has had to mow his property on five separate occasions, and we have filed liens against his property for the incurred expenses. In addition, the property taxes with Denton County are two years in arrears.

Due to continued deterioration and exposure to the elements, the condition of the structure has worsened. The structure cannot be brought up to minimum code standards without costly remodeling or demolition. Mr. Kelly has stated to staff that he has no plans to demolish or repair the home.

ANALYSIS

Lewisville City Code, Article VII. Substandard Buildings-Section 4-241, states in part:

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in Section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

The following conditions were found to exist in violation of minimum standards of the Lewisville City Code, Article VI, Section 4-311 (13) and are submitted as evidence of the structure's substandard condition:

1. General dilapidation and improper maintenance of exterior materials.
2. Deteriorated or ineffective waterproofing of exterior walls, roof, foundations or floors, including broken windows or doors.
3. Defective or lack of weather protection for exterior wall coverings, including lack of paint, or weathering due to lack of paint or other approved protective covering.
4. Broken, rotten, split or buckled exterior wall coverings or roof coverings.

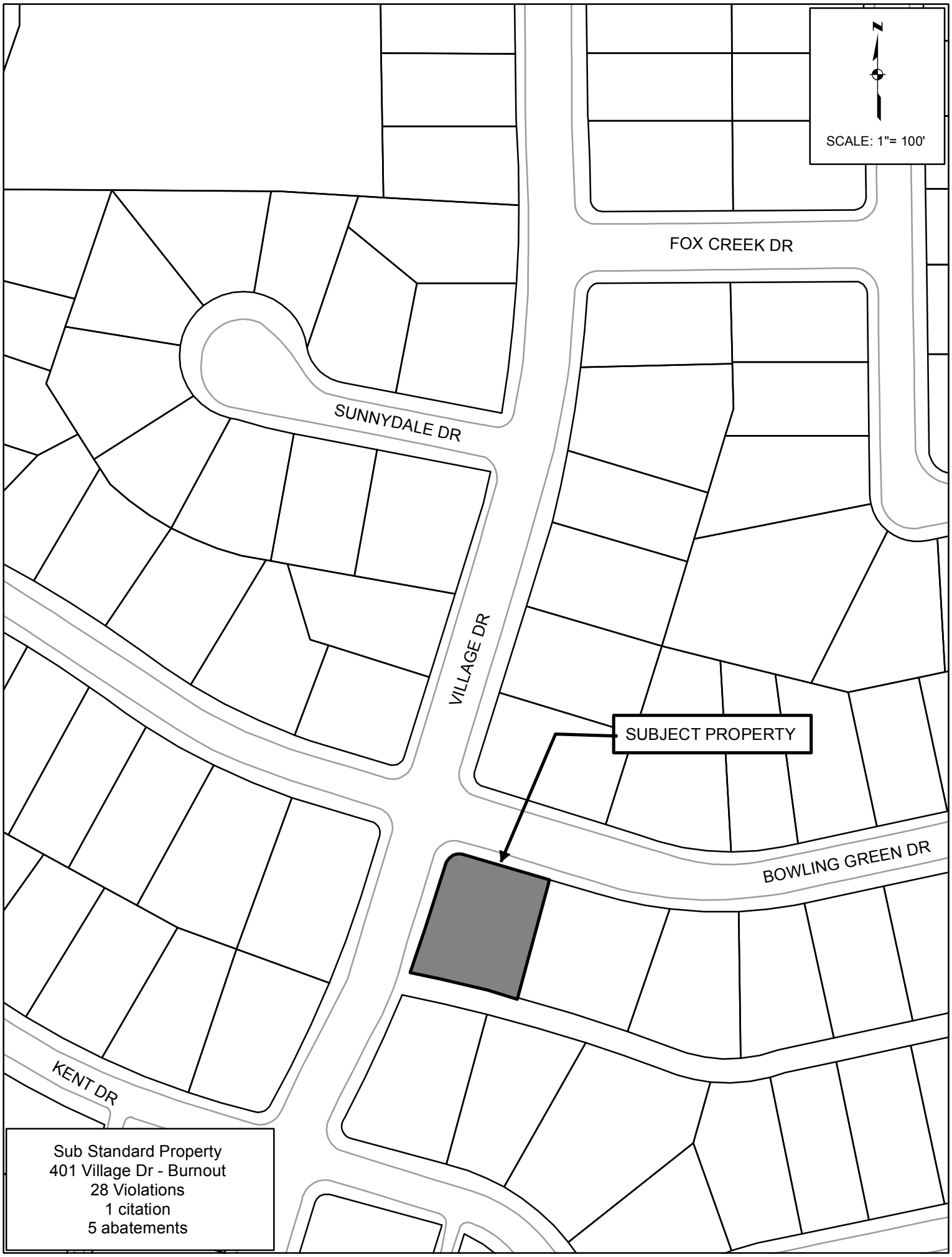
Required notices have been provided to the owner and all lienholders. Letters notifying the property owner of substandard conditions on their property were sent on the following dates:

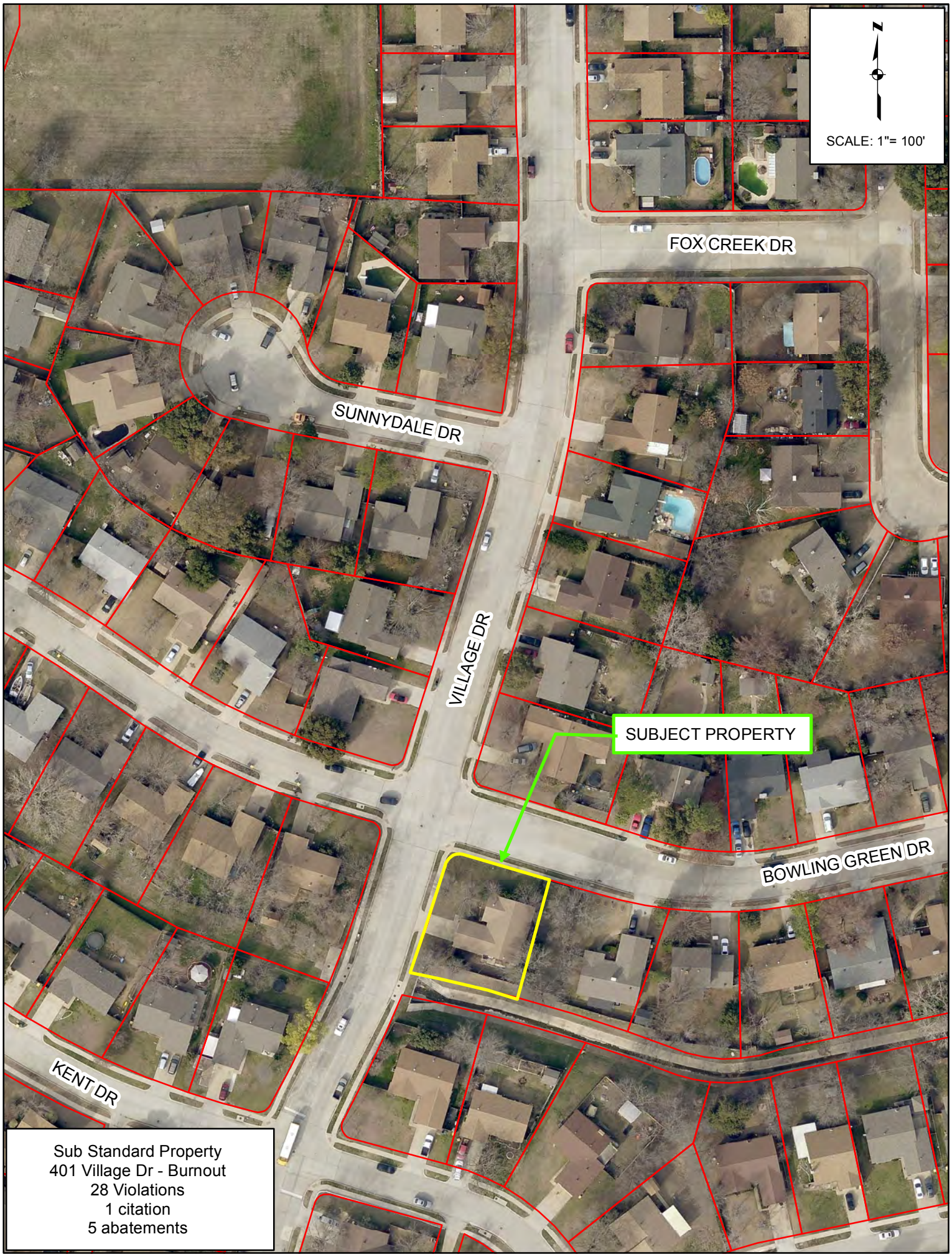
1. March 15, 2016 (substandard notice)
2. April 20, 2016 (2nd substandard notice)
3. October 10, 2016 (Public Hearing Notice)

The time between the fire, the initial substandard notification letter, and subsequent letters is due to the difficulty in locating the homeowner. The owner provided no forwarding address, email, or contact phone with any public or private agency (county, postal, utility, etc.). Although the difficulty in locating this property owner has been the primary reason for delay, staff has also recently worked with our legal department to develop a more stream-lined substandard process. We expect to bring these substandard cases to you more quickly in the future.

RECOMMENDATION

It is City staff's recommendation that the single family structure be deemed substandard as set forth in the caption above.


N
SCALE: 1"= 100'
FOX CREEK DR
SUNNYDALE DR
VILLAGE DR
SUBJECT PROPERTY
BOWLING GREEN DR
KENT DR
Sub Standard Property
401 Village Dr - Burnout
28 Violations
1 citation
5 abatements



Sub Standard Property
401 Village Dr - Burnout
28 Violations
1 citation
5 abatements

October 4, 2016

TO: **E-MAIL: classads@dentonrc.com**
jhammond@dentonrc.com
pmadewell@dentonrc.com

FROM: **Cleve Joiner, CITY OF LEWISVILLE**
(972)219-3471 (OFFICE)
(972)219-3772 (FAX)

NO. OF PAGES: **2 – Three separate Notices**

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THANK YOU FOR YOUR COOPERATION.

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The Public Hearing will be held at 7:00 PM on Monday, October 17, 2016 at the Lewisville City Hall building located at 151 West Church Street, in the City Council Chambers.

Cleve Joiner

Director of Neighborhood Services

972-219-3471

NOTICE OF
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Director of Neighborhood Services
972-219-3471

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Director of Neighborhood Services
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Cleve Joiner
Director of Neighborhood Services
972-219-3471

Denton Publishing Company

Order Confirmation

Customer:	LEWISVILLE CITY LEGAL	**Customer Account:**	100042771
Ad Order #:	0001562448	**PO Number:**	
Sales Rep:	Julie Hammond	**Order Taker:**	Julie Hammond

Net Amount:	$24.10	**Tax Amount:**	$0.00	**Total Amount:**	$24.10
Payment Method:	Check/Money Order	**Payment Amount:**	$0.00	**Amount Due:**	$24.10

Ad Order #: 0001562448

Ad Number: 0001562448-01

Color:

Ad Size: 1 X 33 li

WYSIWYG Content

CITY OF LEWISVILLE

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Cleve Joiner
Director of
Neighborhood Services
972-219-3471

DRC 10/6/2016

Run Dates		Product	Placement/Classification - Position
			Sort Text
Publish Date:	10/06/2016	DP Denton Record	DP C-Legals - DP LG Legals
Stop Date:	10/06/2016		LGL-401 VILLAGE DRIVE, SERENDIPITY VILLAGE
Publish Date:	10/06/2016	DP Denton RC.com	DP C-Legals - DP LG Legals
Stop Date:	11/05/2016		LGL-401 VILLAGE DRIVE, SERENDIPITY VILLAGE

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

City of Lewisville
Code Enforcement Division
151 W. Church Street • PO Box 299002
Lewisville, Texas 75029-9002
www.cityoflewisville.com

March 15, 2016 **CERTIFIED MAIL 9314 8699 0430 0021 4302 48**

KELLY, MARK O
401 VILLAGE DR
LEWISVILLE, TX 75067

Location: 401 VILLAGE DR

SERENDIPITY VILLAGE BLK E LOT 1

As you may be aware, the Building Inspections Division is assigned the responsibility of enforcing the regulations contained in the Code of City of Lewisville. In that regard, for the health and safety of our community, it has come to our attention that the above described property is in violation of the following City of Lewisville ordinance(s). The purpose for this notice is to educate and achieve your voluntary compliance.

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

This property as described herein will be inspected on or after the following date to determine if the conditions have been corrected:

04/15/2016

Please be advised, failure to comply with City code requirements may result in the issuance of citations for the violation and such citations may be issued each and every day for which the violation exists.

If you have any questions, please contact me at the number listed below. Your prompt attention is greatly appreciated.

Respectfully,

Jim Daniel
Building Inspector
CONTACT NUMBER: (972)219-5029

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

City of Lewisville
Building Inspection Division
151 W. Church Street • PO Box 299002
Lewisville, Texas 75029-9002
www.cityoflewisville.com

April 20, 2016

KELLY, MARK O
401 VILLAGE DR
LEWISVILLE, TX 75067

Location: 401 VILLAGE DR

SERENDIPITY VILLAGE BLK E LOT 1

As you may be aware, the Building Inspections Division is assigned the responsibility of enforcing the regulations contained in the Code of City of Lewisville. In that regard, for the health and safety of our community, it has come to our attention that the above described property is in violation of the following City of Lewisville ordinance(s). The purpose for this notice is to educate and achieve your voluntary compliance.

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This property as described herein will be inspected on or after the following date to determine if the conditions have been corrected:

05/20/2016

Please be advised, failure to comply with City code requirements may result in the issuance of citations for the violation and such citations may be issued each and every day for which the violation exists.

If you have any questions, please contact me at the number listed below. Your prompt attention is greatly appreciated.

Respectfully,

Jim Daniel
Building Inspector
CONTACT NUMBER: (972)219-5029

Certified Article Number

9314 8699 0430 0027 1056 83

SENDERS RECORD

LEWISVILLE

Deep Roots. Broad Wings. Bright Future.

October 4, 2016

Kelly, Mark O.
401 Village Dr.
Lewisville, TX 75067

Location: 401 Village Dr.

SUBJECT: PUBLIC HEARING NOTICE (Copy Enclosed)

Please be advised, a public hearing will be held on October 17, 2016 at 7:00 p.m. as provided for in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. Substandard Structure.

At the public hearing, information will be presented to the City Council so that they may determine if the residential structure located at the above address is in fact substandard as defined in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. You will be required to submit at the hearing, proof of the scope of any work that may be required to comply with the ordinance and the time it will take to reasonably perform the work.

Demolish, rebuild or repairs to meet current codes and standards.

Due to the above stated conditions, the Building Inspection Division considers the structures substandard. If we can provide you with additional information please call 972-219-3470.

Sincerely,

Neighborhood Services Director
972-219-3470

City of Lewisville • Neighborhood Services
151 W. Church Street • Lewisville, TX 75057
972.219.3470 www.cityoflewisville.com

ROAD CLOSED
TO
THRU TRAFFIC
568

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Cleve Joiner, Director of Neighborhood Services

VIA: Claire Swann, Assistant City Manager

DATE: October 17, 2016

SUBJECT: **Public Hearing: Consideration of Deeming Substandard a Single Family Dwelling Located at 810 Foxwood Place, Serendipity Village Subdivision, Block 5, Lot 23, Lewisville, Texas.**

BACKGROUND

On November 26, 2014, a two-alarm fire substantially damaged a single family residence located at 810 Foxwood Place. The Building Official has deemed the single family structure to be substandard. The owners of record are Brad and Cara Gill and Nancy and David Koehring. Mrs. Koehring is the main contact for the property. After the fire, the owners did not make necessary repairs, and the structure was left burned-out with no roof for almost two years. Code enforcement on three different occasions have had to mow this property, and we have filed liens against the property for our incurred expenses.

Due to continued deterioration and exposure to the elements, the condition of the structure has worsened. The structure cannot be brought up to minimum code standards without costly remodeling or demolition. Mrs. Koehring has repeatedly claimed to have scheduled demolition and/or repairs of the property, yet has continually failed to follow through.

ANALYSIS

Lewisville City Code, Article VII. Substandard Buildings-Section 4-241, states in part:

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in Section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

The following conditions were found to exist in violation of minimum standards of the Lewisville City Code, Article VI, Section 4-311 (13) and are submitted as evidence of the structure's substandard condition:

1. General dilapidation and improper maintenance of exterior materials.
2. Deteriorated or ineffective waterproofing of exterior walls, roof, foundations or floors, including broken windows or doors.
3. Defective or lack of weather protection for exterior wall coverings, including lack of paint, or weathering due to lack of paint or other approved protective covering.
4. Broken, rotten, split or buckled exterior wall coverings or roof coverings.

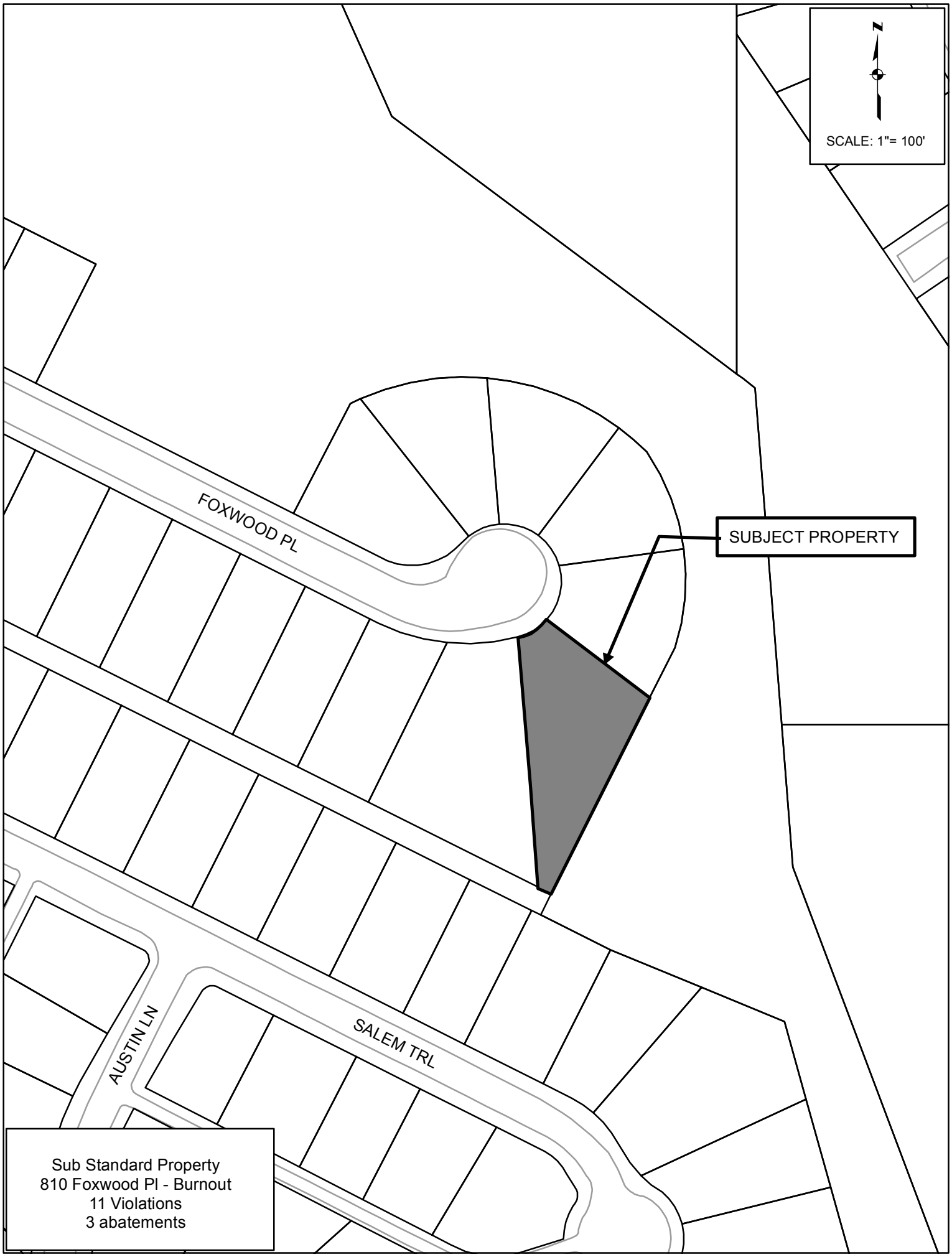
Required notices have been provided to the owner and all lienholders. Letters notifying the property owners of substandard conditions on their property were sent on the following dates:

1. February 9, 2016 (substandard notice - reissued)
2. March 15, 2016 (2nd substandard notice)
3. June 23, 2016 (3rd substandard notice)
4. October 10, 2016 (Public Hearing Notice)

The large time between the initial substandard notification letter and subsequent letters is due to the homeowner making minimal repairs to try to bring the property out of substandard condition. Progress ceased in late 2015, and we subsequently reissued our substandard letters. Since early 2016, no progress has been made to either repair or demolish the structure.

RECOMMENDATION

It is City staff's recommendation that the single family structure be deemed substandard as set forth in the caption above.


N
SCALE: 1"= 100'
FOXWOOD PL
SUBJECT PROPERTY
AUSTIN LN
SALEM TRL
Sub Standard Property
810 Foxwood Pl - Burnout
11 Violations
3 abatements

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11 Violations
3 abatements

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The Public Hearing will be held at 7:00 PM on Monday, October 17, 2016 at the Lewisville City Hall building located at 151 West Church Street, in the City Council Chambers.

Cleve Joiner
Director of Neighborhood Services
972-219-3471

October 4, 2016

TO: **E-MAIL: classads@dentonrc.com**
jhammond@dentonrc.com
pmadewell@dentonrc.com

FROM: **Cleve Joiner, CITY OF LEWISVILLE**
(972)219-3471 (OFFICE)
(972)219-3772 (FAX)

NO. OF PAGES: **2 – Three separate Notices**

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Director of Neighborhood Services

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Cleve Joiner
Director of Neighborhood Services
972-219-3471

Denton Publishing Company

Order Confirmation

Customer:	LEWISVILLE CITY LEGAL	**Customer Account:**	100042771
Ad Order #:	0001562445	**PO Number:**	
Sales Rep:	Julie Hammond	**Order Taker:**	Julie Hammond

Net Amount:	$22.70	**Tax Amount:**	$0.00	**Total Amount:**	$22.70
Payment Method:	Check/Money Order	**Payment Amount:**	$0.00	**Amount Due:**	$22.70

Ad Order #: 0001562445

Ad Number: 0001562445-01

Color:

Ad Size: 1 X 31 li

WYSIWYG Content

CITY OF LEWISVILLE

NOTICE OF PUBLIC HEARING

NOTICE is hereby given to all interested parties that the Lewisville City Council will hold a Public Hearing to determine if the residential structure located at 810 Foxwood Place, Serendipity Village Subdivision, Block 5, Lot 23, Lewisville, Texas Denton County is substandard as defined in the City of Lewisville Code of Ordinances, Chapter 4, Article VII.

The Public Hearing will be held at 7:00 PM on Monday, October 17, 2016 at the Lewisville City Hall building located at 151 West Church Street, in the City Council Chambers.

Cleve Joiner
Director of
Neighborhood Services
972-219-3471

drc 10/6/2016

Run Dates		Product	Placement/Classification - Position
			Sort Text
Publish Date:	10/06/2016	DP Denton Record	DP C-Legals - DP LG Legals
Stop Date:	10/06/2016		LGL-810 FOXWOOD PLACE, SERENDIPITY VILLAGE
Publish Date:	10/06/2016	DP Denton RC.com	DP C-Legals - DP LG Legals
Stop Date:	11/05/2016		LGL-810 FOXWOOD PLACE, SERENDIPITY VILLAGE

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

City of Lewisville
Code Enforcement Division
151 W. Church Street • PO Box 299002
Lewisville, Texas 75029-9002
www.cityoflewisville.com

March 24, 2016 **CERTIFIED MAIL** 9314 8699 0430 0021 6454 13

MCFERREN, MELVA JOYCE
549 SURF ST
LEWISVILLE, TX 75067

Location: 729 RED WING DR **1ST Letter **

TIMBERBROOK 4 PH A BLK D LOT 2

As you may be aware, the Building Inspections Division is assigned the responsibility of enforcing the regulations contained in the Code of City of Lewisville. In that regard, for the health and safety of our community, it has come to our attention that the above described property is in violation of the following City of Lewisville ordinance(s). The purpose for this notice is to educate and achieve your voluntary compliance.

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

This property as described herein will be inspected on or after the following date to determine if the conditions have been corrected:

04/25/2016

Please be advised, failure to comply with City code requirements may result in the issuance of citations for the violation and such citations may be issued each and every day for which the violation exists.

If you have any questions, please contact me at the number listed below. Your prompt attention is greatly appreciated.

Respectfully,

Jim Daniel
Building Inspector
CONTACT NUMBER: (972)219-5029

LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

City of Lewisville
Building Inspection Division
151 W. Church Street • PO Box 299002
Lewisville, Texas 75029-9002
www.cityoflewisville.com

June 23, 2016 **CERTIFIED MAIL** 9314 8699 0430 0024 3354 96

9314 8699 0430 0024 3354 96
PATRICIA AND PATRICK MALONE
1804 MORNING MIST TRAIL
FLOWER MOUND TEXAS 75028

Location: 729 RED WING DR—FINAL NOTICE

TIMBERBROOK 4 PH A BLK D LOT 2

As you may be aware, the Building Inspections Division is assigned the responsibility of enforcing the regulations contained in the Code of City of Lewisville. In that regard, for the health and safety of our community, it has come to our attention that the above described property is in violation of the following City of Lewisville ordinance(s). The purpose for this notice is to educate and achieve your voluntary compliance.

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

Any building or portion thereof which is determined to be an unsafe building in accordance with the building code adopted in section 4-26, or any building or portion thereof, including any dwelling unit, guest room or suite of rooms, or the premises on which the same is located, in which there exists any of the conditions listed in this article or not in compliance with section 4-151 et seq., to an extent that endangers the life, limb, health, property, safety or welfare of the public or the occupants thereof shall be deemed and hereby is declared to be a substandard building.

As the result of a structure fire the roof is destroyed. The structure has no utilities: Water, Gas, or Electric.

This property as described herein will be inspected on or after the following date to determine if the conditions have been corrected:

07/25/2016

Please be advised, failure to comply with City code requirements may result in the issuance of citations for the violation and such citations may be issued each and every day for which the violation exists.

If you have any questions, please contact me at the number listed below. Your prompt attention is greatly appreciated.

Respectfully,

Jim Daniel
Building Inspector
CONTACT NUMBER: (972)219-5029

Certified Article Number

9314 8699 0430 0027 3867 92

SENDERS RECORD

LEWISVILLE

Deep Roots. Broad Wings. Bright Future.

October 4, 2016

Nancy Koehring
420 E Bixby
Long Beach CA 90807-3430

Location: 810 Foxwood Pl.

SUBJECT: PUBLIC HEARING NOTICE (Copy Enclosed)

Please be advised, a public hearing will be held on October 17, 2016 at 7:00 p.m. as provided for in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. Substandard Structure.

At the public hearing, information will be presented to the City Council so that they may determine if the residential structure located at the above address is in fact substandard as defined in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. You will be required to submit at the hearing, proof of the scope of any work that may be required to comply with the ordinance and the time it will take to reasonably perform the work.

Demolish, rebuild or repairs to meet current codes and standards.

Due to the above stated conditions, the Building Inspection Division considers the structures substandard. If we can provide you with additional information please call 972-219-3470.

Sincerely,

Neighborhood Services Director
972-219-3470

City of Lewisville • Neighborhood Services
151 W. Church Street • Lewisville, TX 75057
972.219.3470 www.cityoflewisville.com

Certified Article Number

9314 8699 0430 0027 1057 82

SENDERS RECORD

LEWISVILLE

Deep Roots. Broad Wings. Bright Future.

October 4, 2016

Cara and Brad Gill
201 College Park Dr.
Seal Beach, CA 90740-2530

Location: 810 Foxwood Pl.

SUBJECT: PUBLIC HEARING NOTICE (Copy Enclosed)

Please be advised, a public hearing will be held on October 17, 2016 at 7:00 p.m. as provided for in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. Substandard Structure.

At the public hearing, information will be presented to the City Council so that they may determine if the residential structure located at the above address is in fact substandard as defined in the City of Lewisville, Texas, Code of Ordinances, Chapter 4, Article VII. You will be required to submit at the hearing, proof of the scope of any work that may be required to comply with the ordinance and the time it will take to reasonably perform the work.

Demolish, rebuild or repairs to meet current codes and standards.

Due to the above stated conditions, the Building Inspection Division considers the structures substandard. If we can provide you with additional information please call 972-219-3470.

Sincerely,

Neighborhood Services Director
972-219-3470

City of Lewisville • Neighborhood Services
151 W. Church Street • Lewisville, TX 75057
972.219.3470 www.cityoflewisville.com

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Claire Swann, Assistant City Manager

DATE: October 11, 2016

SUBJECT: **Approval of a First Amendment to Agreement By and Between City of Lewisville, Texas and City of Farmers Branch, Texas Regarding the Expansion of the Camelot Landfill.**

BACKGROUND

On January 6, 2016, the City of Lewisville and City of Farmers Branch entered into an agreement relating to the expansion of the Camelot Landfill (the "Settlement Agreement"). Among the other terms of that Agreement, Farmers Branch was required to seek zoning and site plan approval from the City of Lewisville for such expansion. This required compliance with all of City of Lewisville development regulations unless otherwise addressed in the Settlement Agreement. The Settlement Agreement did not specifically address tree mitigation or escrow requirements for the Huffines extension. Farmers Branch requests consideration of an amendment to the Settlement Agreement to address these two issues.

ANALYSIS

Tree Mitigation

Under the Lewisville Development Code, to remove 5,491 caliper inches of protected trees, Farmers Branch would be required to pay $2,856,500 of tree mitigation costs. In discussions with Lewisville's management, an alternative was proposed whereby Farmers Branch and Camelot Landfill would allow Lewisville residents the right to dispose of solid waste one time per month free of charge for the life of the landfill. Residents could begin dropping off their solid waste following the closure of the DFW Recycling and Disposal Facility--the landfill that currently accepts solid waste from Lewisville residents. Staff anticipates that DFW Recycling and Disposal will close in eight years, and this disposal service from Camelot would continue a service currently offered to our residents for the then remaining life of the Camelot Landfill (approximately 31 years). Staff has examined the long-term financial benefits to the City of Lewisville for this service. Using the 2015 tonnage dropped-off by residents at the DFW Recycling and Disposal facility, a 0.5% per ton tipping fee increase per year, and a conservative 1% increase in tonnage disposed by Lewisville residents per year, the total cost to Farmers Branch will ultimately exceed the tree mitigation costs. See the attached excel spreadsheet for the calculations over the life of the landfill.

Huffines Extension Escrow & Dedication

Farmers Branch has also requested that it be allowed to retain road escrow funds relating to the construction of Huffines Extension until such time as the funds are needed to pay for design and construction. The Huffines Extension is planned to connect Stonewall Drive and the new Corporate Drive which we expect to be complete by 2021. Farmers Branch is required to dedicate the right-of-way and escrow $700,000 for the construction and design of the road. Road escrow funds are typically deposited prior to approval of a plat and engineering site plan. Farmers Branch requests that they be allowed to retain the escrow funds until such time as the City of Lewisville begins design and construction of the Huffines Extension. Under the First Amendment to the Settlement Agreement, Farmers Branch will appropriate and set aside the $700,000 in a special project account for the design and construction of the Huffines Extension. Lewisville will retain any interest earned on such monies, and within five days of Lewisville's request, Farmers Branch will provide the escrow funds and any income and interest earned to Lewisville. Given that Farmers Branch is a governmental entity, city staff can support this request.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the First Amendment to Agreement as set forth in the caption above.

FIRST AMENDMENT TO AGREEMENT BY AND BETWEEN CITY OF LEWISVILLE, TEXAS AND CITY OF FARMERS BRANCH, TEXAS REGARDING THE EXPANSION OF THE CAMELOT LANDFILL

This First Amendment to Agreement by and between City of Lewisville, Texas ("Lewisville") and City of Farmers Branch, Texas ("Farmers Branch"), both being Texas home rule municipalities and herein collectively referred to as "the Parties," regarding the expansion of Camelot Landfill ("First Amendment") is dated and effective as of the __ day of _____, 2016 (the "Effective Date").

RECITALS

WHEREAS Farmers Branch currently owns a tract of land located in Lewisville, Denton County, Texas, utilized as a Type I municipal solid waste landfill otherwise known as "Camelot Landfill" (the "Landfill") pursuant to Texas Commission on Environmental Quality ("TCEQ") Permit No. 1312A; and

WHEREAS Farmers Branch is currently seeking a permit amendment from the TCEQ to expand the lateral and vertical limits and thereby expand the capacity of the Landfill ("the Project") pursuant to TCEQ Permit Application No. 1312B (the "Application"); and

WHEREAS the Parties previously entered into that certain Agreement by and between City of Lewisville, Texas and City of Farmers Branch, Texas, (the "Agreement") on the 6th day of January, 2016, which sets forth the agreement between the Parties regarding the expansion of the Camelot Landfill and the Application; and

WHEREAS the Parties desire to amend the Agreement, as more particularly set forth below.

NOW, THEREFORE, in consideration of the mutual covenants, obligations and promises contained in this First Amendment, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

I.
AGREEMENTS

A. Deferral of Escrow Funds – Huffines Extension.

The Parties shall enter into a Public Improvement Deferral Agreement, which is attached hereto and incorporated as if fully set forth herein as Attachment "1." Said Public Improvement Deferral Agreement shall govern the escrow of funds for the future construction of the Huffines Extension as defined and described in Attachment "1."

B. Landfill Use by Lewisville Residents in Lieu of Lewisville's Tree Mitigation Regulations

The Parties shall enter into a Landfill Use Agreement, which is attached hereto and incorporated as if fully set forth herein as Attachment "2." Said Landfill Use Agreement shall govern the use of the Landfill by Lewisville residents as described in Attachment "2" in lieu of Lewisville's tree mitigation regulations.

II.
MISCELLANEOUS

Nothing contained herein shall be deemed to amend or modify the Agreement, except as expressly set forth herein. In the event of a conflict between the terms of the Agreement and the terms of this First Amendment, the terms of this First Amendment shall control. Any capitalized term used herein, but not defined herein, shall have that meaning set forth in the Agreement.

SIGNATURE PAGE FOLLOWS

CITY OF LEWISVILLE, TEXAS

_____
Donna Barron, CITY MANAGER

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

CITY OF FARMERS BRANCH, TEXAS

_____
Charles Cox, CITY MANAGER

ATTEST:

_____
Amy Piukana, CITY SECRETARY

APPROVED AS TO FORM:

_____
Peter G. Smith, CITY ATTORNEY

ATTACHMENT "1"

PUBLIC IMPROVEMENT DEFERRAL AGREEMENT

ATTACHMENT "2"

LANDFILL USE AGREEMENT

STATE OF TEXAS	§	
	§	**PUBLIC IMPROVEMENT DEFERRAL AGREEMENT**
COUNTIES OF DALLAS	§	
AND DENTON	§	

This **PUBLIC IMPROVEMENT DEFERRAL AGREEMENT** ("Agreement") is made as of the Effective Date by and between the **City of Lewisville** ("Lewisville"), a Texas home rule municipality, and the **City of Farmers Branch** ("Farmers Branch"), a Texas home rule municipality. Lewisville and Farmers Branch collectively referred to herein as "the Parties" or separately as "Party."

RECITALS

WHEREAS, Farmers Branch currently owns a tract of land located in Lewisville, Denton County, Texas, utilized as a Type I municipal solid waste landfill otherwise known as "Camelot Landfill" (the "Landfill") pursuant to Texas Commission on Environmental Quality ("TCEQ") Permit No. 1312A; and

WHEREAS, Farmers Branch is currently seeking a permit amendment from the TCEQ to expand the lateral and vertical limits and thereby expand the capacity of the Landfill ("the Project") pursuant to TCEQ Permit Application No. 1312B (the "Application"); and

WHEREAS, the Landfill, as expanded, will occupy the Property and portions of the Adjacent Property; and

WHEREAS, Farmers Branch has submitted an application to Lewisville to change the zoning of the Property and the Adjacent Property to establish a Special Use District ("SUD") in accordance with the Development Regulations; and

WHEREAS, as a condition for granting the SUD, Lewisville is requiring the Huffines Extension to be constructed, but finds it to be in the public interest to delay construction of the Huffines Extension to an unknown future date; and

WHEREAS, the Development Regulations usually require a developer to bear the cost of construction of public improvements relating to a development; and

WHEREAS, in order to secure the funding for the future construction of the Huffines Extension and in lieu of the immediate construction of the Huffines Extension, Lewisville is requiring as a condition for obtaining approval of the application for the SUD that Farmers Branch dedicate the right of way for the Huffines Extension and escrow the funds estimated to be necessary to pay for the construction of the Huffines Extension; and

WHEREAS, in light of the fact that Farmers Branch is another governmental entity who would be using public funds for the construction of the Huffines Extension or funding the escrow in lieu of construction, Farmers Branch has requested that it be allowed to retain such funds in its

account until such time as the funds are needed to pay for the construction of the Huffines Extension; and

WHEREAS, Lewisville desires to consent to the request of Farmers Branch subject to the provisions of this Agreement;

NOW THEREFORE, in consideration of the premises and the mutual covenants contained herein and other valuable consideration the sufficiency and receipt of which are hereby acknowledged, the Parties agree as follows:

Article I
Term

The term of this Agreement shall commence on the Effective Date and shall continue until all Parties have fully satisfied all terms and conditions of this Agreement unless sooner terminated as provided herein.

Article I
Definitions

For the purposes of this Agreement, the following words and phrases shall have the meanings set forth herein unless the context clearly requires otherwise:

"Adjacent Property" means the real property located in Lewisville's corporate limits and more particularly described in Exhibit "B," hereto.

"Development Regulations" mean Chapter 6 and 17 of the Code of Ordinances of the City of Lewisville, as amended, and such other ordinances or regulations relating to the use and development of the Property and the Adjacent Property on the Effective Date.

"Effective Date" means the date this Agreement is signed by the authorized representatives of all of the Parties.

"Force Majeure" means any contingency or cause beyond the reasonable control of a Party including, without limitation, acts of God or the public enemy, war, riot, civil commotion, insurrection, adverse weather, government or de facto governmental action (unless caused by acts or omissions of such Party), fires, explosions or floods, strikes, slowdowns or work stoppages.

"Huffines Extension" means approximately one thousand three hundred (1300) linear feet of a two-lane public street with curb and gutter constructed with the approximate alignment shown in Exhibit "C" attached hereto from the southern end of the Huffines Boulevard as its exists on the Effective Date to its intersection with the proposed Corporate Drive.

"Property" means that certain tract of land located within City's incorporated limits and more particularly described in Exhibit "A", attached hereto.

Article III
Deferral Agreement

3.1 **Dedication of Right-of-Way:** Notwithstanding any provision of Chapter 245, Texas Local Government Code, as amended, to the contrary, Farmers Branch agrees to dedicate to Lewisville Lot 4, Block A of the final plat approved by the Lewisville planning and zoning commission on October 4, 2016 (the "final plat"). Dedication shall be in fee simple by deed and shall be dedicated prior to Lewisville's acceptance of the new scale house built on Lot 1A, Block A of the final plat.

3.2 **Construction by Lewisville:** Except as otherwise provided herein, Lewisville shall be responsible for the design and construction of the Huffines Extension at a time and/or date as determined at its discretion, but in no case shall actual construction commence later than the fifteenth (15th) anniversary of the Effective Date.

3.3 **Escrow of Funds**.

(a) Not later than thirty (30) days after the Effective Date, Farmers Branch will appropriate and set aside current funds in the amount of $700,000.00 into a special project account fund ("the Huffines Extension Fund") to be shown on Farmers Branch's books, which funds shall be used solely to pay for the construction of the Huffines Extension.

(b) Not later than thirty (30) days after Lewisville provides written notice to Farmers Branch that the Lewisville City Council has awarded a contract for the design or construction of the Huffines Extension, Farmers Branch will pay to Lewisville the funds in the Huffines Extension Fund, said amount to not exceed $700,000.00.

(c) Upon receipt of the funds from the Huffines Extension Fund, Lewisville shall place the funds into a project account identified on Lewisville's accounting books to be called the "Huffines Extension Fund". Such funds shall be used by Lewisville solely to pay the design and construction costs related to the design and construction of the Huffines Extension. Upon request by Farmers Branch, Lewisville shall provide a complete accounting of the expenditures paid by funds from the Huffines Extension Fund.

(d) Income and interest from the investment and/or deposit of the funds in the Huffines Extension Fund while held in the accounts of Farmers Branch and Lewisville shall belong to Lewisville.

3.4 **Termination of Escrow Obligation**. Farmers Branch's obligation to retain the funds in the Huffines Extension Account or otherwise to pay for the construction of the Huffines Extension shall terminate upon occurrence of any of the following:

(a) Lewisville fails to award, sign a contract, and issue a notice to proceed for the design or construction of the Huffines Extension on or before the fifteenth (15th) anniversary of the Effective Date; or

(b) Lewisville obtains funds from a third-party, including, but limited to, Denton County, the North Texas Tollway Authority, or the Texas Department of Transportation, to construct the Huffines Extension; provided, however, if such third-party funds do not cover the entire cost of the construction of the Huffines Extension, Farmers Branch's obligation to fund the Huffines Extension Fund shall be reduced to an amount equal to the difference in the funds provided by the third-party and the actual costs of constructing the Huffines Extension; provided, however, that regardless of the amount received by the third-party, all income and interest from investment and/or deposit of the funds in the Huffines Extension Fund while held in the accounts of Farmers Branch or Lewisville shall belong to Lewisville; or

(c) Farmers Branch enters an agreement with a third-party to assume the obligations to construct and/or pay for the costs of constructing the Huffines Extension and said third-party either (i) proceeds to construct the Huffines Extension in accordance with plans and specifications approved by Lewisville or (ii) said third-party escrows the funds for construction of the Huffines Extension in accordance with the Development Regulations; provided, however, that regardless of any of the foregoing, all income and interest from investment and/or deposit of the funds in the Huffines Extension Fund while held in the accounts of Farmers Branch or Lewisville shall belong to Lewisville.

Article IV
Miscellaneous

4.1 **Notices**. When notice is permitted or required by this Agreement, it shall be in writing and shall be deemed delivered when delivered in person or on the date when placed, postage prepaid in the United States mail, certified return receipt requested, and addressed to the Parties at the address set forth below. Either Party may designate from time to time another and different address for receipt of notice by giving notice of such change or address.

If intended for Farmers Branch, to:
City of Farmers Branch
Attn: City Manager
13000 William Dodson Parkway
Farmers Branch, Texas 75234

With Copies to:
Peter G. Smith
Nichols, Jackson, Dillard, Hager & Smith, LLP
500 N. Akard St., Suite 1800
Dallas, Texas 75201

In intended for Lewisville to:
City of Lewisville, Texas
Attn: City Manager
P. O. Box 299002
151 Church Street
Lewisville, TX 75029-9002

With Copies to:

4.2 **Binding Effect**. This Agreement shall be binding on and inure to the benefit of the Parties hereto and their respective successors and permitted assigns, including, but not limited to, any successors in title to Property and/or the Adjacent Property.

4.3 **Assignment.** Farmers Branch shall not assign or transfer its rights or obligations under this Agreement in whole or in part to any other person or entity without the prior written consent of Lewisville, which consent will not be unreasonably withheld.

4.4 **Severability**. In the event any section, subsection, paragraph, sentence, phrase or word herein is held invalid, illegal or unconstitutional, the balance of this Agreement shall be enforceable and shall be enforced as if the Parties intended at all times to delete said invalid section, subsection, paragraph, sentence, phrase or word.

4.5 **Governing Law**. The validity of this Agreement and any of its terms and provisions, as well as the rights and duties of the Parties, shall be governed by the laws of the State of Texas; and venue for any action concerning this Agreement shall be in a State Court of competent jurisdiction in Denton County, Texas. The Parties agree to submit to the personal and subject matter jurisdiction of said court.

4.6 **Entire Agreement**. This Agreement embodies the entire Agreement between the Parties and supersedes all prior Agreements, understandings, if any, relating to the Property and the matters addressed herein and may be amended or supplemented only by written instrument executed by the Party against whom enforcement is sought.

4.7 **Recitals**. The Recitals to this Agreement are incorporated herein as part of this Agreement.

4.8 **Exhibits**. All exhibits to this Agreement are incorporated herein by reference for all purposes wherever reference is made to the same.

4.9 **Counterparts**. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original and constitute one and the same instrument.

4.10 **Headings.** The headings of this Agreement are for the convenience of reference only and shall not affect in any manner any of the terms and conditions hereto.

(Signatures on Following Page)

SIGNED AND AGREED this _____ day of _____, 2016.

CITY OF FARMERS BRANCH, TEXAS

By: _____
Charles Cox, City Manager

ATTEST:

_____
Amy Piukana, City Secretary

APPROVED AS TO FORM:

_____
Peter G. Smith, City Attorney

SIGNED AND AGREED this _____ day of _____, 2016.

CITY OF LEWISVILLE, TEXAS

By:_____
Donna Barron, City Manager

ATTEST:

_____
Julie Heinze, City Secretary

APPROVED AS TO FORM:

_____
Lizbeth Plaster, City Attorney

Exhibit "A"
Description of the Property

Exhibit "B"
Description of Adjacent Property

Exhibit "C"
Depiction of Proposed Huffines Extension Alignment

STATE OF TEXAS	§	
	§	**LANDFILL USE AGREEMENT**
COUNTIES OF DALLAS	§	
AND DENTON	§	

This **LANDFILL USE AGREEMENT** ("Agreement") is made as of the Effective Date by and between the **City of Lewisville** ("Lewisville"), a Texas home rule municipality, and the **City of Farmers Branch** ("Farmers Branch"), a Texas home rule municipality. Lewisville and Farmers Branch collectively referred to herein as "the Parties" or separately as "Party."

RECITALS

WHEREAS, Farmers Branch currently owns a tract of land located in Lewisville, Denton County, Texas, utilized as a Type I municipal solid waste landfill otherwise known as "Camelot Landfill" (the "Landfill") pursuant to Texas Commission on Environmental Quality ("TCEQ") Permit No. 1312A; and

WHEREAS, Farmers Branch is currently seeking a permit amendment from the TCEQ to expand the lateral and vertical limits and thereby expand the capacity of the Landfill ("the Project") pursuant to TCEQ Permit Application No. 1312B (the "Application"); and

WHEREAS, Farmers Branch must comply with all Lewisville applicable ordinances regarding development of property, except as otherwise varied by agreement of both parties; and

WHEREAS, Chapter 6 of the Lewisville Code of Ordinances, as amended, sets forth the tree mitigation requirements for the development of land within Lewisville ("Tree Mitigation Regulations"); and

WHEREAS, in lieu of strict compliance with the Tree Mitigation Regulations, Farmers Branch desires to have Lewisville residents dispose of solid waste at the Landfill without charge at least one (1) day per calendar month; and

WHEREAS, Farmers Branch desires to enter this Agreement with Lewisville to provide such service;

NOW, THEREFORE, for and in consideration of the promises and agreements made one to one another as provided herein, the Parties agree as follows:

1. **Landfill Use by Lewisville Residents**. Subject to the provisions of this Agreement, Farmers Branch agrees to allow residents of Lewisville to dispose of municipal solid waste at the Landfill at no cost on one (1) calendar day per month beginning the first calendar month following the closure of the DFW Recycling and Disposal Facility located at 1601 Railroad Street in Lewisville, Texas.

2. **Residents Only**. Only people occupying a residential dwelling unit located within Lewisville's incorporated limits may use the service provided by Farmers Branch in accordance

with Section 1, above, at the time the person utilizes the service. Farmers Branch and/or the entity with whom Farmers Branch has contracting to operate the Landfill (which, as of the Effective Date, is Camelot Landfill TX, LP)("the Operator") shall be authorized to establish such policies and procedures reasonable and necessary to confirm that a person delivering solid waste to the Landfill pursuant to this Agreement is a current Lewisville resident, including, but not limited to, requiring presentation of a current driver's license, City of Lewisville water bill or other utility bill, or similar proof of residency.

3. **Excluded Waste Not Accepted**. Notwithstanding anything to the contrary herein, Farmers Branch and the Operator shall not be required to accept at the Landfill from any person Excluded Waste. For purpose of this Agreement:

a. "Excluded Waste" means any material containing hazardous materials, wastes or substances; toxic substances, wastes or pollutants; contaminants; pollutants; infectious wastes; medical wastes; or radioactive wastes, each as defined by applicable federal, state or local laws or regulations. "Excluded Waste" shall also include tires and vehicle batteries.

b. "Hazardous Materials" and "Hazardous Waste" shall mean solid waste identified or listed as a hazardous material or hazardous waste by the Administrator of the United States Environmental Protection Agency under the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. Section 6901, et seq.), or by any appropriate state agency under federal or state law.

4. **Notice of Service**. Lewisville shall be solely responsible for informing its residents of the services available pursuant to this Agreement.

5. **Compliance with Policies**. Any person delivering solid waste to the Landfill pursuant to this Agreement must comply with all operational rules relating to delivery and disposal of solid waste at the Landfill that are applicable to all other persons delivering and disposing of solid waste at the Landfill. Farmers Branch and the Operator shall have the right to prohibit a Lewisville resident from delivering solid waste to the Landfill if such person does so in violation of the policies adopted by Farmers Branch and/or the Operator or otherwise attempts to dispose of Excluded Waste at the Landfill.

6. **Notices**. When notice is permitted or required by this Agreement, it shall be in writing and shall be deemed delivered when delivered in person or on the date when placed, postage prepaid in the United States mail, certified return receipt requested, and addressed to the Parties at the address set forth below. Either Party may designate from time to time another and different address for receipt of notice by giving notice of such change or address.

If intended for Farmers Branch, to:
City of Farmers Branch
Attn: City Manager
13000 William Dodson Parkway
Farmers Branch, Texas 75234

With Copies to:
Peter G. Smith
Nichols, Jackson, Dillard, Hager & Smith, LLP
500 N. Akard St., Suite 1800
Dallas, Texas 75201

In intended for Lewisville to:
City of Lewisville, Texas
Attn: City Manager
P. O. Box 299002
151 Church Street
Lewisville, TX 75029-9002

With Copies to:
City Attorney
P.O. Box 299002
Lewisville 75029-9002

7. **Binding Effect**. This Agreement shall be binding on and inure to the benefit of the Parties hereto and their respective successors and permitted assigns, including, but not limited to, any successors in title to Property and/or the Adjacent Property.

8. **Assignment.** Farmers Branch shall not assign or transfer its rights or obligations under this Agreement in whole or in part to any other person or entity without the prior written consent of Lewisville, which consent will not be unreasonably withheld.

9. **Severability**. In the event any section, subsection, paragraph, sentence, phrase or word herein is held invalid, illegal or unconstitutional, the balance of this Agreement shall be enforceable and shall be enforced as if the Parties intended at all times to delete said invalid section, subsection, paragraph, sentence, phrase or word.

10. **Governing Law**. The validity of this Agreement and any of its terms and provisions, as well as the rights and duties of the Parties, shall be governed by the laws of the State of Texas; and venue for any action concerning this Agreement shall be in a State Court of competent jurisdiction in Denton County, Texas. The Parties agree to submit to the personal and subject matter jurisdiction of said court.

11. **Entire Agreement**. This Agreement embodies the entire Agreement between the Parties and supersedes all prior Agreements, understandings, if any, relating to the Property and the matters addressed herein and may be amended or supplemented only by written instrument executed by the Party against whom enforcement is sought.

13. **Recitals**. The Recitals to this Agreement are incorporated herein as part of this Agreement.

14. **Exhibits**. All exhibits to this Agreement are incorporated herein by reference for all purposes wherever reference is made to the same.

15. **Counterparts**. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original and constitute one and the same instrument.

16. **Headings.** The headings of this Agreement are for the convenience of reference only and shall not affect in any manner any of the terms and conditions hereto.

17. **Effective Date**. This Agreement shall be effective on the date it bears the signatures of authorized representatives of all of the Parties ("the Effective Date").

18. **Termination**. This Agreement shall terminate immediately if the Application is denied without further rights of Farmers Branch to appeal such denial.

(Signatures on Following Page)

SIGNED AND AGREED this _____ day of _____, 2016.

CITY OF FARMERS BRANCH, TEXAS

By: _____
Charles Cox, City Manager

ATTEST:

_____
Amy Piukana, City Secretary

APPROVED AS TO FORM:

_____
Peter G. Smith, City Attorney

SIGNED AND AGREED this _____ day of _____, 2016.

CITY OF LEWISVILLE, TEXAS

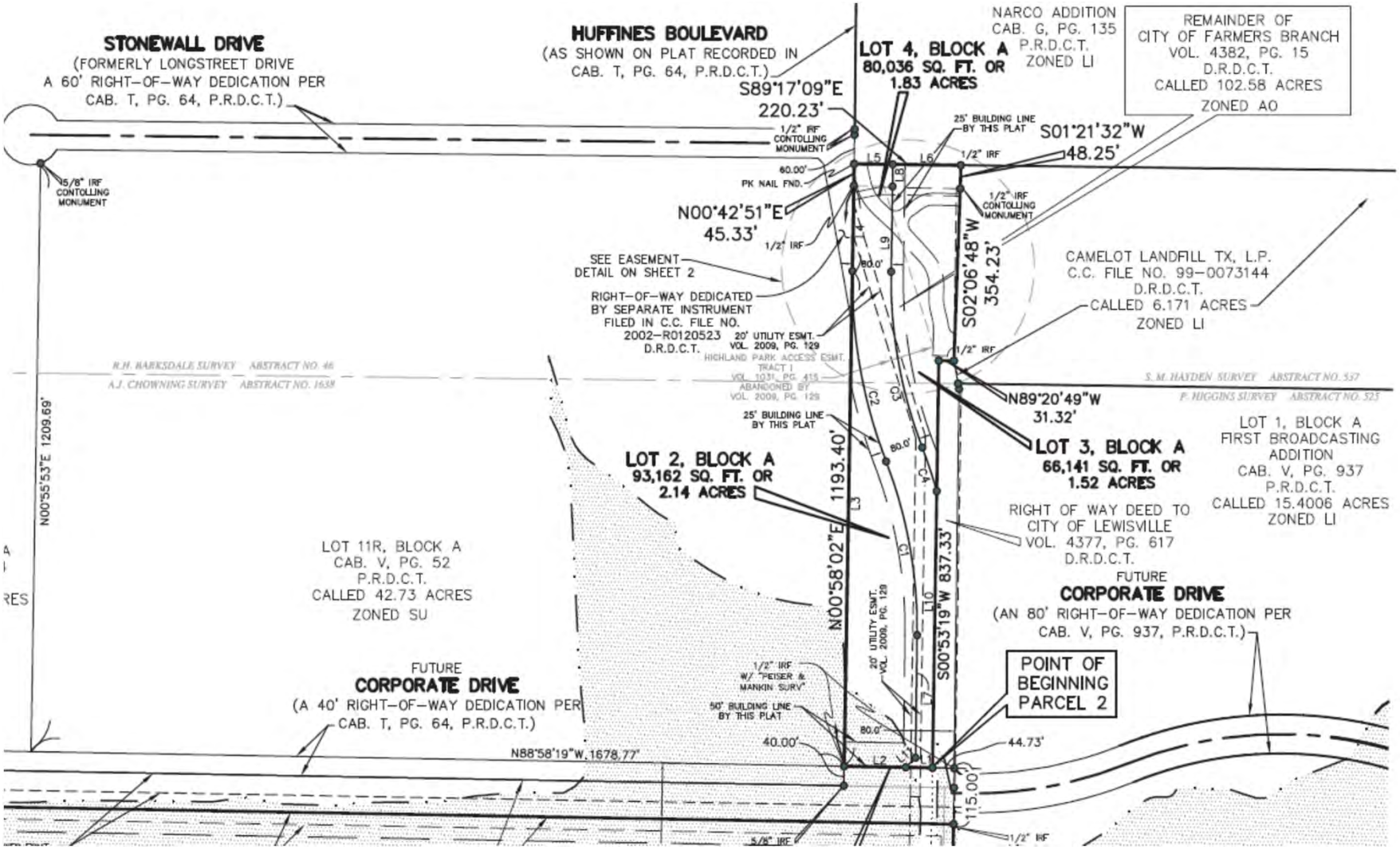
By:_____
Donna Barron, City Manager

ATTEST:

_____
Julie Heinze, City Secretary

APPROVED AS TO FORM:

_____
Lizbeth Plaster, City Attorney



Lot 4, Block A of the Farmers Branch Camelot Landfill Addition will be dedicated by separate instrument for the extension of Huffines Boulevard from Stonewall Dr. to Corporate Drive.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD–SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

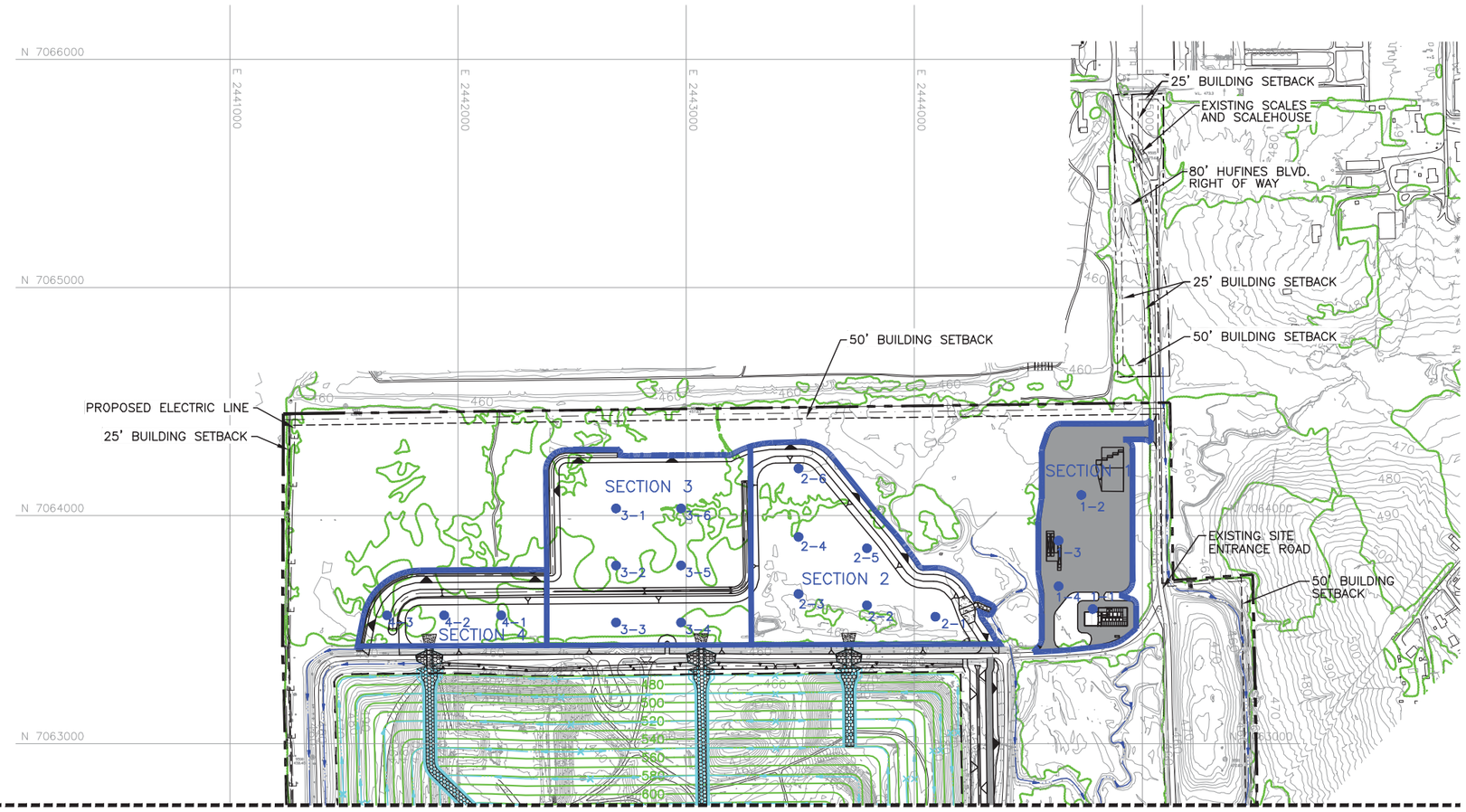
N

0 300 600

SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- PROPERTY BOUNDARY
- 430 EXISTING CONTOUR
- LIMIT OF WASTE
- N 7063000 STATE PLANE COORDINATE SYSTEM
- 600 FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- E E ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 2)
- EXISTING TREES/ VEGETATED AREAS
- TREE SURVEY SECTION BOUNDARY
- 2–1 PLOT DESIGNATION



TREE SURVEY INFORMATION:

THE TREE SURVEY WAS SPLIT INTO SIX SECTIONS AS SHOWN ON DRAWINGS 25 AND 26. FOR SECTIONS 1 THROUGH 5, A SERIES OF ONE–TENTH ACRE PLOTS WERE ESTABLISHED TO TAKE REPRESENTATIVE SAMPLES OF THE NUMBER, SIZE, AND SPECIES OF PROTECTED TREES IN EACH SECTION. THE PLOTS WERE AVERAGED AND MULTIPLIED BY THE ACREAGE OF THAT SECTION TO CALCULATE THE NUMBER OF PROTECTED TREES IN EACH SECTION. ALL PROTECTED TREES IN SECTION 6 WERE IDENTIFIED.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.
2. BUILDING SETBACKS ARE 25–FEET OR 35–FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10–FEET ALONG THE NORTH, 50–FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
3. ALL PROTECTED TREES SHOWN ON THIS PLAN WILL REMAIN UNDISTURBED UNTIL CONSTRUCTION BEGINS IN EACH AREA. A TREE MITIGATION PLAN WILL BE SUBMITTED TO THE CITY OF LEWISVILLE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
4. TREE SURVEY DATA COLLECTED IN MARCH 2016 BY URBAN RUNWALL, INC. A LICENSED ARBORIST CONSULTING FIRM.
5. ALLOWANCE OF HUFFINES ESCROW AND TREE MITIGATION BY SETTLEMENT AGREEMENT, AS AMENDED ON _____.

Tree Survey Data Section 1 - 7.6 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 1-1	39	0	0	0
Plot 1-2	2	1	0	0
Plot 1-3	14	1	0	0
Plot 1-4	24	4	0	0
Total	79	6	0	0
1/10 Acre Average	19.75	1.5	0	0
Average Per Acre	197.5	15	0	0
Total Protected Trees in Section 1	**1,501**	**114**	**0**	**0**

TOTAL TREE REMOVAL COST: $864,500

[1] ALL PROTECTED TREES LISTED IN SECTION 1 ARE CEDAR ELM.

[2] ACREAGE FOR SECTION 1 DOES NOT INCLUDE THE AREAS WITHIN THE BUILDING PADS OR FIRELANE.

Tree Survey Data Section 2 - 14.3 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 2-1	36	0	0	0
Plot 2-2	24	2	0	0
Plot 2-3	14	5	0	0
Plot 2-4	13	2	0	0
Plot 2-5	2	0	0	0
Plot 2-6	1	0	0	0
Total	90	9	0	0
1/10 Acre Average	15	1.5	0	0
Average Per Acre	150	15	0	0
Total Protected Trees in Section 2	**2,145**	**215**	**0**	**0**

TOTAL TREE REMOVAL COST: $1,287,500

[1] ALL PROTECTED TREES LISTED IN SECTION 2 ARE CEDAR ELM.

Tree Survey Data Section 3 - 17.3 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 3-1	2	0	0	0
Plot 3-2	1	1	0	0
Plot 3-3	2	0	0	0
Plot 3-4	6	1	0	0
Plot 3-5	4	0	0	0
Plot 3-6	21	0	0	0
Total	36	2	0	0
1/10 Acre Average	6	0.3	0	0
Average Per Acre	60	3	0	0
Total Protected Trees in Section 3	**1,038**	**52**	**0**	**0**

TOTAL TREE REMOVAL COST: $571,000

[1] ALL PROTECTED TREES LISTED IN SECTION 3 ARE CEDAR ELM.

Tree Survey Data Section 4 - 5.9 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 4-1	2	0	0	0
Plot 4-2	4	0	0	0
Plot 4-3	0	0	0	0
Total	6	0	0	0
1/10 Acre Average	2	0	0	0
Average Per Acre	20	0	0	0
Total Protected Trees in Section 4	**118**	**0**	**0**	**0**

TOTAL TREE REMOVAL COST: $59,000

[1] ALL PROTECTED TREES LISTED IN SECTION 4 ARE CEDAR ELM.

LANDSCAPE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

PREPARED FOR

CITY OF FARMERS BRANCH

DATE: 05/2016
FILE: 1339–351–11
CAD: 25–LANDSCAPE PLAN.DWG

DRAWN BY: CCJ
DESIGN BY: CRM
REVIEWED BY: JAE

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

WWW.WCGRP.COM

DRAWING 25

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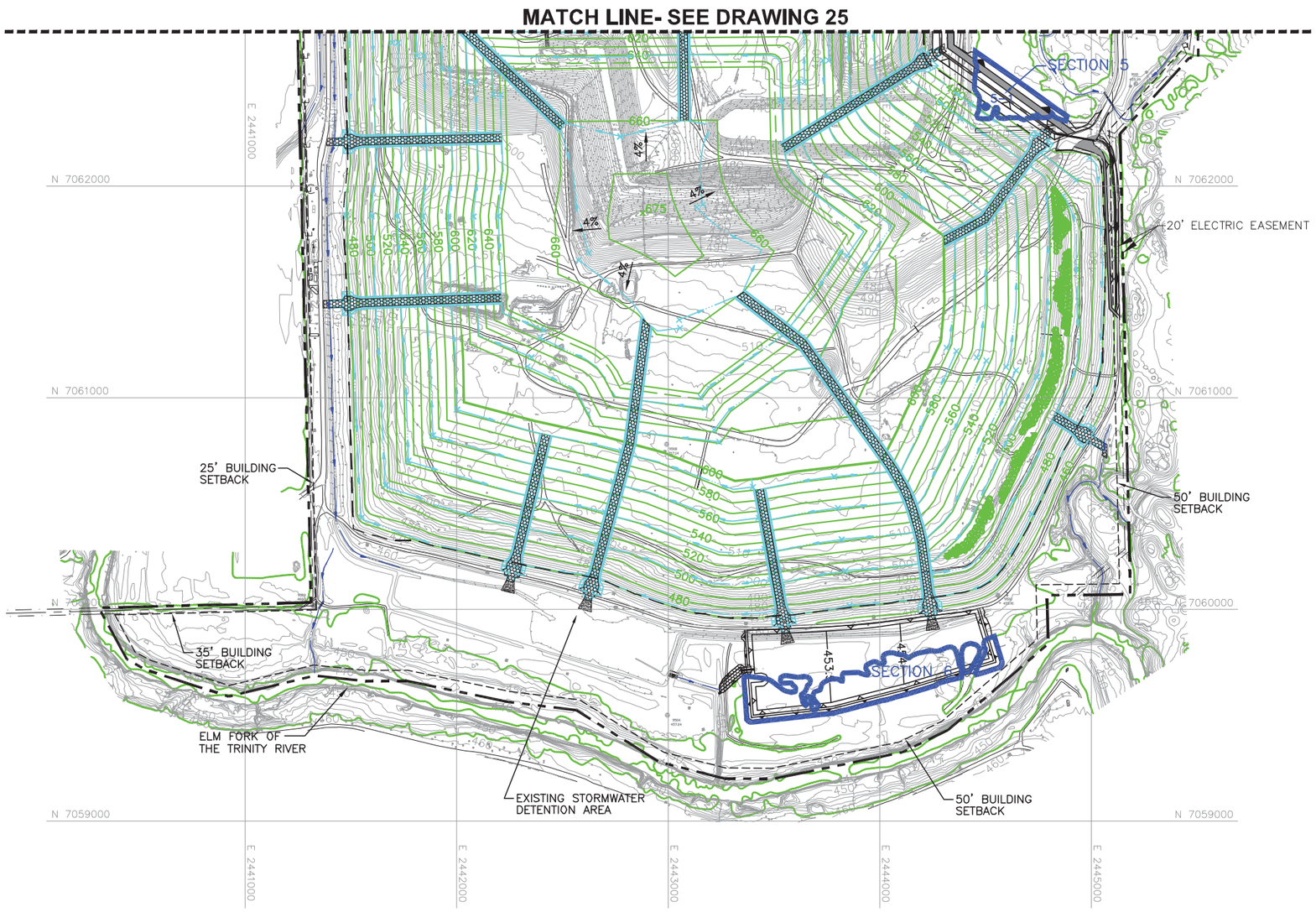

N

0 300 600

SCALE IN FEET

LEGEND:

- LANDFILL PERMIT BOUNDARY (TCEQ PERMIT NO. 1312B)
- PROPERTY BOUNDARY
- 430 — EXISTING CONTOUR
- LIMIT OF WASTE
- N 7063000 — STATE PLANE COORDINATE SYSTEM
- 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EXISTING LANDFILL ACCESS ROAD
- EASEMENT
- E — ELECTRICAL LINE
- BUILDING SETBACK LINE (SEE NOTE 2)
- EXISTING TREES/ VEGETATED AREAS
- TREE SURVEY SECTION BOUNDARY
- 2–1 — PLOT DESIGNATION

TREE SURVEY INFORMATION:

THE TREE SURVEY WAS SPLIT INTO SIX SECTIONS AS SHOWN ON DRAWINGS 25 AND 26. FOR SECTIONS 1 THROUGH 5, A SERIES OF ONE–TENTH ACRE PLOTS WERE ESTABLISHED TO TAKE REPRESENTATIVE SAMPLES OF THE NUMBER, SIZE, AND SPECIES OF PROTECTED TREES IN EACH SECTION. THE PLOTS WERE AVERAGED AND MULTIPLIED BY THE ACREAGE OF THAT SECTION TO CALCULATE THE NUMBER OF PROTECTED TREES IN EACH SECTION. ALL PROTECTED TREES IN SECTION 6 WERE IDENTIFIED.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS, INC. COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 2–14–2015.
2. BUILDING SETBACKS ARE 25–FEET OR 35–FEET ALONG THE WEST SIDE OF THE PERMIT BOUNDARY, 10–FEET ALONG THE NORTH, 50–FEET ALONG THE SOUTH AND EAST, 25' ALONG HUFFINES BOULEVARD RIGHT OF WAY, AND 50' ALONG CORPORATE DRIVE RIGHT OF WAY. NO CONSTRUCTION IN THE FLOODPLAIN WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM FEMA OR THE US ARMY CORPS OF ENGINEERS.
3. ALL PROTECTED TREES SHOWN ON THIS PLAN WILL REMAIN UNDISTURBED UNTIL CONSTRUCTION BEGINS IN EACH AREA. A TREE MITIGATION PLAN WILL BE SUBMITTED TO THE CITY OF LEWISVILLE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
4. TREE SURVEY DATA COLLECTED IN MARCH 2016 BY URBAN RUNWALL, INC. A LICENSED ARBORIST CONSULTING FIRM.
5. ALLOWANCE OF HUFFINES ESCROW AND TREE MITIGATION BY SETTLEMENT AGREEMENT, AS AMENDED ON _____.

VARIANCE APPROVED BY THE CITY COUNCIL ON _____, 2016:

a. TO ALLOW OVERHEAD ELECTRICAL LINES TO EXISTING METHANE GAS FACILITY AND TEMPORARY EMPLOYEE BREAKROOM.

b. TO ALLOW METAL OR WOOD–SIDED BUILDINGS FOR THE EXISTING METHANE GAS FACILITY, TEMPORARY EMPLOYEE BREAKROOM, AND EQUIPMENT STORAGE BUILDING.

c. TO ALLOW EXISTING PORTABLE RESTROOMS IN LIEU OF SEWER LINES UNTIL CONSTRUCTION OF THE PROPOSED ENTRANCE FACILITIES AND OFFICE/MAINTENANCE BUILDING ARE COMPLETE.

d. TO ALLOW PORTABLE BUILDINGS WITHOUT FIXED FOUNDATIONS.

e. TO WAIVE INTERIOR LANDSCAPING AND IRRIGATION FOR TEMPORARY AND PERMANENT PARKING AREAS.

f. TO ALLOW A DEAD END WATER LINE THAT EXCEEDS 600 LINEAR FEET UNTIL THE CONSTRUCTION OF CORPORATE DRIVE.

g. TO ALLOW GRAVEL TO ACCESS THE TEMPORARY BUILDINGS AND TO THE BAY DOORS OF THE PROPOSED MAINTENANCE BUILDING.

Tree Survey Data Section 5 - 1.6 Acres

Plot	5"-9" Caliper Protected Trees	10"-14" Caliper Protected Trees	15"-24" Caliper Protected Trees	25"+ Caliper Protected Trees
Plot 5-1	2	5	0	0
1/10 Acre Average	2	5	0	0
Average Per Acre	20	50	0	0
Total Protected Trees in Section 5	**32**	**80**	**0**	**0**

TOTAL TREE REMOVAL COST: $96,000

[1] ALL PROTECTED TREES LISTED IN SECTION 5 ARE CEDAR ELM.

Tree Survey Data Section 6 - 4.4 Acres

Tree Number	Species	Caliper (in.)	Condition
1	Pecan	35	--
2	Cedar Elm	22	Broken Top
3	Cedar Elm	24	Broken Top
4	Cedar Elm	23	Broken Top
5	Cedar Elm	23.5	Broken Top
6	Cedar Elm	5	--
7	Cedar Elm	5.5	--
8	Cedar Elm	6	--
9	Cedar Elm	5	--
10	Cedar Elm	7	--
11	Cedar Elm	5.5	--
12	Cedar Elm	5.5	--
13	Cedar Elm	29	Broken Top

TOTAL TREE REMOVAL COST: $13,500

LANDSCAPE PLAN

☐ 90% REVIEW
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION

DATE: 08/2016
FILE: 1339–351–11
CAD: 26–LANDSCAPE PLAN.DWG

DRAWN BY: CCJ
DESIGN BY: CRM
REVIEWED BY: JAE

Weaver Consultants Group
TBPE REGISTRATION NO. F–3727

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	09/2016	UPDATED PER CITY COMMENTS
2	09/2016	UPDATED PER CITY COMMENTS

ENGINEERING SITE PLAN
FOR CAMELOT LANDFILL EXPANSION
FARMERS BRANCH CAMELOT LANDFILL ADDITION
LOTS 1A, 2, 3, AND 4 BLOCK A
465.250 ACRES
SPECIFIC USE DISTRICT – LANDFILL & LANDFILL ACCESSORY USES

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DRAWING 26

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2015 Residential Tons	4538
Est Ann Tonnage Increase	101.0%
Initial Yr	8
Initial Tipping Fee	$26.50
Tipping Fee % Increase	100.5% *Increase .5% per year; reasonable*

Remaining Life (Yrs)	Year	Est Tons per Yr	Tipping Fee ($/ton)	Cost per Yr	Accumulated Total
31	2024	2457.00	$ 27.58	$ 67,761.01	$ 67,761.01
30	2025	2481.57	$ 27.72	$ 68,780.81	$ 136,541.82
29	2026	2506.39	$ 27.86	$ 69,815.96	$ 206,357.78
28	2027	2531.45	$ 27.99	$ 70,866.69	$ 277,224.47
27	2028	2556.77	$ 28.13	$ 71,933.24	$ 349,157.71
26	2029	2582.33	$ 28.28	$ 73,015.83	$ 422,173.54
25	2030	2608.16	$ 28.42	$ 74,114.72	$ 496,288.26
24	2031	2634.24	$ 28.56	$ 75,230.15	$ 571,518.40
23	2032	2660.58	$ 28.70	$ 76,362.36	$ 647,880.76
22	2033	2687.19	$ 28.84	$ 77,511.61	$ 725,392.38
21	2034	2714.06	$ 28.99	$ 78,678.16	$ 804,070.54
20	2035	2741.20	$ 29.13	$ 79,862.27	$ 883,932.81
19	2036	2768.61	$ 29.28	$ 81,064.20	$ 964,997.00
18	2037	2796.30	$ 29.43	$ 82,284.21	$ 1,047,281.22
17	2038	2824.26	$ 29.57	$ 83,522.59	$ 1,130,803.81
16	2039	2852.50	$ 29.72	$ 84,779.60	$ 1,215,583.41
15	2040	2881.03	$ 29.87	$ 86,055.54	$ 1,301,638.95
14	2041	2909.84	$ 30.02	$ 87,350.67	$ 1,388,989.62
13	2042	2938.94	$ 30.17	$ 88,665.30	$ 1,477,654.92
12	2043	2968.33	$ 30.32	$ 89,999.71	$ 1,567,654.64
11	2044	2998.01	$ 30.47	$ 91,354.21	$ 1,659,008.85
10	2045	3027.99	$ 30.62	$ 92,729.09	$ 1,751,737.94
9	2046	3058.27	$ 30.78	$ 94,124.66	$ 1,845,862.60
8	2047	3088.85	$ 30.93	$ 95,541.24	$ 1,941,403.84
7	2048	3119.74	$ 31.09	$ 96,979.14	$ 2,038,382.98
6	2049	3150.94	$ 31.24	$ 98,438.67	$ 2,136,821.65
5	2050	3182.45	$ 31.40	$ 99,920.17	$ 2,236,741.82
4	2051	3214.27	$ 31.55	$ 101,423.97	$ 2,338,165.79
3	2052	3246.41	$ 31.71	$ 102,950.40	$ 2,441,116.19
2	2053	3278.88	$ 31.87	$ 104,499.81	$ 2,545,616.00
1	2054	3311.67	$ 32.03	$ 106,072.53	$ 2,651,688.53
0	2055	3344.78	$ 32.19	$ 107,668.92	$ 2,759,357.45

Amount of Calculated Tree Mitigation Fees:	2,856,500
Difference:	(97,142.55)

Per review, analysis appears to be conservative. FB is increasing tipping fee .5% each year and that residential tons will increase 1% per year. Per Lisa, this is very low as our experience with our residents has been a much higher increase each year (38% for fy15). Farmers Branch appears to have a very conservative approach as to the value that will be received over time by our residents.

While there's a difference at the end, if we raise the tonnage up to just 2%, the accumulated value would be more than enough to cover the tree mitigation fee (see next tab).

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Eric Ferris, Deputy City Manager

DATE: October 11, 2016

SUBJECT: **Approval of a Resolution of the City Council of the City of Lewisville, Texas, Approving the Major Permit Amendment Application, Revised August 2016, for Camelot Landfill, TCEQ Permit No. MSW-1312B.**

BACKGROUND

Section 361.1231 of the Texas Health & Safety Code provides, in part, that the TCEQ may not approve an application for the issuance, amendment, or renewal of a permit that seeks to expand the area or capacity of a landfill unless the governing body of the municipality in which the landfill is located first approves by resolution or order the issuance, amendment, or renewal of the permit.

The City of Lewisville objected to Farmers Branch's original TCEQ permit amendment to expand the lateral and vertical limits of the Camelot Landfill. But on January 6, 2016, the two cities signed an agreement whereby Lewisville agreed to withdraw its objections and forgo seeking a contested case hearing if Farmers Branch met certain conditions and timelines (the "Settlement Agreement"). Such conditions included limiting the increased elevation of the landfill (623 feet for pre-Subtitle D area and 675 feet for Subtitle D area), adding new monitoring wells, compliance with agreed upon landscaping requirements, payment of host fees and equalization fees, deed restricting their property to prevent subsequent expansions, dedication of certain land for Lewisville right-of-way and/or easements, escrow of right-of-way funds for the construction of Corporate Drive and its intersection with Huffines Boulevard, and required submittal of an application for SU zoning (which also triggered a new plat and engineering site plan). Concurrent with this zoning request, Lewisville City Council will also be considering the first amendment to the Settlement Agreement to allow a deferral of escrow funds for the construction of Huffines Boulevard, a delayed dedication of Huffines Boulevard right-of-way, and offering of certain landfill services to Lewisville Residents in lieu of tree mitigation fees.

ANALYSIS

Staff and outside counsel have reviewed the above-referenced amendment application and is satisfied that upon the City Council's approval of the First Amended Settlement Agreement, the SU zoning ordinance, and the related variances, Farmers Branch has met the requirements of the settlement agreement entered into with the City of Farmers Branch on January 6, 2016.

RECOMMENDATION

It is City staff's recommendation that the City Council adopt the proposed resolution as set forth in the caption above.

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, APPROVING THE MAJOR PERMIT AMENDMENT APPLICATION, REVISED AUGUST 2016, FOR CAMELOT LANDFILL, TCEQ PERMIT NO. MSW-1312B.

WHEREAS Farmers Branch currently owns a tract of land located in Lewisville, Denton County, Texas, and described in **Exhibit A** hereto, (the "Site"), which is utilized as a Type I municipal solid waste landfill otherwise known as "Camelot Landfill" (the "Landfill") pursuant to Texas Commission on Environmental Quality ("TCEQ") Permit No. 1312A; and

WHEREAS Farmers Branch is currently seeking a permit amendment from the TCEQ to expand the lateral and vertical limits and thereby expand the capacity of the Landfill ("the Project") pursuant to TCEQ Permit Application No. 1312B (the "Application"); and

WHEREAS Section 361.1231 of the Texas Health & Safety Code provides, in part, that the TCEQ may not approve an application for the issuance, amendment, or renewal of a permit that seeks to expand the area or capacity of a landfill unless the governing body of the municipality in which the landfill is located first approves by resolution or order the issuance, amendment, or renewal of the permit.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The City Council of the City of Lewisville hereby approves the amendments to the Application, attached hereto as **Exhibit B** and incorporated as if fully set forth herein.

SECTION 2. The City Council of the City of Lewisville does not oppose the issuance of an amended TCEQ permit based on the amendments to the Application, as set forth in **Exhibit B**.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, ON THIS THE 17th DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

EXHIBIT "A"

EXHIBIT "B"

Farmers Branch Camelot Landfill Addition – Lot 1A, Block A

Whereas the City of Farmers Branch and Camelot Landfill TX, L.P. are the sole owners of that certain lot, tract or parcel of land situated in the Patrick O'Leary Survey, Abstract No. 974, the H. Harper Survey, Abstract No. 605, and the P. Higgins Survey, Abstract No. 525, Denton County, Texas, and being all of Lot 1, Block A of Farmers Branch Camelot Landfill Addition, an addition to the City of Lewisville, as recorded in Document No. 2009–129, of the Plat Records of Denton County, Texas, and being all that certain tract of land described in deed dated March 24, 1967 from M.L. Ledbetter et al to The Town of Highland Park, as recorded in Volume 551, Page 136, Deed Records, Denton County, Texas, and being that called 0.238 acre tract of land described in deed dated May 23, 1988, from 121 County Venture to the Town of Highland Park, as recorded in Volume 2384, Page 64, said Deed Records, and being a portion of that certain called 102.58 acre tract of land described in deed dated July 13, 1999, from the Town of Highland Park to the City of Farmers Branch, as recorded in Volume 4382, Page 15, said Deed Records, also being that certain tract of land described in deed dated July 19, 1999 from Barfknecht Enterprises, L.C. to Camelot Landfill TX, L.P., as recorded in Volume 4383, Page 742, said Deed Records, and being more particularly described as follows:

PARCEL 1:

BEGINNING at a 5/8 inch iron rod found for the southwest corner of said City of Farmers Branch tract, same being the northwest corner of said Lot 1, same being in the east line of that certain tract of land to Freddy Duwe Stockard, etal, by deed recorded in Volume 633, Page 476, of said Deed Records;

THENCE North 01 deg. 55 min. 25 sec. East, along the common line of said City of Farmers Branch tract, and said Stockard tract, a distance of 1,019.05 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northwest corner of the herein described tract, same being the southwest corner of that certain tract of land from City of Farmers Branch to City of Lewisville, by Special Warranty Deed dated June 28, 2016, and recorded under Document No. 2016–76340, Official Public Records, Denton County, Texas;

THENCE South 88 deg. 58 min. 19 sec. East, through the interior of said City of Farmers Branch tract, and along the south line of said City of Lewisville tract, a distance of 3,887.09 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northeast corner of the herein described tract, same being in the east line of said City of Farmers Branch tract, same being in the west line of Lot 1, Block B of First Broadcasting Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 937, aforesaid Plat Records;

THENCE South 00 deg. 43 min. 55 sec. West, along the common line of said Camelot Landfill TX tract, and said Lot 1, Block B, a total distance of 778.87 feet to a 1/2 inch iron rod found for the southwest corner of said Lot 1, Block B, same being in a north line of aforesaid Lot 1, Block A, Farmers Branch Camelot Landfill Addition;

THENCE North 87 deg. 33 min. 13 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B of First Broadcasting Addition, passing at a distance of 315.01 feet a 1/2 inch iron rod found for corner corner, and continuing a total distance of 349.25 feet a 1/2 inch iron rod found for corner, said point being the most northerly northeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being an internal corner of said Lot 1, Block B;

THENCE South 00 deg. 38 min. 00 sec. West, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B, passing at a distance of 1030.53 feet a 1/2 inch iron rod found with "Powell Powell" cap, said point being the most southerly southwest corner of said Lot 1, Block B, same being the northwest corner of that certain tract of land to Larry D. Williams, by deed recorded in C.C. File No. 97–0019796, of aforesaid Deed Records, and continuing along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Williams tract, a total distance of 1135.31 feet to a point from which a 1/2 inch iron rod found with "Kadleck 3852" cap bears North 00 deg. 38 min. 00 sec. East, 3.01 feet, and another 1/2 inch iron rod found with "Pacheko Koch" cap bears North 42 deg. 57 min. 38 sec. West, 5.75 feet, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the southwest corner of said Williams tract, same being in the north line of Lot 1, Block 1 of Indian Creek Ranch Golf Course Addition, Phase I, an addition to the City of Carrollton, Denton County, Texas, according to the plat thereof recorded in Cabinet O, Page 313, of aforesaid Plat Records;

THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block 1 as follows:

North 88 deg. 23 min. 57 sec. West, a distance of 42.08 feet to a concrete monument with a 1/2 inch iron rod found;
South 44 deg. 07 min. 51 sec. West, a distance of 487.22 feet to a 1/2 inch iron rod found for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 2175.70 feet to a 5/8 inch iron rod found with "Carter & Burgess" cap for corner, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition;
North 88 deg. 58 min. 21 sec. West, a distance of 394.00 feet to a 1/2 inch iron rod found for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 230.00 feet to a point for corner in the approximate centerline of Elm Fork of Trinity River, said point being the most southerly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the most westerly southwest corner of said Lot 1, Block 1, same being the most northerly northeast corner of Lot 2, of D/FW Recycling & Disposal Facility, Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet L, Page 346, of aforesaid Plat Records;

THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 2, and along the approximate centerline of said Elm Fork of Trinity River as follows:

South 51 deg. 01 min. 49 sec. West, a distance of 623.06 feet to a point for corner;
South 65 deg. 47 min. 32 sec. West, a distance of 239.43 feet to a point for corner;
South 80 deg. 05 min. 38 sec. West, a distance of 622.76 feet to a point for corner;
North 87 deg. 53 min. 29 sec. West, a distance of 232.31 feet to a point for corner;
North 73 deg. 57 min. 44 sec. West, a distance of 316.66 feet to a point for corner;
North 56 deg. 18 min. 20 sec. West, a distance of 463.78 feet to a point for corner;
North 81 deg. 23 min. 24 sec. West, a distance of 322.39 feet to a point for corner;
North 76 deg. 32 min. 03 sec. West, a distance of 493.32 feet to a point for corner;
North 88 deg. 31 min. 36 sec. West, a distance of 197.16 feet to a point for corner;
North 82 deg. 08 min. 34 sec. West, a distance of 237.74 feet to a point for corner;
South 78 deg. 06 min. 25 sec. West, a distance of 417.73 feet to a point for corner;
North 70 deg. 27 min. 39 sec. West, a distance of 407.54 feet to a point for corner;
North 59 deg. 22 min. 22 sec. West, a distance of 105.48 feet to a point for corner;
North 26 deg. 55 min. 54 sec. West, a distance of 277.90 feet to a point for corner, said point being the most westerly southwest corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being a northeast corner of said Lot 2, same being the most southerly southeast corner of Lot 5, of D/FW Recycling & Disposal Facility Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 929, of aforesaid Plat Records, same being the most southerly southwest corner of aforesaid Stockard tract;

THENCE South 89 deg. 38 min. 10 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 1003.88 feet to a 1/2 inch iron rod found for corner, said point being the southeast corner of said Stockard tract;

THENCE North 00 deg. 24 min. 20 sec. East (basis of bearing), along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 3395.38 feet to the POINT OF BEGINNING and containing 459.76 acres of computed land, more or less.

Farmers Branch Camelot Landfill Addition – Lots 2, 3 and 4, Block A

PARCEL 2:

BEGINNING at a 1/2 inch iron rod set with "Peiser & Mankin Surv" red plastic cap (hereinafter referred to as 1/2 inch iron rod set) for the southeast corner of the herein described tract, same being the southwest corner of that certain Right of Way Deed to City of Lewisville, as recorded in Volume 4377, Page 617, aforesaid Deed Records, same being in the north line of aforesaid City of Lewisville tract (Doc. No. 2016–76340), same being in the east line of aforesaid City of Farmers Branch tract;

THENCE North 88 deg. 58 min. 19 sec. West, along the north line of said City of Lewisville tract (Doc. No. 2016–76340), a distance of 182.44 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap found for the southwest corner of the herein described tract, same being the southeast corner of Lot 11R, Block A, Riverview Industrial Park, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 52, said Plat Records, same being the northeast corner of a 40 foot right–of–way dedication of Corporate Drive (a 40 foot right–of–way, as dedicated by Cabinet V, Page 52, said Plat Records);

THENCE North 00 deg. 58 min. 02 sec. East, along the common line of said City of Farmers Branch tract, and said Lot 11R, passing the most easterly northeast corner of said Lot 11R, same being the most southerly point of a right–of–way dedication for Huffines Boulevard, as recorded in County Clerk's File No. (C.C. File No.) 2002–R0120523, of aforesaid Deed Records, and continuing along the common line of said City of Farmers Branch tract, and the east right–of–way line of said Huffines Boulevard, a total distance of 1193.40 feet to a 1/2 inch iron rod found for corner;

THENCE North 00 deg. 42 min. 51 sec. East, continuing along the common line of said City of Farmers Branch tract, and the east right–of–way line of said Huffines Boulevard, a distance of 45.33 feet to a pk nail found for corner for the northwest corner of the herein described tract, from which a 1/2 inch iron rod found bears North 00 deg. 42 min. 51 sec. East, 60.00 feet, said point being the most northerly northwest corner of said City of Farmers Branch tract, same being the southwest corner of NARCO Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet G, Page 135, of aforesaid Plat Records;

THENCE South 89 deg. 17 min. 09 sec. East, along the common line of said City of Farmers Branch tract, and said NARCO Addition, a distance of 220.23 feet to a 1/2 inch iron rod found for the northeast corner of the herein described tract, said point being the most northerly northeast corner of said City of Farmers Branch tract, same being the most northerly northwest corner of that certain called 6.171 acre tract of land to Camelot Landfill TX, L.P., by deed recorded in C.C. File No. 99–0073144, of aforesaid Deed Records;

THENCE South 01 deg. 21 min. 32 sec. West, along the common line of said City of Farmers Branch tract, and said called 6.171 acre tract, a distance of 48.25 feet to a 1/2 inch iron rod found for corner;

THENCE South 02 deg. 06 min. 48 sec. West, continuing along the common line of said City of Farmers Branch tract, and said called 6.171 acre tract, a distance of 354.23 feet to a 1/2 inch iron rod found for corner for the most northerly northeast corner of aforesaid City of Lewisville Right of Way deed (Volume 4377, Page 617);

THENCE North 89 deg. 20 min. 49 sec. West, along the north line of said City of Lewisville Right of Way deed, a distance of 31.32 feet to a 1/2 inch iron rod set for an internal corner, same being the northwest corner of said City of Lewisville Right of Way deed,

THENCE South 00 deg. 53 min. 19 sec. West, continuing along the common of said Farmers Branch tract and said City of Lewisville Right of Way deed, a distance of 837.33 feet to the POINT OF BEGINNING and containing 239,357 square feet or 5.49 acres of computed land, more or less.

Weaver Consultants Group

Project No. 1339-351-11-02-12
August 3, 2016

DRAFT

Mr. Dwight C. Russell, P.E.
MC-124
Waste Permits Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Re: Supplemental Submittal
Camelot Landfill Permit Amendment Application – Denton County
Municipal Solid Waste (MSW) Permit No. 1312B
CN600131676/RN101479038

Dear Mr. Russell:

This supplemental submittal has been prepared on behalf of the City of Farmers Branch to supplement the application that was declared Technically Complete by the Texas Commission on Environmental Quality (TCEQ) in March 2015. An agreement was reached between the City of Farmers Branch and the City of Lewisville on January 6, 2016 regarding the maximum elevations of the completed landfill, additional groundwater monitoring wells, and other matters. This supplement is submitted pursuant to Section 361.1231 of the Texas Health and Safety Code that requires Lewisville to approve the application prior to TCEQ's approval of it. In accordance with that agreement, this submittal includes the following revisions: (1) modifying the final contour plan, (2) adding an additional groundwater monitor well system, (3) revising landfill gas probe, fence locations, and permit boundary along the northern portion of the site, and (4) providing for an additional vegetation establishment requirement for certain intermediate and final cover slopes. Additional detail regarding these revisions is included in Section 1.0 of Parts I/II.

Furthermore, the attached replacement pages also include updates to the application to reflect the completion of the following projects at the site since the application was declared technically complete in March 2015: (1) slurry wall and associated groundwater monitoring system changes and (2) the installation of 10 dedicated pre-Subtitle D area leachate removal wells. Both of these projects were authorized by the TCEQ under TCEQ Permit No. 1312A in September 2014.

During the course of your review, if you need additional information or have any questions, please call.

Sincerely,
Weaver Consultants Group, LLC

DRAFT

Jeffrey P. Young, P.E.
Senior Engineer

Attachments: Camelot Landfill Permit Amendment Replacement Pages (1 original and 3 copies)

cc: Shane Davis, City of Farmers Branch
Brent Ryan, McElroy, Sullivan & Miller, LLP

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

VOLUME 1 OF 6

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014
Revised October 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6A

This document is intended for permitting purposes only.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

APPLICATION TABLE OF CONTENTS

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised June 2014

Revised August 2016

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Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

Project No. 1339-351-11-02-06

CAMELOT LANDFILL MAJOR PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-1312B
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CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

TCEQ PART I APPLICATION FORM AND CORE DATA FORM

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised January 2014
Revised March 2014
Revised April 2014
Revised June 2014
Revised October 2014
Revised January 2015

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by
Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

Project No. 0120-84-11-89-01

Facility Name: **Camelot Landfill**
Permittee/Registrant Name: **City of Farmers Branch**
MSW Authorization #: **1312B**
Initial Submittal Date: **March 22, 2012**
Revision Date: **August ____, 2016**

Texas Commission on Environmental Quality

Part I Form

New Permit/Registration and Amendment Applications for an MSW Facility

1. Reason for Submittal

☐ Initial Submittal ☐ Notice of Deficiency (NOD) Response ☒ Supplement

2. Authorization Type

☒ Permit ☐ Registration

3. Application Type

☐ New ☒ Major Amendment
☐ Major Amendment (Limited Scope)

4. Application Fees

☐ Pay by Check ☒ Online Payment

If paid online, e-Pay Confirmation Number: **582EA000118867**

5. Application URL

Is the application submitted for Type I Arid Exempt (AE) and/or Type IV AE facility?

☐ Yes ☒ No

If the answer is "No", provide the URL address of a publicly accessible internet web site where the application and all revisions to that application will be posted.
http://**www.ftwweaverboos.com**

6. Application Publishing

Party Responsible for Publishing Notice:

☒ Applicant ☐ Agent in Service ☐ Consultant

7. Alternative Language Notice

Is an alternative language notice required for this application? (For determination refer to Alternative Language Checklist on the Public Notice Verification Form TCEQ-20244-Waste)

☒ Yes ☐ No

8. Public Place Location of Application

Name of the Public Place: **Lewisville Public Library**

Physical Address: **1197 West Main Street**

City: **Lewisville** County: **Denton** State: **Texas** Zip Code: **75067**

(Area code) Telephone Number: **972-219-3570**

9. Consolidated Permit Processing

Is this submittal part of a consolidated permit processing request, in accordance with 30 TAC Chapter 33?

☐ Yes ☒ No ☐ Not Applicable

If "Yes", state the other TCEQ program authorizations requested:

10. Confidential Documents

Does the application contain confidential documents?

☐ Yes ☒ No

If "Yes", cross-reference the confidential documents throughout the application and submit as a separate attachment in a binder clearly marked "CONFIDENTIAL."

11. Permits and/or Construction Approvals (refer to Table 2-3 in Parts I/II)

Select all that apply	Received	Pending	Not Applicable
Hazardous Waste Management Program under the Texas Solid Waste Disposal Act	☐	☐	☒
Underground Injection Control Program under the Texas Injection Well Act	☐	☐	☒
National Pollutant Discharge Elimination System Program under the Clean Water Act and Waste Discharge Program under Texas Water Code, Chapter 26	☒	☐	☐
Prevention of Significant Deterioration Program under the Federal Clean Air Act (FCAA). Nonattainment Program under the FCAA	☐	☐	☒
National Emission Standards for Hazardous Air Pollutants Preconstruction Approval under the FCAA	☐	☐	☒
Ocean Dumping Permits under the Marine Protection Research and Sanctuaries Act	☐	☐	☒
Dredge or Fill Permits under the CWA	☒	☐	☐
Licenses under the Texas Radiation Control Act	☐	☐	☒

Other Environmental Permits			
Air Quality – Title V Operating Permit	☒	☐	☐
Air Quality – Standard Operating Permit	☒	☐	☐
	☐	☐	☐
	☐	☐	☐

12. General Facility Information

Facility Name: **Camelot Landfill (see note at the bottom of this section)**

MSW Authorization No. (if available): **1312B**

Regulated Entity Reference No. (if issued)*: RN**101479038**

Physical or Street Address (if available): **580 Huffines Blvd.**

City: **Lewisville** County: **Denton** State: **Texas** Zip Code: **75056**

(Area Code) Telephone Number: **972-492-3888**

Latitude (Degrees, Minutes Seconds): **N33° 02′ 0.79″ (Benchmark Location)**

Longitude (Degrees, Minutes Seconds): **W96° 56′ 35.6″ (Benchmark Location)**

Benchmark Elevation (above mean sea level): **455.46 ft. (Benchmark Location)**

Provide a description of the location of the facility with respect to known or easily identifiable landmarks: **The site entrance is located at 580 Huffines Boulevard, approximately 1,800 feet south of the State Highway 121 Business and Huffines Boulevard intersection.**

Detail access routes from the nearest United States or state highway to the facility: **From State Highway 121 Business vehicles travel approximatelly 1,800 feet south on Huffines Boulevard to the site.**

Note: With this major amendment application, the name of the facility will change from Camelot Sanitary Landfill to Camelot Landfill, as discussed in Parts I/II – Section 2.1.

*If this number has not been issued for the facility, complete a TCEQ Core Data Form (TCEQ-10400) and submit it with this application. List the Facility as the Regulated Entity.

13. Facility Type(s)

☒ Type I ☐ Type IV ☐ Type V
☐ Type I AE ☐ Type IV AE ☐ Type VI

14. Activities Conducted at the Facility

☒ Storage ☒ Processing ☒ Disposal

15. Facility Waste Management Unit(s)

☒ Landfill Unit(s)
☐ Class 1 Landfill Unit(s)
☐ Process Tank(s)
☒ Storage Tank(s)
☐ Tipping Floor
☐ Storage Area
☐ Container(s)
☐ Roll-off Boxes
☐ Surface Impoundment
☐ Incinerator(s)
☐ Autoclave(s)
☐ Refrigeration Unit(s)
☐ Mobile Processing Unit(s)
☐ Type VI Demonstration Unit
☐ Compost Pile(s) and/or Vessel(s)
☒ Other (Specify) **Citizens Convenience Center**
☒ Other (Specify) **Wood Waste Processing**
☒ Other (Specify) **Type IX Energy/Material Recovery**

16. Description of the Revisions to the Facility

Skip this box, if "New" is selected under "Application Type".

Provide a brief description of all revisions to the permit conditions and supporting documents referenced by the permit. Also, provide an explanation of why the amendment is requested. **The purpose of this Major Permit Amendment is to secure authorization for a vertical and horizontal expansion of the Camelot Landfill. The existing active 198.3-acre waste disposal area will be expanded by 38.5 acres. The existing permit boundary, surveyed in November 2010 as 350.77 acres, will be expanded by 118.85 acres to ~~469.62~~ 459.76 acres. The maximum permitted final cover elevation will be increased from 523 ft-msl to ~~725~~ 675 ft-msl and the resulting capacity increase is ~~37,700,000~~ 30,300,000 cy. This landfill expansion will provide for the long-term disposal needs of the City of Farmers Branch, Denton County, and surrounding communities.**

17. Facility Contact Information

Site Operator (Permittee/Registrant) Name: City of Farmers Branch
Customer Reference No. (if issued)*: CN **600131676**
Mailing Address: **13000 William Dodson Parkway**
City: **Farmers Branch** County: **Dallas** State: **Texas** Zip Code: **75234**
(Area Code) Telephone Number: **(972) 919-2614**
Email Address: **shane.davis@farmersbranchtx.gov**
TX Secretary of State (SOS) Filing Number:

*If the Site Operator (Permittee/Registrant) does not have this number, complete a TCEQ Core Data Form (TCEQ-10400) and submit it with this application. List the Site Operator (Permittee/Registrant) as the Customer.

Operator Name[1]: Same as "Site Operator (Permittee/Registrant)"
Customer Reference No. (if issued)*:
Mailing Address:
City: County: State: Zip Code:
(Area Code) Telephone Number:
Email Address:
TX SOS Filing Number:

[1]If the Operator is the same as Site Operator/Permittee type "Same as "Site Operator (Permittee/Registrant)".
*If the Operator does not have this number, complete a TCEQ Core Data Form (TCEQ-10400) and submit it with this application. List the Operator as the customer.

Consultant Name (if applicable): Weaver Boos Consultants
Texas Board of Professional Engineers Firm Registration Number: **F-3727**
Mailing Address: **6420 Southwest Boulevard, Suite 206**
City: **Fort Worth** County: **Tarrant** State: **Texas** Zip Code: **76109**
(Area Code) Telephone Number: **817-735-9770**
E-Mail Address: **jyoung@wcgrp.com**
Agent in Service Name (required only for out-of-state):
Mailing Address:
City: County: State: Zip Code:
(Area Code) Telephone Number:
E-Mail Address:

18. Facility Supervisor's License

Select the Type of License that the Solid Waste Facility Supervisor, as defined in 30 TAC Chapter 30, Occupational Licenses and Registrations, will obtain prior to commencing facility operations.

☒ Class A ☐ Class B

19. Ownership Status of the Facility

☐ Corporation	☒ Limited Partnership	☐ Federal Government
☐ Individual	☒ City Government	☐ Other Government
☐ Sole Proprietorship	☐ County Government	☐ Military
☐ General Partnership	☐ State Government	☐ Other (Specify):

Note: Called 18.71 acres of the proposed permit boundary are owned by Camelot Landfill TX, LP. The remaining 450.91 acres of the permit boundary are owned by the City of Farmers Branch. Property owner affidavits for both property owners are included in Section 14 of Parts I/II.

Does the Site Operator (Permittee/Registrant) own all the facility units and all the facility property?

☐ Yes ☒ No

If "No", provide the information requested below for any additional ownership.

Owner Name: Camelot Landfill TX, LP

Street or P.O. Box: **911 E. Highway 121 Business, Suite 201**

City: **Lewisville** County: **Denton** State: **Texas** Zip Code: **75057**

(Area Code) Telephone Number: **972-434-2010**

Email Address (optional):

20. Other Governmental Entities Information

Texas Department of Transportation District: Dallas District

District Engineer's Name: **Kelly Selman, P.E.**

Street Address or P.O. Box: **4777 E. Highway 80**

City: **Mesquite** County: **Dallas** State: **Texas** Zip Code: **75150-6643**

(Area Code) Telephone Number: **214-320-6100**

E-Mail Address (optional):

The Local Governmental Authority Responsible for Road Maintenance (if applicable): Texas Department of Transportation

Contact Person's Name: **Nancy Cline, P.E., Denton County Area Engineer**

Street Address or P.O. Box: **2624 West Prairie**

City: **Denton** County: **Denton** State: **Texas** Zip Code: **76201**

(Area Code) Telephone Number: **940-387-1414**

E-Mail Address (optional):

AND

City of Lewisville Department of Public Services
~~Carole Bassinger,~~ Keith Marvin, Director
1100-D North Kealy
Lewisville, Denton, Texas 75057
Telephone: 972-219-3510

City Mayor Information

City Mayor's Name: **~~Dean Ueckert~~ Rudy Durham**

Office Address: **151 W. Church Street**

City: **Lewisville** County: **Denton** State: **Texas** Zip Code: **75057**

(Area Code) Telephone Number: **(972) 219-3400**

E-Mail Address (optional):

City Health Authority: Refer to Additional Information Page for City Health Authority Related Information

Contact Person's Name:

Street Address or P.O. Box:

City: County: State: Zip Code:

(Area Code) Telephone Number:

E-Mail Address (optional):

County Judge Information

County Judge's Name: **Mary Horn**

Street Address or P.O. Box: **110 West Hickory Street**

City: **Denton** County: **Denton** State: **Texas** Zip Code: **76201-4168**

(Area Code) Telephone Number: **940-349-2820**

E-Mail Address (optional):

County Health Authority: Denton County Health Department

Contact Person's Name: **Matt Richardson, DrPH, MPH**

Street Address or P.O. Box: **535 South Loop 288**

City: **Denton** County: **Denton** State: **Texas** Zip Code: **76205**

(Area Code) Telephone Number: **972-~~434-4700~~ 349-2900**

E-Mail Address (optional):

State Representative Information

District Number: **65**

State Representative's Name: **Ron Simmons**

District Office Address: **1029 W. Rosemeade Pkwy., Suite 108**

City: **Carrollton** County: **Denton** State: **Texas** Zip Code: **75007**

(Area Code) Telephone Number: **972-492-2080**

E-Mail Address (optional):

State Senator Information

District Number: **12**

State Senator's Name: **Jane Nelson**

District Office Address: **1235 S. Main Street, Suite 280**

City: **Grapevine** County: **Tarrant** State: **Texas** Zip Code: **76051**

(Area Code) Telephone Number: **817-424-3446**

E-Mail Address (optional):

Council of Government (COG) Name: North Central Texas Council of Govts.

COG Representative's Name: **Edith Marvin**

COG Representative's Title: **Director of Environment and Development**

Street Address or P.O. Box: **P.O. Box 5888**

City: **Arlington** County: **Tarrant** State: **Texas** Zip Code: **76005-5888**

(Area Code) Telephone Number: **817-695-9211**

E-Mail Address (optional):

River Basin Authority Name: Trinity River Authority, Northern Region

Contact Person's Name: **Fiona Allen**

Watershed Sub-Basin Name: **Elm Fork Trinity River Below Lewisville Lake**

Street Address or P.O. Box: **P.O. Box 240**

City: **Arlington** County: **Tarrant** State: **Texas** Zip Code: **76004**

(Area Code) Telephone Number: **817-493-5145**

E-Mail Address (optional):

Coastal Management Program

Is the facility within the Coastal Management Program boundary?

☐ Yes ☒ No

U.S. Army Corps of Engineers

The facility is located in the following District of the U.S. Army Corps of Engineers:

☐ Albuquerque, NM ☐ Galveston, TX

☒ Ft. Worth, TX ☐ Tulsa, OK

Local Government Jurisdiction

Within City Limits of: **Lewisville**

Within Extraterritorial Jurisdiction of:

Is the facility located in an area in which the governing body of the municipality or county has prohibited the storage, processing or disposal of municipal or industrial solid waste?

☐ Yes ☒ No

(If "Yes", provide a copy of the ordinance or order as an attachment):

Signature Page

I, ____Charles S. Cox____ ____City Manager____,
(Site Operator (Permittee's Authorized Signatory)) (Title)

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: ______________ Date: __________

- -

TO BE COMPLETED BY THE OPERATOR IF THE APPLICATION IS SIGNED BY AN AUTHORIZED REPRESENTATIVE FOR THE OPERATOR

I, ____________________, hereby designate ________________________
(Print or Type Operator Name) (Print or Type Representative Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

____
Printed or Typed Name of Operator or Principal Executive Officer

____
Signature

- -

SUBSCRIBED AND SWORN to before me by the said____________________

On this ______ day of ______, ______

My commission expires on the ______ day of ______, ______

____
Notary Public in and for

____________________ County, Texas
(Note: Application Must Bear Signature & Seal of Notary Public)

Part I Attachments

(See Instructions for P.E. seal requirements.)

Required Attachments	**Attachment No.**
Supplementary Technical Report	**Parts I/II Section 2**
Property Legal Description	**Parts I/II Section 13**
Property Metes and Bounds Description	**Parts I/II Section 13**
Facility Legal Description	**Parts I/II Section 13**
Facility Metes and Bounds Description	**Parts I/II Section 13**
Metes and Bounds Drawings	**Parts I/II Section 13**
On-Site Easements Drawing	**Parts I/II Section 13**
Land Ownership Map	**Parts I/II Section 5**
Land Ownership List	**Provided in CD**
Electronic List or Mailing Labels	**Provided in CD**
Texas Department of Transportation (TxDOT) County Map	**Parts I/II Section 4**
General Location Map	**Parts I/II Section 4**
General Topographic Map	**Parts I/II Section 4**
Verification of Legal Status	**Parts I/II Section 15**
Property Owner Affidavit	**Parts I/II Section 14**
Evidence of Competency	**Parts I/II Section 16**

Additional Attachments as Applicable- Select all those apply and add as necessary

- ☒ TCEQ Core Data Form(s)
- ☒ Signatory Authority Delegation
- ☒ Fee Payment Receipt **(E-Payment Ref. No. provided on page 1 of Part I Form)**
- ☐ Confidential Documents
- ☐ Waste Storage, Processing and Disposal Ordinances
- ☐ Final Plat Record of Property
- ☐ Certificate of Fact (Certificate of Incorporation)
- ☐ Assumed Name Certificate

TCEQ

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided)*

☐ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☒ Other **Major Permit Amendment**

2. Attachments **Describe Any Attachments:** *(ex. Title V Application, Waste Transporter Application, etc.)*

☒Yes ☐No Major Permit Amendment

3. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	4. Regulated Entity Reference Number *(if issued)*
CN 601253628		RN 101479038

SECTION II: Customer Information

5. Effective Date for Customer Information Updates (mm/dd/yyyy) 9/1/2012

6. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check only one of the following:*

☐Owner ☒ Operator ☐ Owner & Operator
☐Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐Other: _____

7. General Customer Information

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐Change in Legal Name (Verifiable with the Texas Secretary of State) ☒ No Change**

If "No Change" and Section I is complete, skip to Section III – Regulated Entity Information.

8. Type of Customer:	☐ Corporation	☐ Individual	☐ Sole Proprietorship- D.B.A
☐ City Government	☐ County Government	☐ Federal Government	☐ State Government
☐ Other Government	☐ General Partnership	☐ Limited Partnership	☐ Other: _____

9. Customer Legal Name *(If an individual, print last name first: ex: Doe, John)*	*If new Customer, enter previous Customer below*	*End Date:*

10. Mailing Address:							
	City		State		ZIP		ZIP + 4

11. Country Mailing Information *(if outside USA)*	12. E-Mail Address *(if applicable)*

13. Telephone Number	14. Extension or Code	15. Fax Number *(if applicable)*
( ) -		( ) -

16. Federal Tax ID *(9 digits)*	17. TX State Franchise Tax ID *(11 digits)*	18. DUNS Number *(if applicable)*	19. TX SOS Filing Number *(if applicable)*

20. Number of Employees

☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

21. Independently Owned and Operated?

☐ Yes ☐ No

SECTION III: Regulated Entity Information

22. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☒ Update to Regulated Entity Name ☐ Update to Regulated Entity Information ☒ No Change** *(See below)*

****If "NO CHANGE" is checked and Section I is complete, skip to Section IV, Preparer Information.**

23. Regulated Entity Name *(name of the site where the regulated action is taking place)*

Camelot Landfill

24. Street Address of the Regulated Entity: *(No P.O. Boxes)*							
	City		State		ZIP		ZIP + 4
25. Mailing Address:	a						
	City		State		ZIP		ZIP + 4

26. E-Mail Address:		
27. Telephone Number	28. Extension or Code	29. Fax Number *(if applicable)*
( ) -		( ) -

30. Primary SIC Code (4 digits)	31. Secondary SIC Code (4 digits)	32. Primary NAICS Code (5 or 6 digits)	33. Secondary NAICS Code (5 or 6 digits)

34. What is the Primary Business of this entity? *(Please do not repeat the SIC or NAICS description.)*

Questions 34 – 37 address geographic location. Please refer to the instructions for applicability.

35. Description to Physical Location:			
36. Nearest City	County	State	Nearest ZIP Code

37. Latitude (N) In Decimal:			38. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form or the updates may not be made. If your Program is not listed, check other and write it in. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Industrial Hazardous Waste	☐ Municipal Solid Waste
☐ New Source Review – Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS	☐ Sludge
☐ Stormwater	☐ Title V – Air	☐ Tires	☐ Used Oil	☐ Utilities
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Jeffrey P. Young, P.E.	41. Title:	Senior Engineer
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(817) 735-9770	111	(817) 735-9775	jyoung@wcgrp.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 9 and/or as required for the updates to the ID numbers identified in field 39.

(See the Core Data Form instructions for more information on who should sign this form.)

Company:	Camelot Landfill TX, LP	Job Title:	Area President
Name *(In Print)*:	Gregg Brummer	Phone:	(817) 317-2000
Signature:		Date:	

TCEQ

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided)*

☐ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☒ Other **Major Permit Amendment**

2. Attachments **Describe Any Attachments:** *(ex. Title V Application, Waste Transporter Application, etc.)*

☒ Yes ☐ No Major Permit Amendment

3. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	4. Regulated Entity Reference Number *(if issued)*
CN 600131676		RN 101479038

SECTION II: Customer Information

5. Effective Date for Customer Information Updates (mm/dd/yyyy) 3/11/2010

6. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check only one of the following:*

☐ Owner ☐ Operator ☒ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other: _____

7. General Customer Information

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐ Change in Legal Name (Verifiable with the Texas Secretary of State) ☒ No Change**

If "No Change" and Section I is complete, skip to Section III – Regulated Entity Information.

8. Type of Customer:	☐ Corporation	☐ Individual	☐ Sole Proprietorship- D.B.A
☐ City Government	☐ County Government	☐ Federal Government	☐ State Government
☐ Other Government	☐ General Partnership	☐ Limited Partnership	☐ Other: _____

9. Customer Legal Name *(If an individual, print last name first: ex: Doe, John)*	*If new Customer, enter previous Customer below*	*End Date:*

10. Mailing Address:								
	City		State		ZIP		ZIP + 4	

11. Country Mailing Information *(if outside USA)*	12. E-Mail Address *(if applicable)*

13. Telephone Number	14. Extension or Code	15. Fax Number *(if applicable)*
( ) -		( ) -

16. Federal Tax ID *(9 digits)*	17. TX State Franchise Tax ID *(11 digits)*	18. DUNS Number *(if applicable)*	19. TX SOS Filing Number *(if applicable)*

20. Number of Employees

☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

21. Independently Owned and Operated?

☐ Yes ☐ No

SECTION III: Regulated Entity Information

22. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☒ Update to Regulated Entity Name ☐ Update to Regulated Entity Information ☒ No Change** *(See below)*

****If "NO CHANGE" is checked and Section I is complete, skip to Section IV, Preparer Information.**

23. Regulated Entity Name *(name of the site where the regulated action is taking place)*

Camelot Landfill

24. Street Address of the Regulated Entity: *(No P.O. Boxes)*								
	City		State		ZIP		ZIP + 4	
25. Mailing Address:	a							
	City		State		ZIP		ZIP + 4	
26. E-Mail Address:								

27. Telephone Number	28. Extension or Code	29. Fax Number *(if applicable)*
( ) -		( ) -

30. Primary SIC Code (4 digits)	31. Secondary SIC Code (4 digits)	32. Primary NAICS Code (5 or 6 digits)	33. Secondary NAICS Code (5 or 6 digits)

34. What is the Primary Business of this entity? *(Please do not repeat the SIC or NAICS description.)*

Questions 34 – 37 address geographic location. Please refer to the instructions for applicability.

35. Description to Physical Location:	

36. Nearest City	County	State	Nearest ZIP Code

37. Latitude (N) In Decimal:			38. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form or the updates may not be made. If your Program is not listed, check other and write it in. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Industrial Hazardous Waste	☐ Municipal Solid Waste
☐ New Source Review – Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS	☐ Sludge
☐ Stormwater	☐ Title V – Air	☐ Tires	☐ Used Oil	☐ Utilities
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Jeffrey P. Young, P.E.	41. Title:	Senior Engineer

42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(817) 735-9770	111	(817) 735-9775	jyoung@wcgrp.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 9 and/or as required for the updates to the ID numbers identified in field 39.

(See the Core Data Form instructions for more information on who should sign this form.)

Company:	City of Farmers Branch	**Job Title:**	City Manager
Name *(In Print)*:	Charles S. Cox	**Phone:**	(972) 919-2515
Signature:		**Date:**	

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PARTS I/II
GENERAL APPLICATION REQUIREMENTS

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014
Revised October 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99338, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6A

This document is intended for permitting purposes only.

1 INTRODUCTION

This section addresses §330.59, §330.61, and §305.45.

The purpose of this Major Permit Amendment is to secure authorization for a vertical and horizontal expansion of the Camelot Landfill. The existing active 198.3-acre waste disposal area will be expanded by 38.5 acres. The existing permit boundary, surveyed in November 2010 as 350.77 acres, will be expanded by ~~118.85~~ 108.99 acres to ~~469.62~~ 459.76 acres. The maximum permitted final cover elevation will be increased from 523 ft-msl to ~~725~~ 675 ft-msl and the resulting capacity increase is ~~37,700,000~~ 30,300,000 cy. This landfill expansion will provide for the long-term disposal needs of the City of Farmers Branch, Denton County, and surrounding communities.

The General Application Requirements Section (Parts I/II) of this Permit Amendment Application for the Camelot Landfill has been prepared consistent with the State of Texas requirements set forth in Title 30 Texas Administrative Code (TAC) §330.59 and §330.61. Part II has been combined with Part I in accordance with §330.57(c)(2). Section 2, Supplementary Technical Report, presents an overview of the project and a detailed facility description as well as the types of waste that will be accepted at the facility. The remaining portions of Parts I/II present information on specific existing conditions on and around the site and regulatory matters of the entities involved in the application process.

This application was initially declared technically complete by the TCEQ on March 19, 2015. An agreement was reached between the City of Farmers Branch and the City of Lewisville on January 6, 2016 regarding the maximum elevation of the completed landfill, additional groundwater monitoring wells, and other matters. In accordance with that agreement, this supplemental submittal includes the following revisions:

- Revise the final contours so that the maximum elevation of the completed landfill over the pre-Subtitle D area of the landfill will not exceed 623 feet above mean-sea level (msl) and the maximum elevation of the completed landfill over the Subtitle D area of the landfill will not exceed 675 feet msl.
- Add ten groundwater monitor wells along the east and southeast perimeter of the landfill and two monitor wells along the upgradient west perimeter. Each of these monitor wells will be completed in the Woodbine Formation. These ten monitor wells will comprise the "Woodbine Groundwater Monitoring Well System" and will be installed within twelve months after a final unappealable permit is issued.

- Revise landfill gas probe, fence locations, and permit boundary along the northern portion of the site where property has been conveyed to the City of Lewisville for the construction of Corporate Drive and Huffines Boulevard.
- Beautify the non-active slopes of the landfill through the establishment of native grasses and flowering plants as part of the vegetative cover. This vegetative cover will include a mixture of Bermuda, vetch, rye, wheat grass, wild flowers, flowering plants, and other applicable vegetative material. This additional vegetation establishment requirement will be applicable to both interim and final slopes.

Since the application was declared technically complete, the following improvements have been completed at the facility.

- The slurry wall located along the southern and eastern perimeter of the site has been installed per a permit modification that was approved by the TCEQ in September 2014.
- Three additional groundwater monitor wells have been installed. These monitor wells are labeled MW-9A, MW-4A, and MW-13R2 and were installed after the slurry wall was constructed. These wells were authorized by the TCEQ in September 2014.
- Dedicated pre-Subtitle D area leachate removal wells have been installed. Ten dedicated leachate removal wells were installed in the pre-Subtitle D area per a permit modification that was approved by the TCEQ in September 2014.

2 SUPPLEMENTARY TECHNICAL REPORT

2.1 Facility Location and Project Overview

This section addresses §305.45(a)(7), §305.45(a)(8), §330.57(i), §330.59(b), §330.61(b), §330.61(l), §330.61(o), and §330.61(p).

The Camelot Landfill is an existing municipal solid waste facility (TCEQ Permit No. MSW-1312A) in Denton County which is owned by the City of Farmers Branch. The site entrance facilities are located at 580 Huffines Boulevard, approximately 1,800 feet south of State Highway 121 Business.

The site was originally permitted as a solid waste landfill under Texas Department of Health (TDH) Permit No. 1312 in December 1979. The permit was amended in March 1981, before the site opened, to expand the permit boundary to approximately 351 acres (TCEQ Permit No. MSW-1312A). The site was upgraded to Subtitle D standards in 1996. A minor amendment to revise the facility's base grades and final cover configuration was approved by the TCEQ in 2001. The minor amendment reduced the footprint of the site from 238 acres to the existing 198.3 acres.

The purpose of this Major Permit Amendment is to secure authorization for a vertical and horizontal expansion of the Camelot Landfill. Comparisons between (1) the existing permitted and proposed landfill completion plans and (2) the existing permitted and proposed excavation plans are shown on Figure I/II-2.1 and Figure I/II-2.2, respectively. As shown, the existing active 198.3-acre waste disposal area will be expanded by 38.5 acres. Additionally, Figure I/II-2.2 includes the cell designations and their areas for the permitted and proposed configurations. The proposed expansion area will be located within the proposed ~~469.62~~ 459.76-acre permit boundary. The maximum permitted final cover elevation will be increased from 523.0 ft-msl to ~~725.0~~ 675.0 ft-msl. The resulting capacity increase is ~~37,700,000~~ 30,300,000 cubic yards. This landfill expansion will provide for the long-term disposal needs of the City of Farmers Branch, Denton County and surrounding communities. A facility name change is included in the application. The facility name under TCEQ Permit No. MSW-1312A is "Camelot Sanitary Landfill." Upon approval of this application (TCEQ Permit No. MSW-1312B), the facility name will be "Camelot Landfill."

As shown on Figures I/II-2.1 and I/II-2.2, the permit boundary will be expanded to the north by adding ~~118.85~~ 108.99 acres to the existing 350.77-acre permit boundary. The area within the proposed permit boundary expansion area includes an inactive municipal solid waste permit area (TCEQ Permit No. MSW-946). The current permittee of TCEQ Permit No. MSW-946 is the City of Farmers Branch. This permit was issued by the TCEQ on

March 15, 1979 to the Town of Highland Park. The 102.58-acre property and the permit were transferred to the City of Farmers Branch in 2000 (refer to Appendix I/IIH for additional information). The permitted facility has never been developed; however, the record for this permit does indicate some waste filling occurred in the late 1960s and 1970s (refer to Section 3.1 for additional information). As noted in Section 17, the City of Farmers Branch requests that TCEQ Permit No. MSW-946 be revoked upon approval of this permit amendment application, as the majority of the 102.58-acre permit boundary of TCEQ Permit No. MSW-946 will be incorporated into the ~~469.62~~ 459.76-acre permit boundary of TCEQ Permit No. MSW-1312B. Waste within the historic waste fill area associated with TCEQ Permit No. MSW-946 (as shown on Figures I/II-2.1 and I/II-2.2) will be moved to the 236.8-acre waste disposal area prior to the development of the North detention pond (refer to Section 4.6 of Part III and Section 4.25 of Part IV – SOP).

The existing Camelot Landfill currently serves residences and businesses in Denton, Dallas, Collin, and Tarrant Counties. This service area is based on current economic conditions. As economic conditions and available landfill disposal capacity change, the landfill may accept waste from areas other than those noted above.

The quantity and types of waste accepted at the landfill and the site design and operations are discussed in the following subsections. Consistent with Title 30 TAC §330.61(b), the sources and characteristics of wastes are detailed in the following sections. In addition, waste screening and acceptance procedures are further discussed in Part IV – SOP.

2.1.1 Waste Acceptance Plan

The Camelot Landfill is currently operated as a Type I municipal solid waste disposal facility. The facility accepts waste for disposal from both public and private entities in Denton, Collin, Dallas, and Tarrant counties. The proposed expansion of the site will not alter the current disposal patterns. The design and operation of the facility considers the characteristics of the waste types discussed in this section.

The major classifications of solid waste to be accepted at the Camelot Landfill include household waste, yard waste, commercial waste, industrial waste (non-hazardous), construction-demolition waste, and some special wastes. Each classification of waste is defined by §330.3 as follows (note that not all of the special wastes listed in §330.3(148) will be accepted at this site – refer to Part IV for additional information):

- **Household Waste:** Any solid waste (including garbage, trash, and sanitary waste in septic tanks) derived from households (including single and multiple residences, hotels, motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas); does not include brush.
- **Yard Waste:** Leaves, grass clippings, yard and garden debris, and brush, including clean woody vegetative material not greater than 6 inches in diameter, that result from landscaping maintenance and land-clearing operations. The term does not include stumps, roots, or shrubs with intact root balls.

A Wood Waste Processing Area will be located in the area north of the landfill to process source separated wood waste material. This facility may operate periodically after the area is initially developed. The wood waste material will be ground to reduce the size of the material to create wood chips. The Wood Waste Processing Area will consist of a material receiving area, a material processing area that will include a tub grinder to reduce material size (or the grinder may be brought to site as needed), and a wood chip storage area. The processed wood chips may be distributed to local citizens, governmental agencies, and/or used onsite for vegetation enhancement and erosion control.

Waste will only be disposed of in the 236.8-acre solid waste disposal area listed in this permit amendment. No additional waste will be disposed of in the 5.1-acre inactive unit located in the northeast portion of the site. As discussed in Section 4.6 of Part III – Site Development Plan Narrative and Section 4.25 of Part IV – SOP, the existing waste located in the 5.1-acre inactive unit and the historic waste fill area associated with TCEQ Permit No. MSW-946 will be relocated to the 236.8-acre disposal area. The inactive unit will be regraded with soil fill to create an open space/green field area. No other waste disposal activities will occur within the ~~469.62~~ 459.76-acre Camelot Landfill permit boundary.

2.1.2 Disposal Volume and Rate of Waste

The following two subsections detail the volume of waste disposal capacity and the projected disposal rates.

Volume of Waste Disposal Capacity

The waste disposal capacity of the site is summarized in Table 2-1.

Table 2-1
Waste Disposal Capacity Summary

Item	Disposal Capacity[1]	
	Permit No. MSW-1312A	Permit No. MSW-1312B
Consumed Airspace[2]	15,357,000 cy	15,357,000 cy
Remaining Airspace	7,543,000 cy	~~45,243,000~~ 37,843,000 cy
Airspace Gained by Expansion	---	~~37,700,000~~ 30,300,000 cy
Total Capacity	**22,900,000 cy**	**~~60,600,000~~ 53,200,000 cy**

[1] Disposal capacity is defined as waste and daily cover. The consumed airspace represents the waste that has been placed at the site as of August 28, 2010.

[2] The consumed airspace quantity does not include (1) the waste in the 5.1-acre inactive unit that will be relocated to the 236.8-acre disposal area and (2) the historic waste in the Permit No. MSW-946 area. The waste volume from these two areas will consume a portion of the total capacity of the ~~60.6~~ 53.2 million cy disposal area.

Disposal Rate Projections

Two estimates have been developed to provide an assessment of the solid waste disposal rate for the Camelot Landfill. The first estimate is based on the City of Farmers Branch's knowledge of market conditions, both currently and after the permit is issued. A second estimate was completed based on historical waste inflow data.

The disposal rate projections are discussed in detail in Appendix IIIN and summarized in Table 2-2.

Table 2-2
Solid Waste Disposal Rate Summary

Method Used to Determine Solid Waste Generation Rate	Average Daily Waste Inflow (tons/day)	Maximum Projected Waste Inflow (tons/day)	Population Equivalent (persons)	Site Life (years)
City of Farmers Branch Projection	~~3,753~~ 3,358	~~5,299~~ 5,072	~~1,176,283~~ 1,052,480	~~29.3~~ 25.8
Historical Data	~~1,650~~ 1,546	~~2,336~~ 2,072	~~517,151~~ 484,554	~~66.7~~ 56.1

Currently, the Camelot Landfill accepts approximately 305,478 tons per year, based on the 2010 TCEQ annual report. The waste inflow rate is assumed to increase consistent with the projected growth rate for the facility's general service area, which for this analysis is assumed to be Denton, Collin, Dallas, and Tarrant counties. The estimated acceptance rate of disposal at the end of the site's projected life is ~~1,515,604~~ 1,450,712 tons per year.

Operating criteria for a range of waste acceptance rates are included in Part IV – SOP. The above projections are based on current market conditions and may vary as market conditions change. These waste acceptance rates are not a limiting parameter of this permit. The actual yearly waste acceptance rate is a rolling quantity based on the sum of the previous four quarters of waste acceptance (refer to Part IV – SOP for additional information).

The estimated maximum annual waste acceptance rate for the facility for five years (beginning in 2011 and using the base year as 2010) is shown in the following table.

Year	Waste Acceptance Rate (tons per year)
2010*	305,478
2011	429,000
2012	435,692
2013	442,489
2014	449,392
2015	456,403
2016	462,199

*Actual acceptance rate based on 2010 TCEQ Annual Report.

The projected waste acceptance rate for other years is summarized in Part III, Appendix IIIN.

2.1.3 Solid Waste Containment System

The design objective of the containment system [final cover, Subtitle D liner, pre-Subtitle D area overliner (i.e., the term overliner refers to the liner system that will be installed over the existing pre-Subtitle D area), and leachate management systems] is to isolate the solid waste and remove leachate (defined as water that has contacted solid waste) that

may collect on the liner system. The Subtitle D liner system proposed for the landfill is a composite liner (compacted clay/60-mil geomembrane liner/ and drainage geocomposite). The containment system for the Camelot Landfill is shown in Figure 2.1.

The proposed continued development of the site does include a vertical expansion over the pre-subtitle D portion of the landfill. A containment system design for this area is provided to meet the point of compliance (POC) requirements listed in Title 30 TAC §330.331(a)(1). The design includes a composite liner system, slurry wall, and a leachate removal system for the pre-Subtitle D area. The composite overliner system that will be constructed over the pre-Subtitle D waste disposal area will consist of a geosynthetic clay liner (GCL), a 40-mil LLDPE geomembrane liner, drainage geocomposite layer, and a soil protection cover layer.

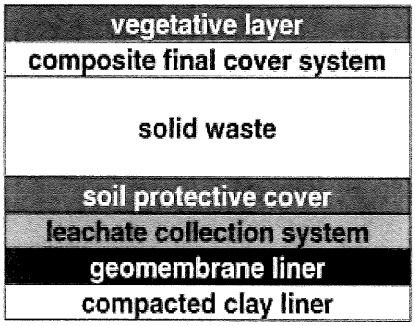


Figure 2.1. The liner and cover systems will be designed to meet or exceed all state and federal regulations.

Design information and the required QA/QC construction procedures for the individual components of the containment system are presented in Part III of this application.

2.1.4 Site Development Plan

The site development plan (SDP) is included in Part III of this application. This plan sets forth the overall design and operating characteristics of the landfill. Drawings showing the proposed landfill configuration during site development are presented in Parts I/II, Appendix I/IIA – Facility Layout Maps. A summary of the landfill configuration is provided below.

- The existing permit boundary, surveyed in November 2010 as 350.77 acres, will be expanded by ~~118.85~~ 108.99 acres to ~~469.62~~ 459.76 acres. The proposed permit boundary will add additional buffer area in the north portion of the landfill, as well as provide additional area for an operations support area and a possible wood waste processing area.
- The existing active 198.3-acre landfill unit will be expanded by 38.5 acres to create a 236.8-acre landfill unit. The existing 5.1-acre landfill unit located in the northeast portion of the site will remain inactive. During the development of the site, the existing waste within the 5.1-acre inactive unit and the historic waste fill area associated with TCEQ Permit No. MSW-946 will be relocated to the 236.8-acre disposal area. The inactive unit area will be regraded to create an open space/green field area.
- A summary of the capacity (volume of waste and cover soils) of the site is listed below:
  - Remaining capacity of existing site (TCEQ Permit No. MSW-1312A) = 7,543,000 cubic yards (as of August 28, 2010).

- Increase due to major permit amendment application = ~~37,700,000~~ 30,300,000 cubic yards.
- Remaining capacity of the site with the major permit amendment application (TCEQ Permit No. MSW-1312B) = ~~45,243,000~~ 37,843,000 cubic yards (as of August 28, 2010).

- The maximum elevation of the final cover will be ~~725~~ 675 ft-msl, and the maximum waste elevation will be ~~721.5~~ 671.5 ft-msl.
- The minimum elevation of the landfill excavation grades (or the elevation of the deepest excavation) will be 387 ft-msl (i.e., bottom of excavation in deepest sump). Throughout this application, the term "minimum elevation of excavation" and "elevation of the deepest excavation" are used interchangeably.
- A Subtitle D composite liner (2-feet-thick compacted clay liner overlain by a 60-mil HDPE geomembrane liner) and leachate collection system will be constructed according to §330.331(a)(2) and §330.333. Details for the liner and LCS are provided in Part III, Appendix IIIA-A – Liner, Overliner, and Final Cover System Details.
- The proposed continued development of the site does include a vertical expansion over the pre-Subtitle portion of the landfill. A containment system design for this area is provided to meet the point of compliance (POC) requirements listed in §330.331(a)(1). The design includes a composite liner system, slurry wall, and leachate removal system for the pre-Subtitle D area. The alternate composite overliner system consists of a GCL, a 40-mil LLDPE geomembrane, a drainage geocomposite leachate collection layer, and a 2-foot-thick protective layer. Details for the overliner system are provided in Part III, Appendix IIIA – Landfill Unit Design Information. The point of compliance demonstration is provided in Part III, Appendix IIIB.
- Above grade waste disposal will conform to the lines and grades set forth in Parts I/II, Appendix I/IIA, Drawing I/IIA.8 – Landfill Completion Plan. Side fill slopes will not exceed 25 percent from the toe of the side embankment to the top of the side embankment. The slope of the landfill top deck will be constructed at a 4 percent maximum slope.
- A final cover system will be constructed over the filled waste material, as shown in Part III, Appendix IIIA-A – Liner, Overliner, and Final Cover System Details. The final cover system is designed to minimize storm water infiltration.
- The existing Citizens Convenience Center is located in the northern portion of the site. Generalized construction details of the convenience center are included in Parts I/II, Appendix I/IIA. Operational requirements are included in Part IV-SOP. The convenience center uses watertight containers. Traffic to the facility is controlled by scale operators to ensure a safe and efficient operation. Prior to the development of Cell 10, the Citizens Convenience Center will be relocated to the operation support area on the north end of the property or near the scale house.

- The Wood Waste Processing Area will be located north of the landfill. Generalized construction details and a Wood Waste Storage and Processing Area Operating Plan are included in Part IV, Appendix IVD.

2.1.5 Site Monitoring Systems

To verify the integrity of the environmental protection systems, the following existing and proposed landfill monitoring systems will be installed and/or maintained.

- **Groundwater Monitoring System** – The purpose of the groundwater monitoring system is to verify the integrity of the containment systems and to confirm that area groundwater is not adversely impacted by the landfill. This is accomplished by obtaining groundwater samples from the monitoring wells on the perimeter of the landfill, which are screened in the uppermost aquifer. Appendix IIIH includes the details of the existing and proposed groundwater monitoring systems. The TCEQ-approved groundwater monitoring system consists of 21 existing detection groundwater monitoring wells and an observation well system discussed in Appendix IIIH (System 2.1.4).

  The groundwater monitoring system was revised in 2010 to comply with Title 30 TAC §330.403(a)(2), which required the installation of additional groundwater monitoring wells. In addition, per the approved permit modification to install the slurry wall submitted to TCEQ under MSW Permit No. 1312A, three additional monitor wells were installed in 2015. Since the waste footprint expansion area is located within the existing monitoring well network, this permit amendment proposes only minor changes to the existing detection groundwater monitoring system. In addition, a separate observation well system is ~~proposed~~ described in Appendix IIIH. The observation well system includes ~~both~~ existing and proposed wells located on the southern portion of the site between the limits of waste and the point of compliance. This additional observation well system ~~will~~ monitors groundwater quality on both sides of the slurry wall to verify the effectiveness of the slurry wall (which creates an additional hydraulic barrier between the limits of waste and the POC) and to provide an additional monitoring system that is designed to detect constituents of concern before they would reach the point of compliance. This early detection system, which is generally located 120 feet to 400 feet upgradient of the point of compliance, will allow for the implementation of corrective action measures before an impact is detected at the point of compliance. Ten new monitor wells will be installed into the Woodbine Formation aquifer within 12 months after a final, unappealable permit is issued. The locations of the 10 Woodbine monitor wells are shown on Drawing I/IIA.1 (Appendix I/IIA) and discussed in more detail in Section 2.1.5 of Appendix IIIH (Part III). The proposed Woodbine monitor wells OW-1 through OW-8 are down groundwater gradient wells and Woodbine monitor wells OW-9 and OW-10 are up gradient wells.

  The detection monitoring well locations are shown in Part III, Appendix IIIH, Figure IIIH-A-1. Two additional groundwater monitoring wells (MW-30 and MW-31), located in the southwest portion of the site will replace detection monitor well MW-13R. MW-32 will replace MW-9A in the southeast portion of the site. Following the installation and background data acceptance of the three proposed detection monitoring wells, the groundwater detection monitoring system will consist of 22 wells.

  The observation well system is detailed in Section 2.1.4 of Appendix IIIH.

- **Landfill Gas Monitoring System** – The purpose of the landfill gas monitoring system is to monitor and verify that landfill gas does not migrate off-site. The TCEQ-approved landfill gas monitoring system consists of 20 existing permanent gas probes around the existing permit boundary. As a result of landfill expansion, there will be a net increase of 2 probes resulting in a total of 22 gas probes (6 of the existing permanent probes will be abandoned, 8 new probes will be installed, and 14 existing probes will remain in place). As shown on Figure I/II-3.5, the site currently has an active landfill gas collection and control system (GCCS). The landfill gas monitoring system is discussed in detail in Part III, Appendix IIII.

- **Surface Water Monitoring Requirements** – The Camelot Landfill is subject to TCEQ stormwater permit requirements. A copy of the TPDES permit is included in Appendix I/IIG. Surface water monitoring is conducted consistent with TPDES requirements.

2.1.6 Site Operations

The Camelot Landfill is now and will continue to be operated by trained and TCEQ-licensed personnel. The Site Operating Plan (SOP) for the Camelot Landfill is presented in Part IV of this permit application. The Site Operating Plan details the required equipment, personnel, and safety procedures required to operate the site in accordance with §330.65. The active landfill area will be covered each evening to control potential nuisance conditions such as odors and vectors. The Camelot Landfill will continue to be inspected by the TCEQ on a regular basis for compliance with state regulations.

The operating hours at the site are 3:00 a.m. to 7:30 p.m. Monday through Friday and 4:00 a.m. to 3:00 p.m. on Saturday. The site is closed on Sunday.

2.2 Regulatory Agency Coordination

Documentation of coordination with the following regulatory agencies is included in Appendix I/IIB:

- Federal Aviation Administration
- Texas Historical Commission
- Texas Department of Transportation
- Texas Parks and Wildlife Department
- North Central Texas Council of Governments
- U.S. Army Corps of Engineers
- U.S. Department of the Interior, Fish and Wildlife Service

In addition, all excavation areas and improvements will be consistent with approved engineering site plans and with permit approvals from the Federal Emergency Management Agency (FEMA), Trinity River Steering Committee/Flood Management Task Force (Corridor Development Certificate), the U.S. Army Corps of Engineers, and Lewisville, as applicable.

2.3 Texas Historical Commission Review

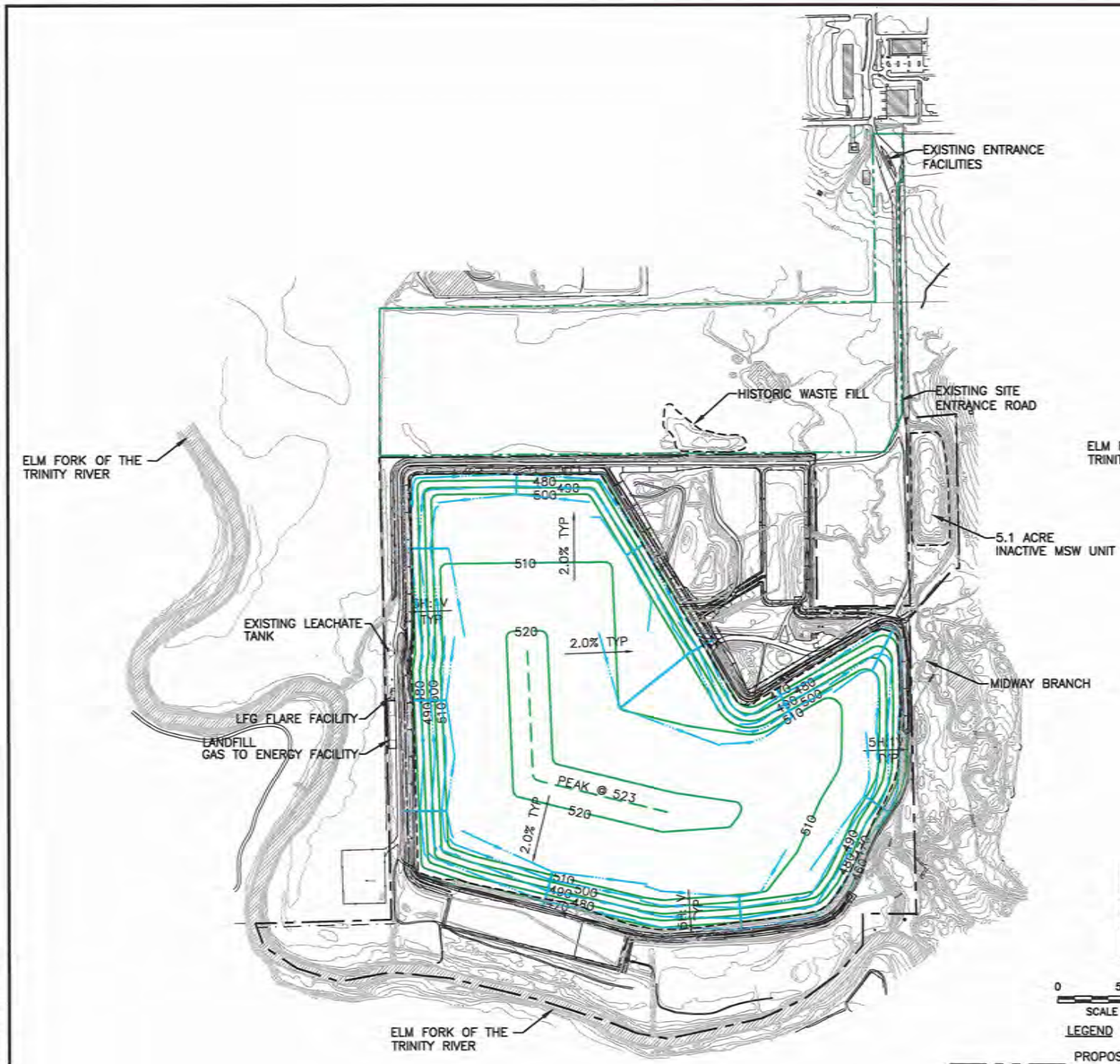
As noted in Section 2.2, a Texas Historical Commission coordination letter is included in Appendix I/IIB. The Historical Commission concluded that no historic properties will be affected by the proposed expansion.

2.4 North Central Texas Council of Governments

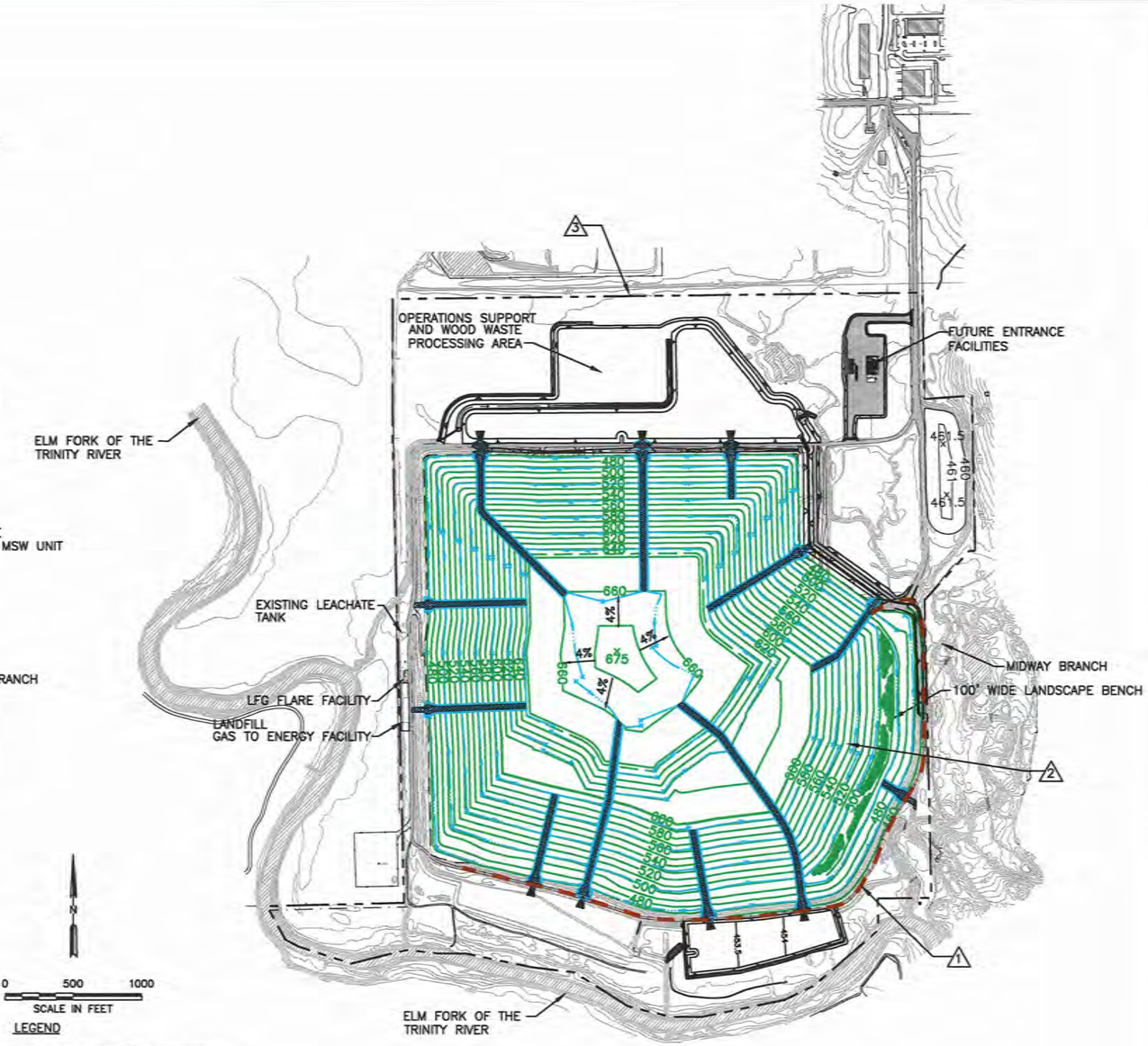
The expansion of the Camelot Landfill is consistent with the North Central Texas Council of Governments (NCTCOG) Regional Sold Waste Management Plan. Parts I/II of this application was submitted to the NCTCOG in March 2012. A letter documenting that Parts I/II was submitted to the NCTCOG is included in Appendix I/IIB. In addition, on February 28, 2013, the NCTCOG Resource Conservation Council found this project consistent with the goals of the Regional Solid Waste Management Plan (refer to Appendix I/IIB for additional information).

2.5 Abandoned Oil and Water Wells

At the time of this submittal, there are no known abandoned oil, gas, or water wells at the site. However, if an abandoned oil, gas, or water well is located, the Landfill Manager will provide written notification to the TCEQ's Executive Director of their location within



PERMITTED LANDFILL COMPLETION PLAN
(TCEQ PERMIT NO. MSW–1312A)



PROPOSED LANDFILL COMPLETION PLAN
(TCEQ PERMIT NO. MSW–1312B)

0 500 1000
SCALE IN FEET

LEGEND

- PROPOSED PERMIT BOUNDARY (TCEQ PERMIT NO. MSW 1312B)
- EXISTING PERMIT BOUNDARY (TCEQ PERMIT NO. MSW 1312A)
- PROPOSED LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- PERMIT BOUNDARY FOR (TCEQ PERMIT NO. MSW 946)
- 500 EXISTING CONTOUR
- 2 600 FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- 1 EXISTING SLURRY WALL
- 600 REGRADED BUFFER ZONE (GREENFIELD/OPEN SPACE) AREA
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED FINAL COVER CONTOURS.
3. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW 1312A WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED NOVEMBER 2010.
3. PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW 1312B WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
4. PERMIT BOUNDARY REPRODUCED FROM THE LEGAL DESCRIPTION INCLUDED IN TCEQ PERMIT NO. MSW–946 DATED MARCH 15, 1979.

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☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339–351–11
CAD: 2.1_FC COMPARISON.DWG
DRAWN BY: JDW
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS		
NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
EXISTING AND PROPOSED
LANDFILL COMPLETION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F–3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735–9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE I/II–2.1

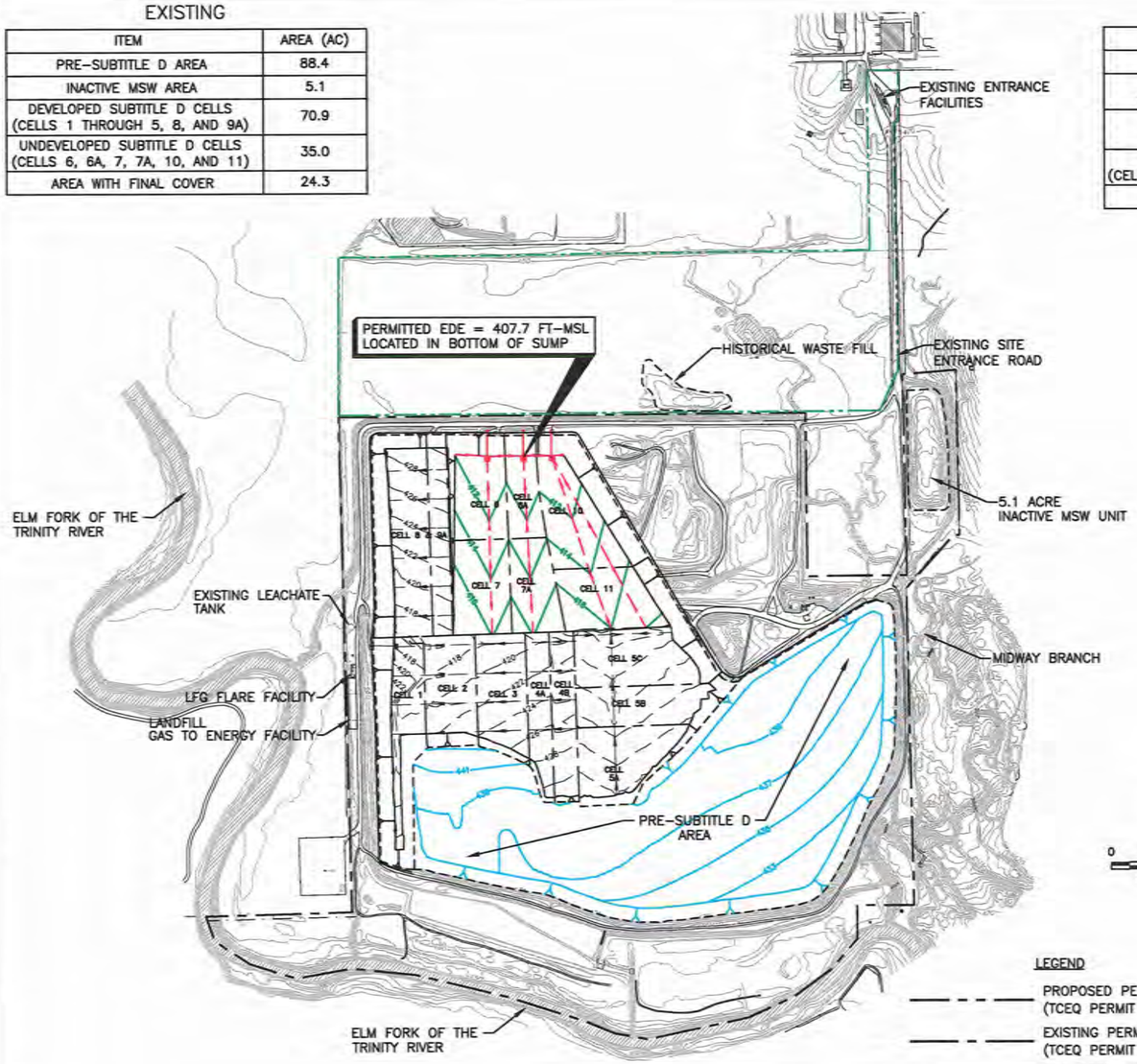
O:\1339\351\EXPANSION 2009\PARTS I-II\2.1-FC COMPARISON.dwg, jwilson, 1:2

EXISTING

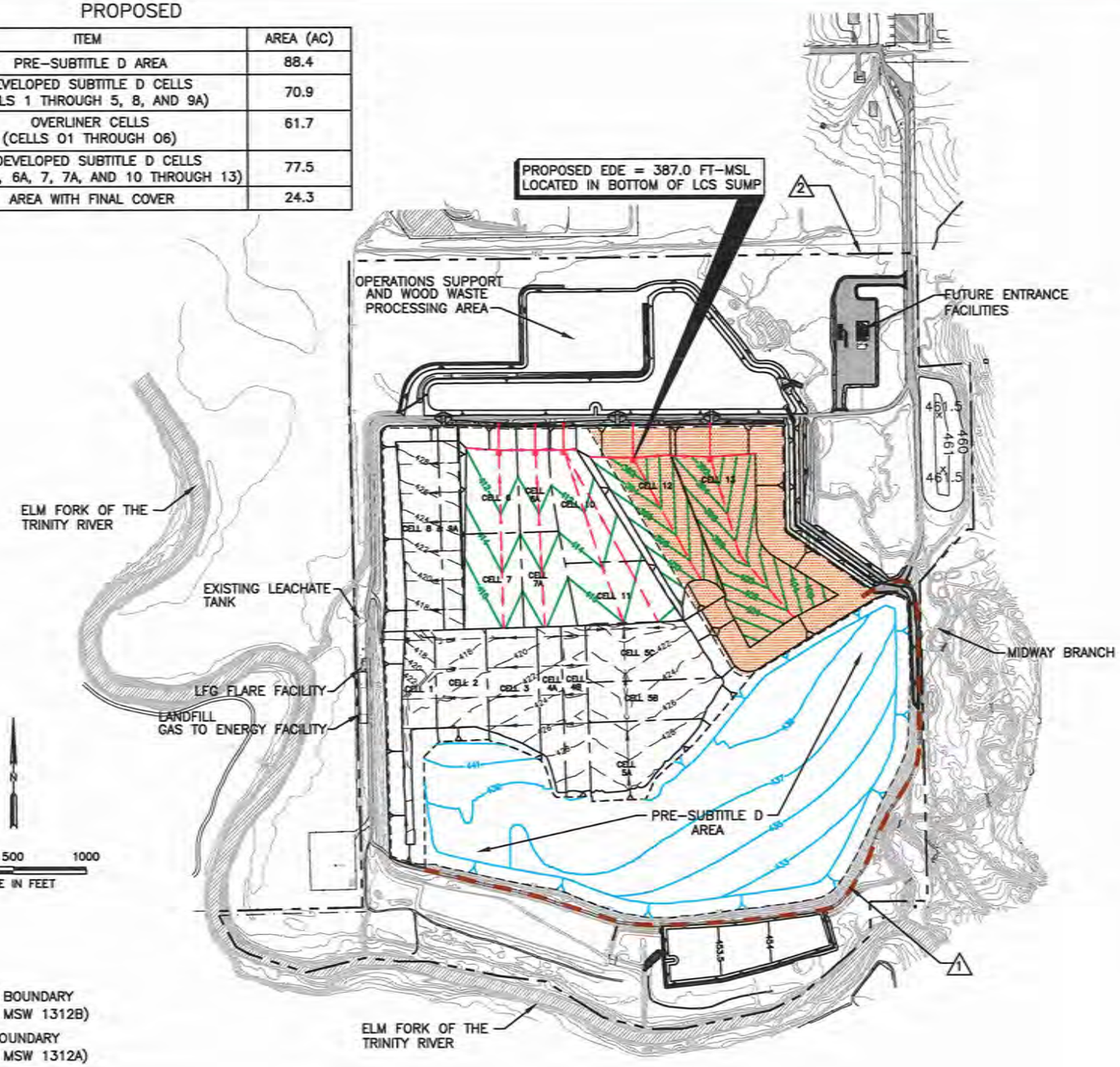
ITEM	AREA (AC)
PRE-SUBTITLE D AREA	88.4
INACTIVE MSW AREA	5.1
DEVELOPED SUBTITLE D CELLS (CELLS 1 THROUGH 5, 8, AND 9A)	70.9
UNDEVELOPED SUBTITLE D CELLS (CELLS 6, 6A, 7, 7A, 10, AND 11)	35.0
AREA WITH FINAL COVER	24.3

PROPOSED

ITEM	AREA (AC)
PRE-SUBTITLE D AREA	88.4
DEVELOPED SUBTITLE D CELLS (CELLS 1 THROUGH 5, 8, AND 9A)	70.9
OVERLINER CELLS (CELLS 01 THROUGH 06)	61.7
UNDEVELOPED SUBTITLE D CELLS (CELLS 6, 6A, 7, 7A, AND 10 THROUGH 13)	77.5
AREA WITH FINAL COVER	24.3



PERMITTED EXCAVATION PLAN
(TCEQ PERMIT NO. MSW-1312A)



PROPOSED EXCAVATION PLAN
(TCEQ PERMIT NO. MSW-1312B)

0 500 1000
SCALE IN FEET

LEGEND

- PROPOSED PERMIT BOUNDARY (TCEQ PERMIT NO. MSW 1312B)
- EXISTING PERMIT BOUNDARY (TCEQ PERMIT NO. MSW 1312A)
- PROPOSED LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- PERMIT BOUNDARY FOR (TCEQ PERMIT NO. MSW 946)
- 500 EXISTING CONTOUR
- 386 EXCAVATION CONTOUR
- LEACHATE LINE
- LEACHATE COLLECTION SUMP
- LEACHATE RISER
- 422 AS-BUILT TOP OF SUBTITLE D GEOMEMBRANE LINER
- 433 APPROXIMATE BOTTOM OF WASTE CONTOUR IN PRE-SUBTITLE D AREA
- PROPOSED WASTE FOOTPRINT LATERAL EXPANSION AREA
- 1 EXISTING SLURRY WALL
- 600 REGRADED BUFFER ZONE (GREENFIELD/OPEN SPACE) AREA
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW 1312A WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATE NOVEMBER 2010.
3. PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW 1312B WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
4. PERMIT BOUNDARY REPRODUCED FROM THE LEGAL DESCRIPTION INCLUDED IN TCEQ PERMIT NO. MSW-946 DATED MARCH 15, 1979.

LIST OF REVISIONS:

1. REVISED TO SHOW EXISTING LOCATION OF SLURRY WALL.
2. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: 2.2_EXCAV COMPARISON.DWG

DRAWN BY: JDW
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	11/2012	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
EXISTING AND PROPOSED
EXCAVATION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 1/II-2.2

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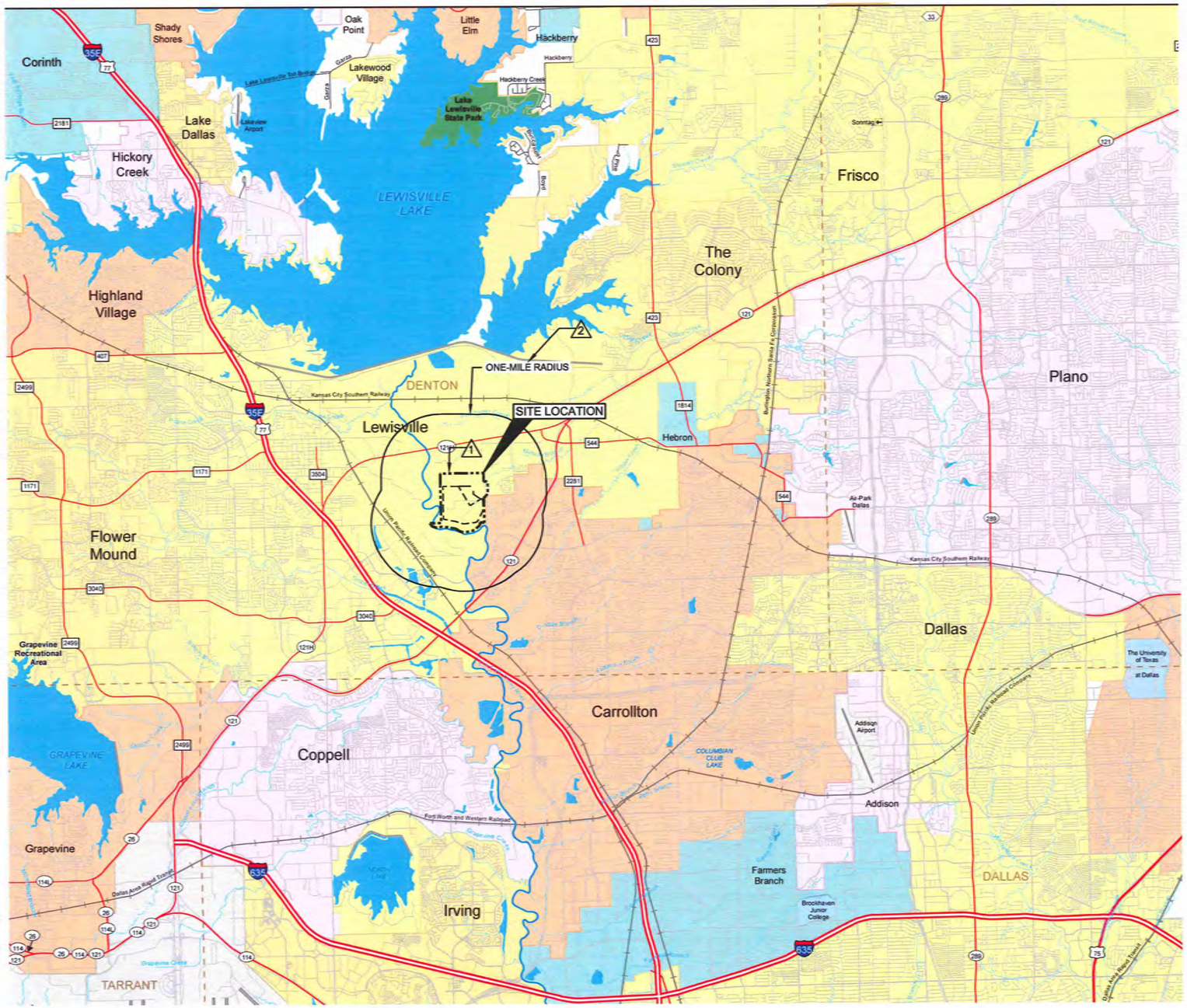

N

0 1 2
SCALE IN MILES

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMIT OF WASTE
- PROPOSED LIMIT OF WASTE
- △1 INDICATES REVISION (SEE LIST OF REVISIONS)

Legend

- IH, BI
- US, BU, UA, UP
- SH, BS
- SL, SS, PR
- FM, BF, RM, RR, RE, RS, PA
- County Road
- City Street or other Non-County Maintained Road
- Railroad
- Incorporated City
- Unincorporated Community
- Airport
- Airport
- Airport Runway
- School
- Military Installation
- Prison
- National or State Park
- National or State Forest
- Other Public Land
- Cemetery
- Dam
- County Line
- District Line
- Canal
- Flowing Stream
- Intermittent Stream
- River
- Gulf Intracoastal Waterway
- Other Body of Water

NOTE:

1. REPRODUCED FROM PAGE 481 OF THE TxDOT COUNTY MAPBOOK 2010 (TEXAS DEPARTMENT OF TRANSPORTATION, TRANSPORTATION PLANNING AND PROGRAMMING DIVISION). THIS MAP SHOWS PORTIONS OF DENTON, COLLIN, DALLAS, AND TARRANT COUNTIES.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED ONE-MILE RADIUS.

DRAFT

- ☐ DRAFT
- ☒ FOR PERMITTING PURPOSES ONLY
- ☐ ISSUED FOR CONSTRUCTION
- ☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: 4.1-SITE LOC MAP.DWG

DRAWN BY: JDW
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SITE LOCATION MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE I/II-4.1

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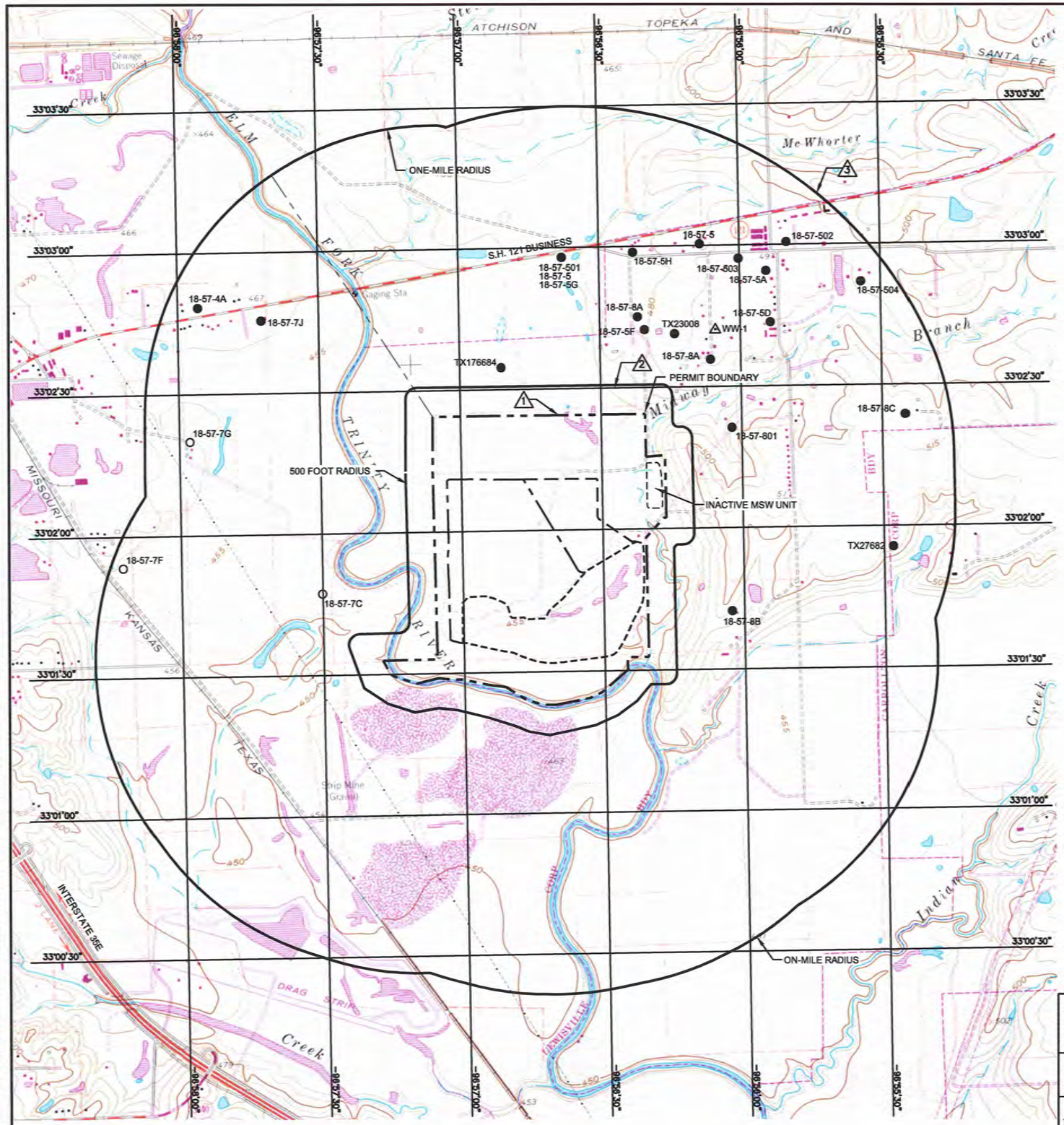
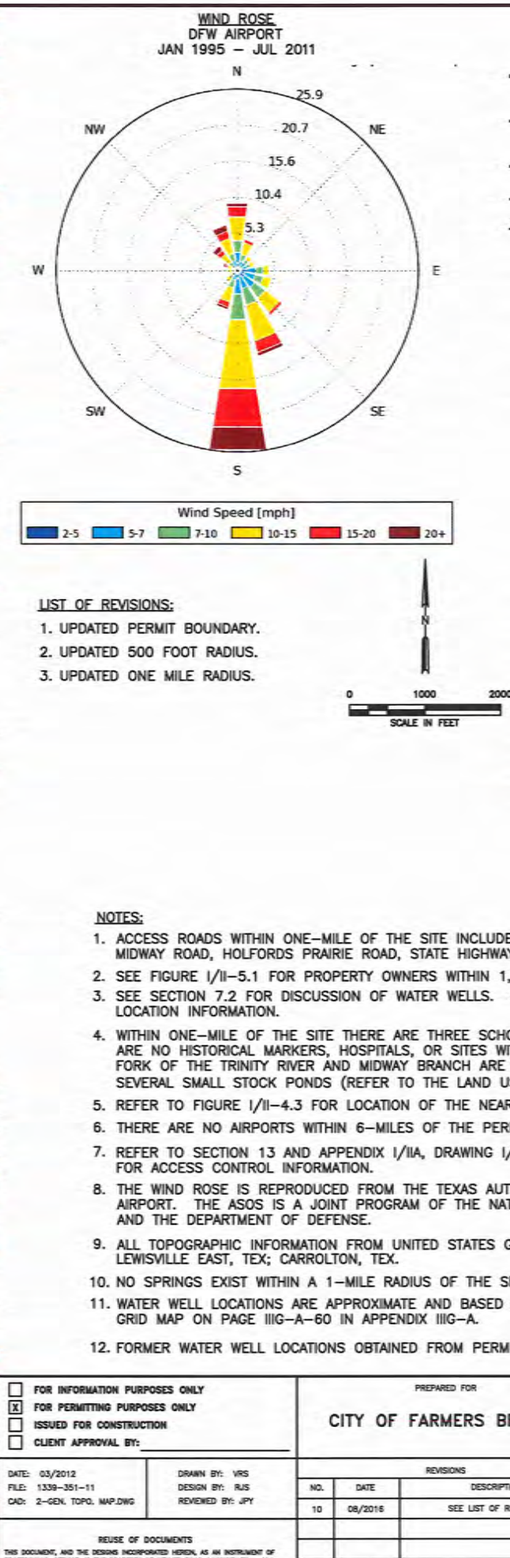
O:\1339\351\EXPANSION 2009\PARTS I-II\4.1-SITE LOCATION MAP.dwg, jwilson, 1:2





LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED 500 FOOT RADIUS.
3. UPDATED ONE MILE RADIUS.

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED PERMITTED PRE–SUBTITLE D AREA LIMIT OF WASTE (PERMIT NO. MSW–1312A)
- AUTHORIZED PERMITTED SUBTITLE D AREA LIMIT OF WASTE (PERMIT NO. MSW–1312A)
- PROPOSED LIMIT OF WASTE
- 33°02'00" GEODETIC COORDINATE SYSTEM
- TX176684 REGISTERED WATER WELL WITH GRID NUMBER OR WELL ID NUMBER ANNOTATED
- WW-1 POTENTIAL WATER WELL LOCATION IDENTIFIED BY WBC IN MARCH 2011 FROM ADJACENT ROADWAY
- 18-57-7G FORMER WATER WELL LOCATION DESCRIBED IN PERMIT NO. MSW–1312A APPLICATION
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

LEWISVILLE EAST, TEX.
N3300—W9652.5/7.5
1960
PHOTOREVISED 1981
DMA 6650 IV SW—SERIES V882

CARROLLTON, TEX.
NW/4 CARROLLTON 15' QUADRANGLE
N3252.5—W9652.5/7.5
1959
DMA 6646 IV NW—SERIES V882

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1957. Field checked 1960

Polyconic projection. 10,000-foot grid ticks based on Texas coordinate system, north central zone. 1000-meter Universal Transverse Mercator grid ticks, zone 14, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 10 meters south and 27 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Red tint indicates areas in which only landmark buildings are shown

Areas covered by dashed light-blue pattern are subject to controlled inundation to 532 feet

DRAFT

NOTES:

1. ACCESS ROADS WITHIN ONE–MILE OF THE SITE INCLUDE HUFFINES BOULEVARD, STATE HIGHWAY 121 BUSINESS, MIDWAY ROAD, HOLFORDS PRAIRIE ROAD, STATE HIGHWAY 121, RAILROAD STREET, AND HEBRON PARKWAY.
2. SEE FIGURE I/II–5.1 FOR PROPERTY OWNERS WITHIN 1,320 FEET OF THE SITE.
3. SEE SECTION 7.2 FOR DISCUSSION OF WATER WELLS. SEE APPENDIX IIIG FOR ADDITIONAL WATER WELL LOCATION INFORMATION.
4. WITHIN ONE–MILE OF THE SITE THERE ARE THREE SCHOOLS, EIGHT CHURCHES, ONE DAY CARE FACILITY. THERE ARE NO HISTORICAL MARKERS, HOSPITALS, OR SITES WITH EXCEPTIONAL AESTHETIC QUALITIES. BOTH THE ELM FORK OF THE TRINITY RIVER AND MIDWAY BRANCH ARE LOCATED WITHIN THE 1–MILE RADIUS AREA AS WELL AS SEVERAL SMALL STOCK PONDS (REFER TO THE LAND USE STUDY IN APPENDIX I/IIE FOR MORE INFORMATION).
5. REFER TO FIGURE I/II–4.3 FOR LOCATION OF THE NEAREST RESIDENCE.
6. THERE ARE NO AIRPORTS WITHIN 6–MILES OF THE PERMIT BOUNDARY (SEE SECTION 8 FOR MORE INFORMATION).
7. REFER TO SECTION 13 AND APPENDIX I/IIA, DRAWING I/IIA.1 FOR EASEMENT INFORMATION. REFER TO DRAWING I/IIA.12 FOR ACCESS CONTROL INFORMATION.
8. THE WIND ROSE IS REPRODUCED FROM THE TEXAS AUTOMATED SURFACE OBSERVING SYSTEM (ASOS) AT THE DFW AIRPORT. THE ASOS IS A JOINT PROGRAM OF THE NATIONAL WEATHER SERVICE, THE FEDERAL AVIATION ADMINISTRATION, AND THE DEPARTMENT OF DEFENSE.
9. ALL TOPOGRAPHIC INFORMATION FROM UNITED STATES GEOLOGICAL SURVEY 7 ½ MINUTE QUADRANGLE SHEETS LEWISVILLE EAST, TEX; CARROLTON, TEX.
10. NO SPRINGS EXIST WITHIN A 1–MILE RADIUS OF THE SITE.
11. WATER WELL LOCATIONS ARE APPROXIMATE AND BASED ON WELL DRILLER SUPPLIED INFORMATION AND TWDB GRID MAP ON PAGE IIIG–A–60 IN APPENDIX IIIG–A.
12. FORMER WATER WELL LOCATIONS OBTAINED FROM PERMIT NO. MSW–1312A APPLICATION.

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☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339–351–11
CAD: 2–GEN. TOPO. MAP.DWG

DRAWN BY: VRS
DESIGN BY: RJS
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS		
NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GENERAL TOPOGRAPHIC MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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SOUTH BEND, IN
SPRINGFIELD, IL
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FIGURE I/II–4.2

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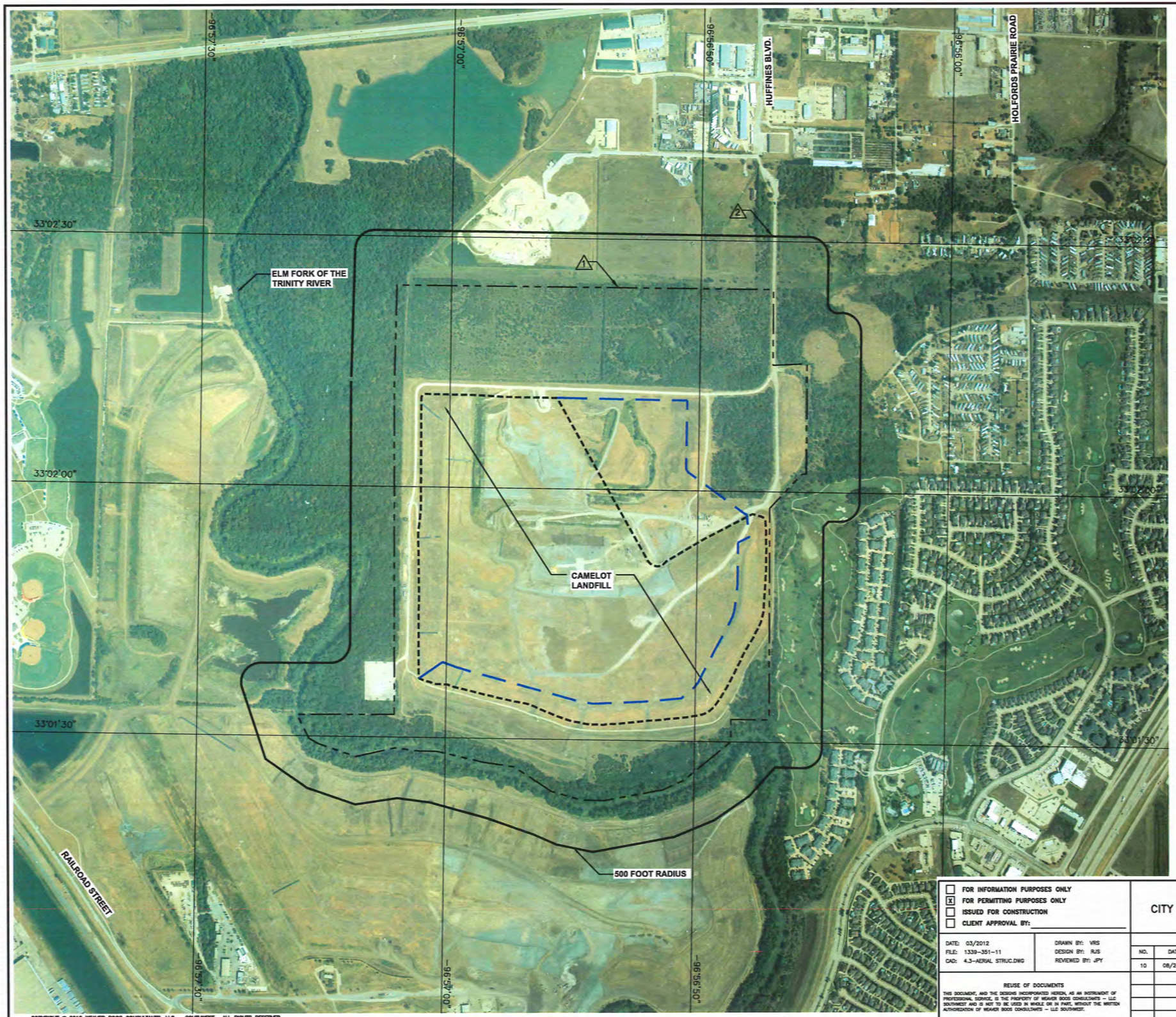
O:\1339\351\EXPANSION 2009\PARTS I-II\4.2-TOPOGRAPHIC MAP.dwg, jwilson, 1:2



N

0 500 1000
SCALE IN FEET

LEGEND:

- PERMIT BOUNDARY
- AUTHORIZED LIMIT OF WASTE
- NEWLY PERMITTED LIMIT OF WASTE (SEE NOTE 3)
- 33°02'00" GEODETIC COORDINATE SYSTEM
- △1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. AERIAL PHOTOGRAPH PROVIDED BY METROPOLITAN AERIAL SURVEYS, FROM AERIAL PHOTOGRAPHY FLOWN ON AUGUST 28, 2010.
2. ALL STRUCTURES WITHIN 500 FEET ARE SHOWN ON THIS FIGURE. EACH STRUCTURE IS ASSUMED TO BE HABITABLE. LAND USE WITHIN A 500-FOOT RADIUS OF THE SITE CONSISTS OF INDUSTRIAL, RESIDENTIAL AND OPEN SPACE. THE NEAREST STRUCTURE TO THE PERMIT BOUNDARY IS LOCATED 40 FEET NORTH OF THE PERMIT BOUNDARY. NO RESIDENCES ARE LOCATED WITHIN 500 FEET OF THE PERMIT BOUNDARY. THE NEAREST RESIDENCE IS LOCATED 680 FEET EAST OF THE PERMIT BOUNDARY.
3. THE NEWLY PERMITTED AIRSPACE LIMIT OF WASTE (AS REFERENCED IN §330.543(b)(2)) REFLECTS THE LATERAL EXPANSION AREA AND THE LIMITS OF WASTE THAT IS ASSOCIATED WITH THE VERTICAL EXPANSION AREA FOR MSW PERMIT NO. 1312B.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED 500 FOOT RADIUS.

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- ☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: 4.3-AERIAL STRUC.DWG

DRAWN BY: VRS
DESIGN BY: RJS
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT STRUCTURES AND INHABITABLE BUILDINGS WITHIN 500 FEET

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FIGURE I/II-4.3

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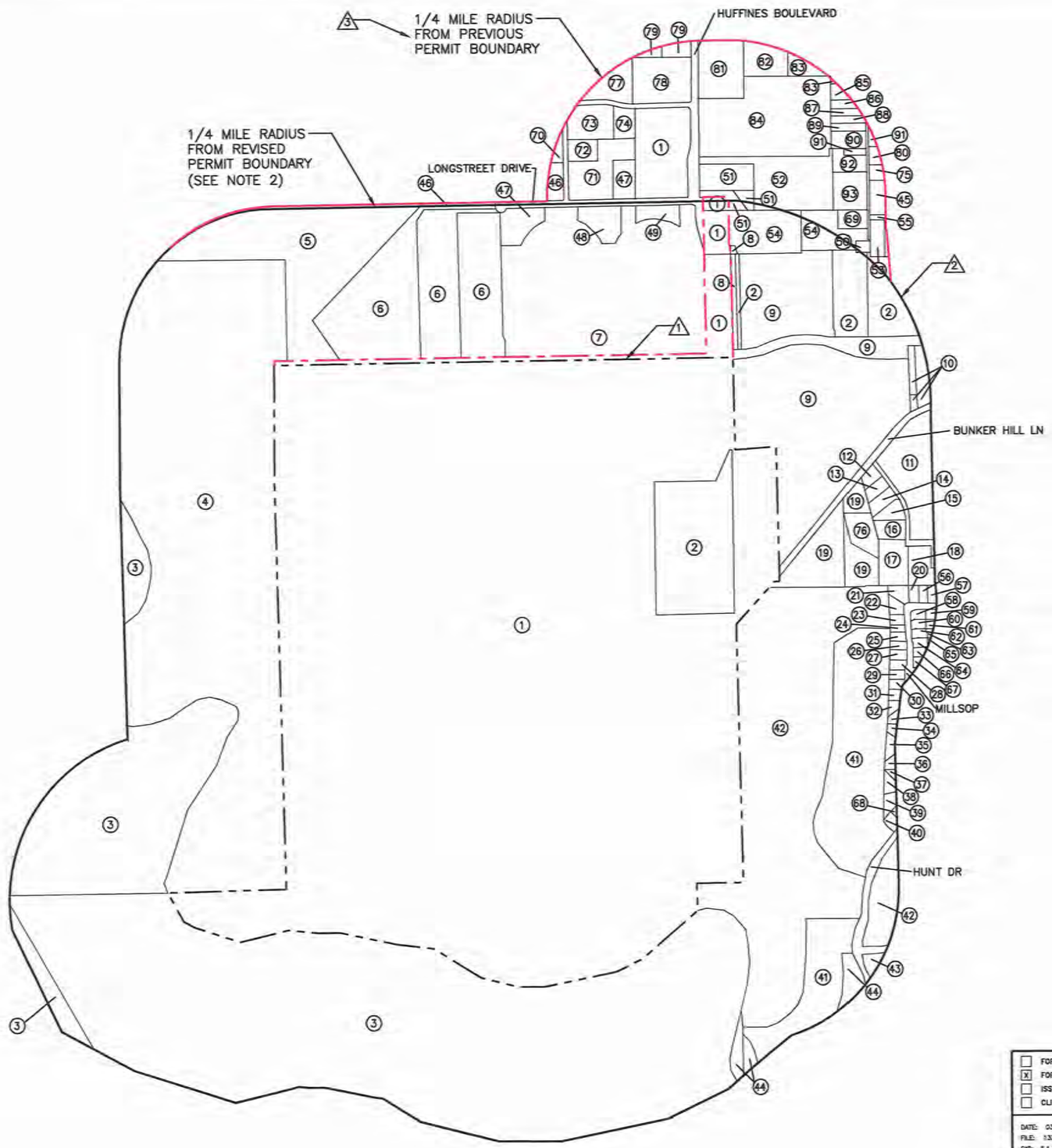
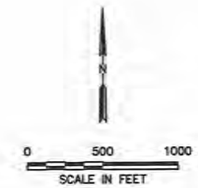
O:\1339\351\EXPANSION 2009\PARTS I-II\4.3-AERIAL STRUCTURES.dwg, jwilson, 1:2





LEGEND

- REVISED PERMIT BOUNDARY
- 1/4 MILE RADIUS LIMIT FROM REVISED PERMIT BOUNDARY
- PREVIOUS PERMIT BOUNDARY
- 1/4 MILE RADIUS LIMIT FROM PREVIOUS PERMIT BOUNDARY
- (1) PROPERTY OWNER DESIGNATION
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. (1) REFER TO LANDOWNERS LISTED ON TABLE I/II–5.1.
2. THIS LINE REPRESENTS A 1/4 MILE DISTANCE FROM THE LIMIT OF THE PERMIT BOUNDARY.
3. REFER TO APPENDIX I/IIA, DRAWING I/IIA.1 FOR LOCATION OF EASEMENTS WITHIN THE PERMIT BOUNDARY.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED ¼ MILE RADIUS.
3. ADDED CALLOUT FOR PREVIOUS ¼ MILE RADIUS AND PERMIT BOUNDARY.

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
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DATE: 03/2012
FILE: 1339–351–11
CAD: 5.1–LANDOWNERS MAP.DWG

DRAWN BY: JDW
DESIGN BY: JAE
REVIEWED BY: NT

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
PROPERTY OWNERS MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

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FIGURE I/II–5.1

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G:\1339\351\EXPANSION 2009\PARTS I-II\5.1-LANDOWNERS MAP.dwg, jwilson, 1:2

N

0 1000 2000
SCALE IN FEET

LEGEND:

- PERMIT BOUNDARY
- AUTHORIZED LIMIT OF WASTE
- PROPOSED LIMIT OF WASTE
- △1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. AERIAL PHOTOGRAPH PROVIDED BY METROPOLITAN AERIAL SURVEYS, FROM AERIAL PHOTOGRAPHY FLOWN ON AUGUST 28, 2010.
2. THE INACTIVE MSW UNIT IN THE NORTHEASTERN PORTION OF THE SITE IS NOT DELINEATED SINCE THE WASTE IN THIS AREA WILL BE RELOCATED.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED ONE-MILE RADIUS.

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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: 6.1-AERIAL.DWG

DRAWN BY: JDW
DESIGN BY: JAE
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
AERIAL PHOTOGRAPHY

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DENTON COUNTY, TEXAS

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FIGURE I/II-6.1

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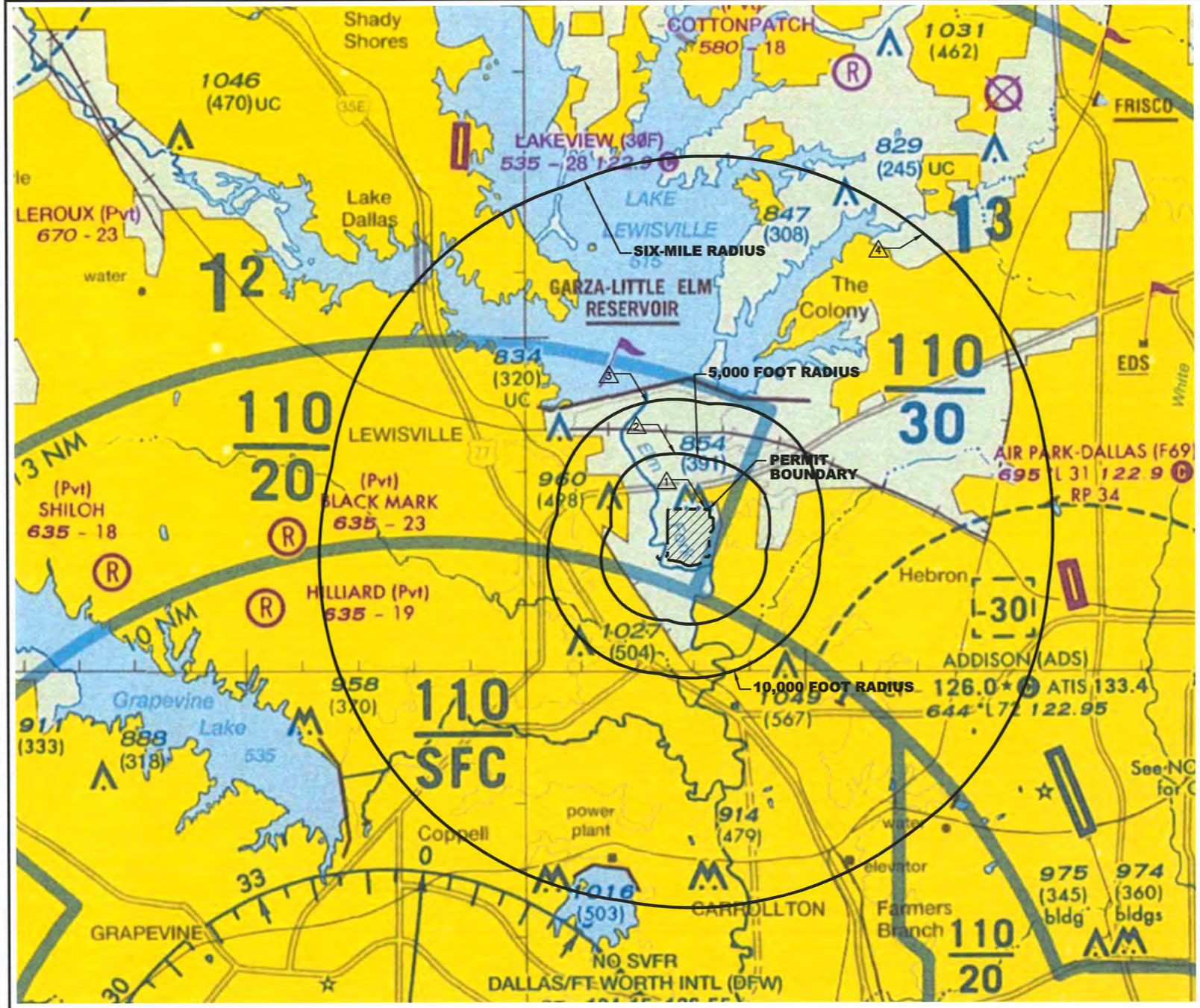
O:\1339\351\EXPANSION 2009\PARTS I-II\6.1-AERIAL.dwg, rmorris, 1:2



AIRPORTS

Other than hard-surfaced runways — Seaplane Base

Hard-surfaced runways 1500 ft. or greater

Open dot within hard-surfaced runway configuration indicates approximate VOR, VOR-DME, or VORTAC location.

All recognizable hard-surfaced runways, including those closed, are shown for visual identification. Airports may be public or private.

ADDITIONAL AIRPORT INFORMATION

Private "(Pvt)" - Non-public use having emergency or landmark value.

Military - Other than hard-surfaced. All military airports are identified by abbreviations AFB, NAS, AAF, etc. For complete airport information consult DOD FLIP.

Heliport Selected — Unverified — Abandoned - paved having landmark value, 3000 ft. or greater — Ultralight Flight Park Selected

Services-fuel available and field tended during normal working hours depicted by use of ticks around basic airport symbol. (Normal working hours are Mon thru Fri 10:00 A.M. to 4:00 P.M. local time.) Consult A/FD for service availability at airports with hard-surfaced runways 1500 ft. or greater.

☆ Rotating airport beacon in operation Sunset to Sunrise.

PERMIT BOUNDARY

1 INDICATES REVISION (SEE LIST OF REVISIONS)

TOPOGRAPHIC INFORMATION

Roads

55 — 42 Road Markers

Railroad

Bridges And Viaducts

Power Transmission Lines

Aerial Cable

Landmark Feature - stadium, factory, school, golf course, etc.

Outdoor Theatre

Lookout Tower P-17 (Site Number) 618 (Elevation Base of Tower)

CG Coast Guard Station

Race Track

Tank - water, oil or gas

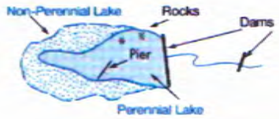
Oil Well — Water Well

Mines And Quarries

Mountain Pass

11823 (Elevation of Pass)

(Pass symbol does not indicate a recommended route or direction of flight and pass elevation does not indicate a recommended clearance altitude. Hazardous flight conditions may exist within and near mountain passes.)



LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED 5,000 FOOT RADIUS.
3. UPDATED 10,000 FOOT RADIUS.
4. UPDATED SIX-MILE RADIUS RADIUS.

NOTE:

1. THIS MAP REPRODUCED FROM THE FAA DALLAS-FORT WORTH SECTIONAL AERONAUTICAL CHART 76th EDITION DATED SEPTEMBER 23, 2010.
2. NO AIRPORTS ARE PRESENT WITHIN 10,000 FEET OF THE PERMIT BOUNDARY. THE NEAREST AIRPORT IS AIR PARK-DALLAS AIRPORT.

DRAFT

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- [x] FOR PERMITTING PURPOSES ONLY
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DATE: 03/2012
FILE: 0120-107-11
CAD: 5-AIRPORT.DWG

DRAWN BY: JDW
DESIGN BY: JPY
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
AREA AIRPORTS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

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FIGURE I/II-8.1

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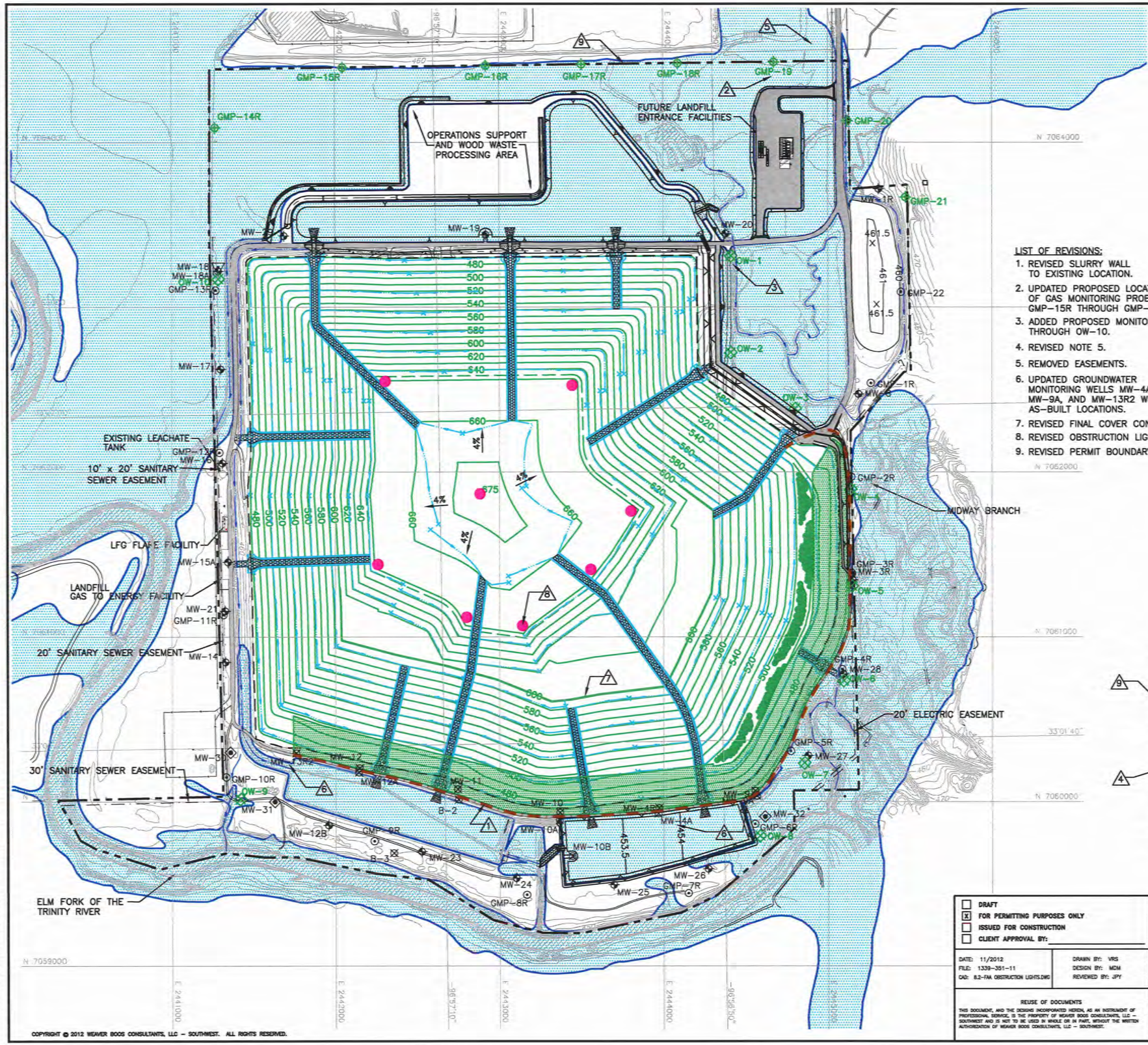
O:\1339\35\EXPANSION 2009\PARTS I-II\8.1-Airport.dwg, jwilson, 1:2



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 7 — 600 — FINAL COVER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- 2 — GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- 6 — MW-12 — OBSERVATION WELL
- 3 — OW-1 — PROPOSED WOODBINE MONITOR WELL
- EXISTING FENCE
- LANDSCAPE BENCH
- EXISTING ALTERNATIVE SOIL FINAL COVER AREA
- 100-YEAR FLOODPLAIN (SEE NOTE 6)
- PERIMETER ACCESS ROAD
- 1 — EXISTING SLURRY WALL
- 8 — RED OBSTRUCTION LIGHTS REQUIRED BY FAA (SEE NOTE 6)
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 5.
5. REMOVED EASEMENTS.
6. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
7. REVISED FINAL COVER CONTOURS.
8. REVISED OBSTRUCTION LIGHT LOCATIONS.
9. REVISED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIF FOR POST DEVELOPMENT DRAINAGE INFORMATION.
4. FINAL COVER DETAILS ARE PROVIDED IN APPENDIX IIIA-A-LINER, OVERLINER AND FINAL COVER SYSTEM DETAILS
5. MAXIMUM FINAL COVER ELEVATION: 675 FT-MSL. MAXIMUM WASTE ELEVATION: 671.5 FT-MSL.
6. AS DISCUSSED IN SECTION 8.2, ONCE THE TOP DECK REACHES 200 FEET ABOVE GRADE, LIGHTS WILL BE INSTALLED PER ADVISORY CIRCULAR AC 70/7460-1K – OBSTRUCTION MARKING AND LIGHTING. THE LIGHTS WILL BE EVENLY SPACED TO MARK THE TOP DECK. THE CONFIGURATION SHOWN ON THIS DRAWING REPRESENTS THE FINAL SITE CONDITION ONLY. A SIMILAR PATTERN WILL BE USED DURING THE DEVELOPMENT OF THE SITE, ONCE THE TOP DECK REACHES 200 FEET ABOVE GRADE.

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DATE: 11/2012
FILE: 1339-351-11
CAD: 8.2-FAA OBSTRUCTION LIGHTS.DWG

DRAWN BY: VRS
DESIGN BY: MCM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	11/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FAA OBSTRUCTION LIGHTS
TYPICAL LAYOUT

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

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FIGURE I/II-8.2

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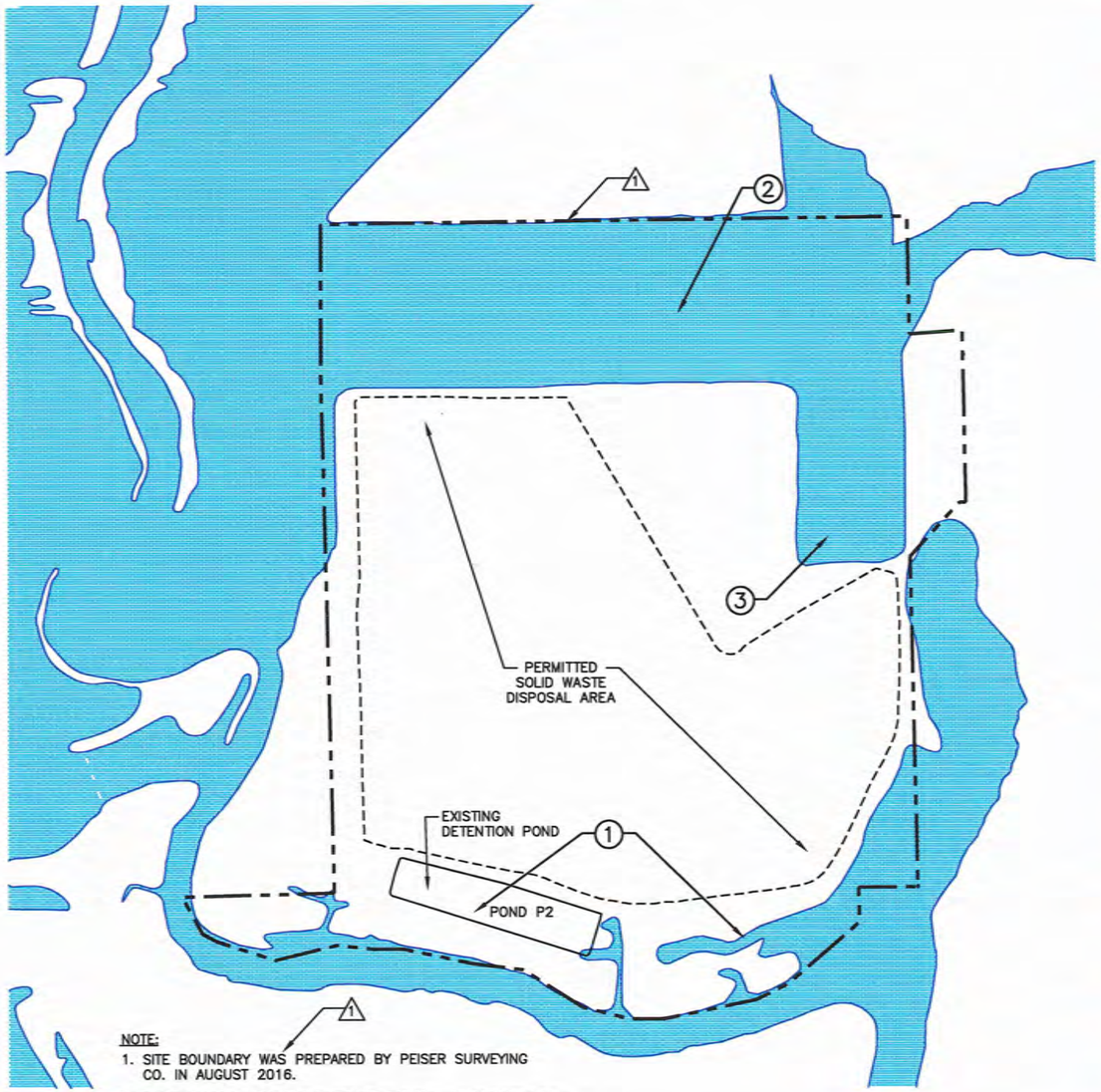
G:\1339\351\EXPANSION 2009\PARTS I-II\8.2-FAA LIGHTS.dwg, jwilson, 1:2

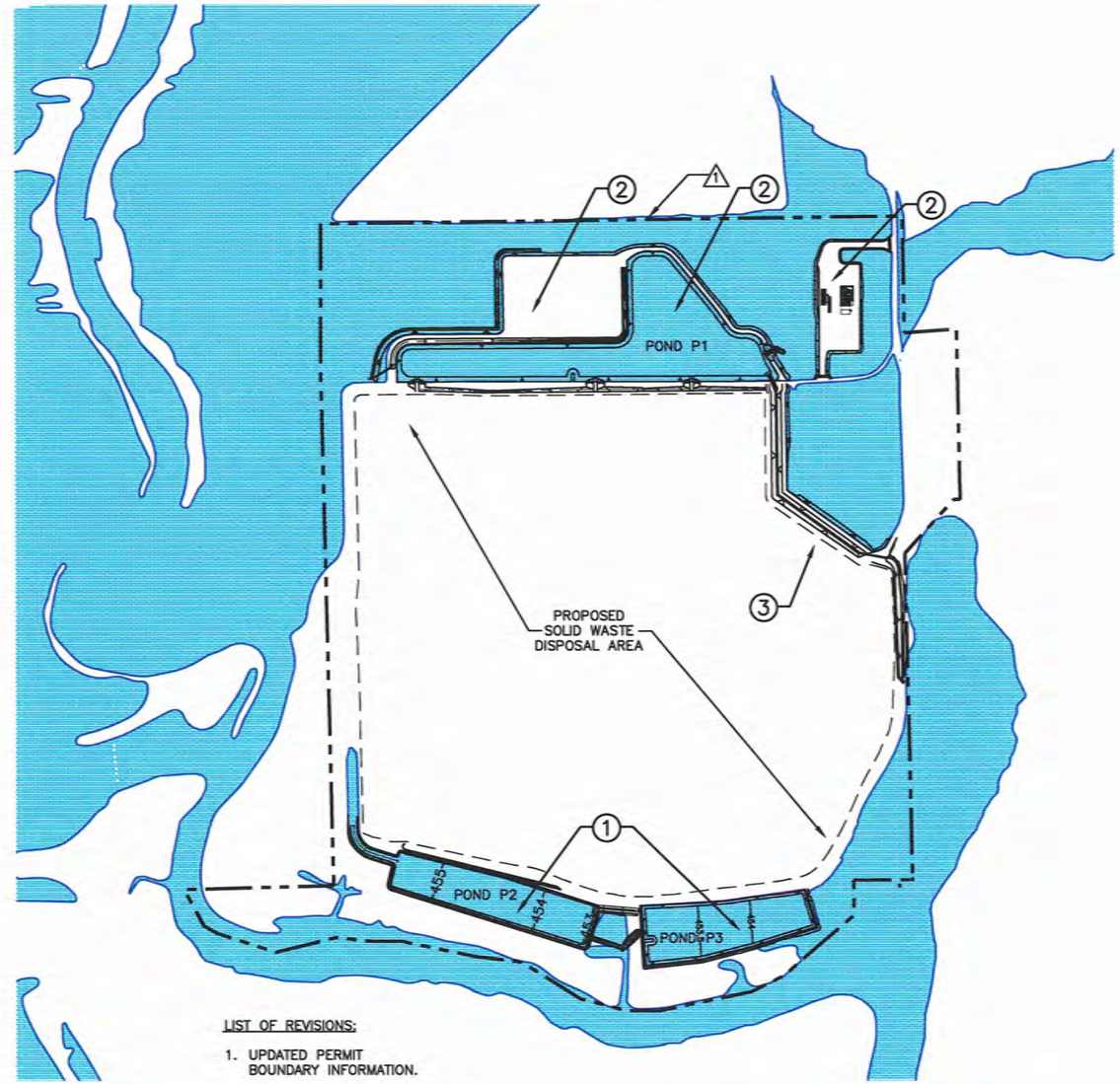
EXISTING PERMITED CONDITION



NOTE:

1. SITE BOUNDARY WAS PREPARED BY PEISER SURVEYING CO. IN AUGUST 2016.
2. FLOODPLAIN REPRODUCED FROM FIRM NO. 48121C0565 G, EFFECTIVE DATE APRIL 18, 2011.

PROPOSED CONDITION



LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

CHANGES FROM EXISTING PERMITTED TO THE PROPOSED CONDITION

(1) ADDITION OF DETENTION POND, POND P3. THE SOUTHWEST POND (POND P2) WAS CONSTRUCTED AS AUTHORIZED BY THE CLOMR APPLICATION (CASE NO. 02-06-1950R APPROVED BY FEMA ON NOVEMBER 18, 2002 FOR THE EXISTING PERMITTED SITE). THE SOUTHEAST POND (POND P3) WILL FUNCTION SIMILAR TO THE PREVIOUSLY-PERMITTED SOUTHWEST POND.

(2) NORTHERN AREA DEVELOPMENT. TO ALLOW FOR THE DEVELOPMENT OF FACILITIES TO SUPPORT THE OPERATION OF THE LANDFILL, THIS PROJECT INCLUDES THE REMOVAL OF TWO AREAS FROM THE FLOODPLAIN IN THE NORTHERN PORTION OF THE SITE. THESE TWO AREAS WILL BE USED FOR (1) OFFICES AND MAINTENANCE FACILITIES, INCLUDING ACCESS ROADS AND (2) A 16-ACRE AREA THAT WILL BE USED TO SUPPORT OPERATIONS, SUCH AS EQUIPMENT STORAGE, A CITIZEN CONVENIENCE CENTER, ENTRANCE FACILITIES, ACCESS ROADS, AND/OR A WOOD WASTE PROCESSING AREA.

(3) REMOVAL OF NORTHEAST AREA FROM FLOODPLAIN TO ALLOW FOR THE CONTINUED DEVELOPMENT OF THE LANDFILL. THIS AREA IS PROPOSED TO BE REMOVED FROM THE INEFFECTIVE FLOW AREA OF THE 100-YEAR FLOODPLAIN.

N

0 500 1000
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- 100-YEAR FLOODPLAIN
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

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- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: 1-1-FLOODPLAIN COMP.DWG

DRAWN BY: VRS
DESIGN BY: CRM
REVIEWED BY: JPY

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FLOODPLAIN CONDITION COMPARISON

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE I/II-11.1

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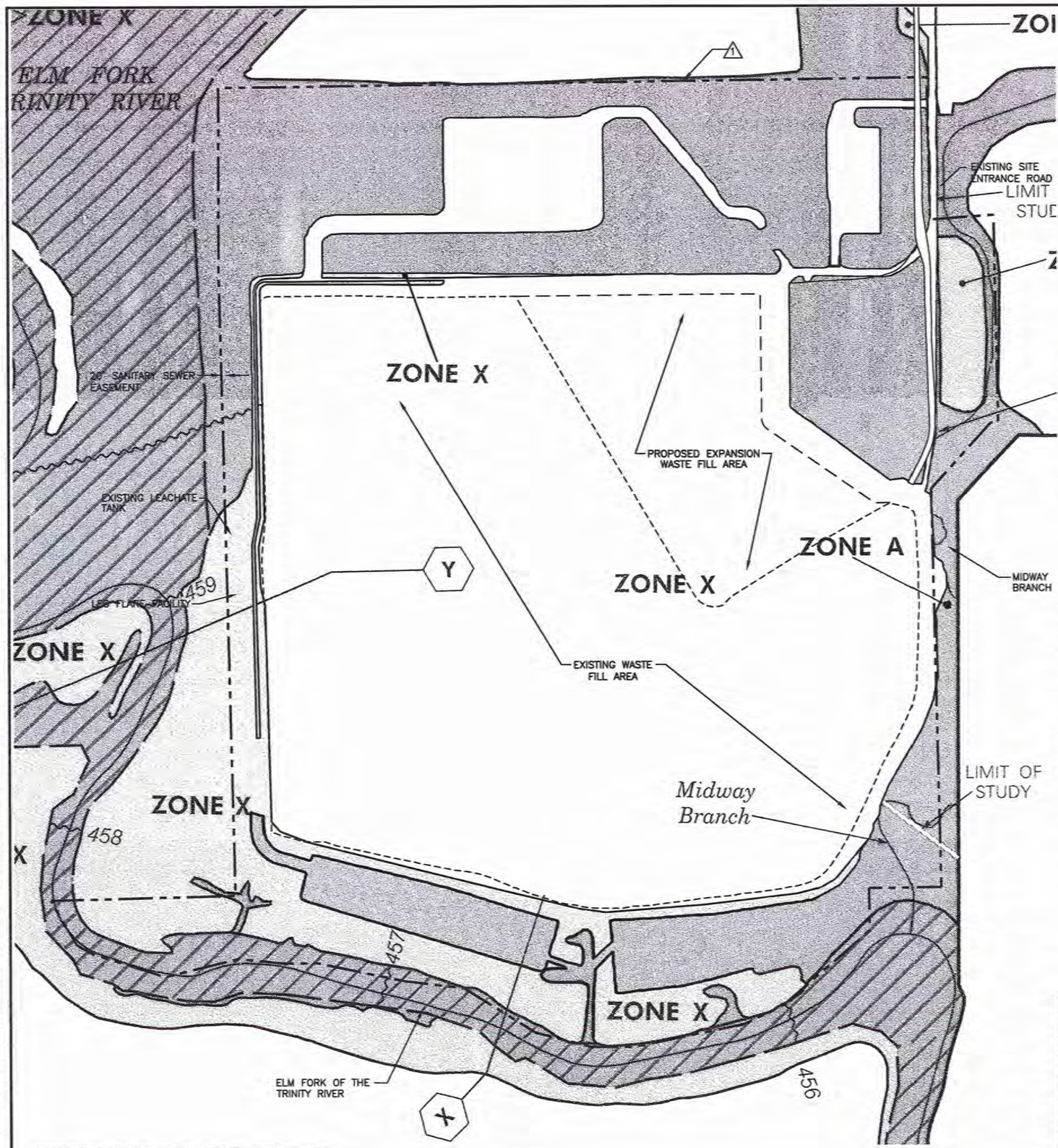
O:\1339\351\EXPANSION 2009\PARTS I-II\11.1-FLOODPLAIN COMPARISON.dwg, rmorris, 1:2



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LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum

RM7 — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

N

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. PORTIONS OF FLOODPLAIN AND FLOODWAY BOUNDARIES WERE REPRODUCED FROM FEMA FIRM NUMBER 48121C0565 G, EFFECTIVE DATE APRIL 18, 2011. THE REVISED FLOODPLAIN LIMITS ARE REPORDUCED FROM THE FEMA APPROVED CLOMR REQUEST DATED JUNE 2011 (PREPARED BY WEAVER BOOS CONSULTANTS).
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SURVEYING CO. IN AUGUST 2016.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- ☐ FOR INFORMATION PURPOSES ONLY
- ☒ FOR PERMITTING PURPOSES ONLY
- ☐ ISSUED FOR CONSTRUCTION
- ☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: 11.2-REVISED FIRM.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

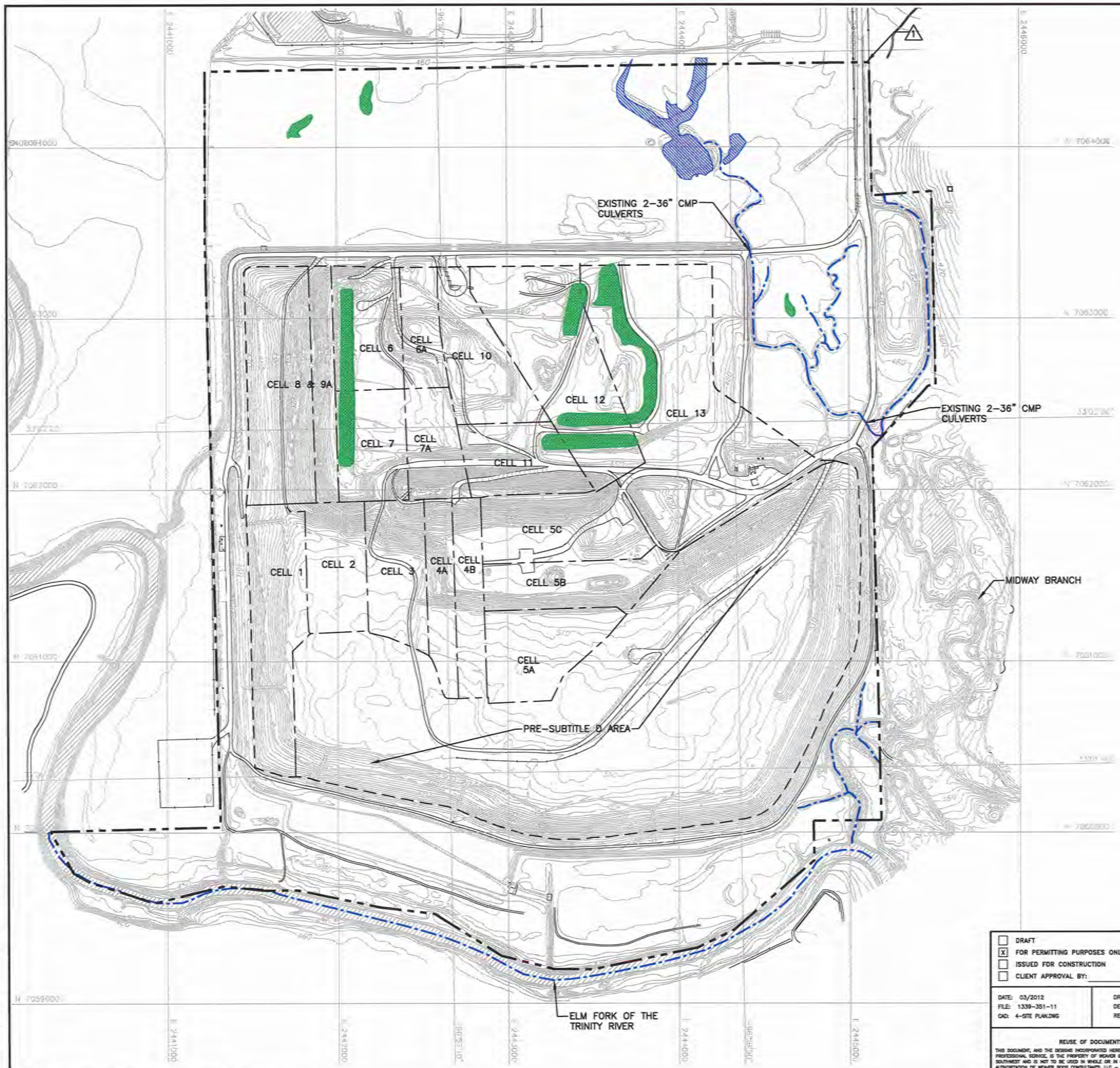
NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
REVISED FLOOD INSURANCE RATE MAP
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL · NAPERVILLE, IL · COLUMBUS, OH · DENVER, CO · FORT WORTH, TX (817) 735-9770 · GRIFFITH, IN · SOUTH BEND, IN · SPRINGFIELD, IL · ST. LOUIS, MO

FIGURE I/II-11.2



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 3)
- USACE SECTION 404 JURISDICTIONAL WETLANDS
- SECTOR BOUNDARY
- NON-JURISDICTIONAL WETLANDS
- △1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. △1 PROPOSED PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM PRELIMINARY SECTION 404 JURISDICTIONAL DETERMINATION REPORT PREPARED BY GOSHAWK ENVIRONMENTAL CONSULTING, INC (SEPTEMBER 17, 2010).

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: 4-SITE PLAN.DWG

DRAWN BY: JDW
DESIGN BY: MDM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT WETLAND LOCATION MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO | FORT WORTH, TX (817) 735-9770 | GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE I/II-11.3

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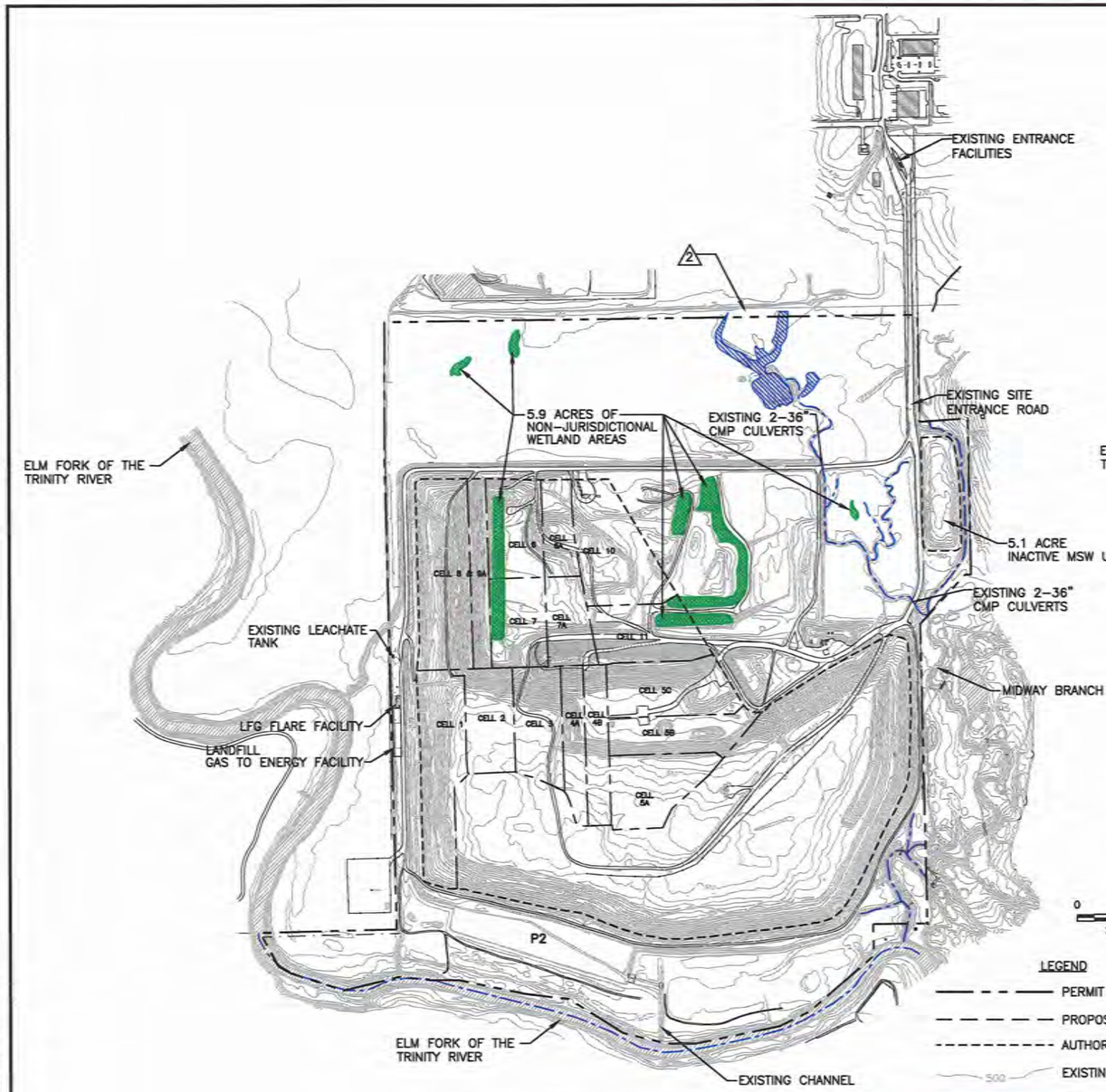
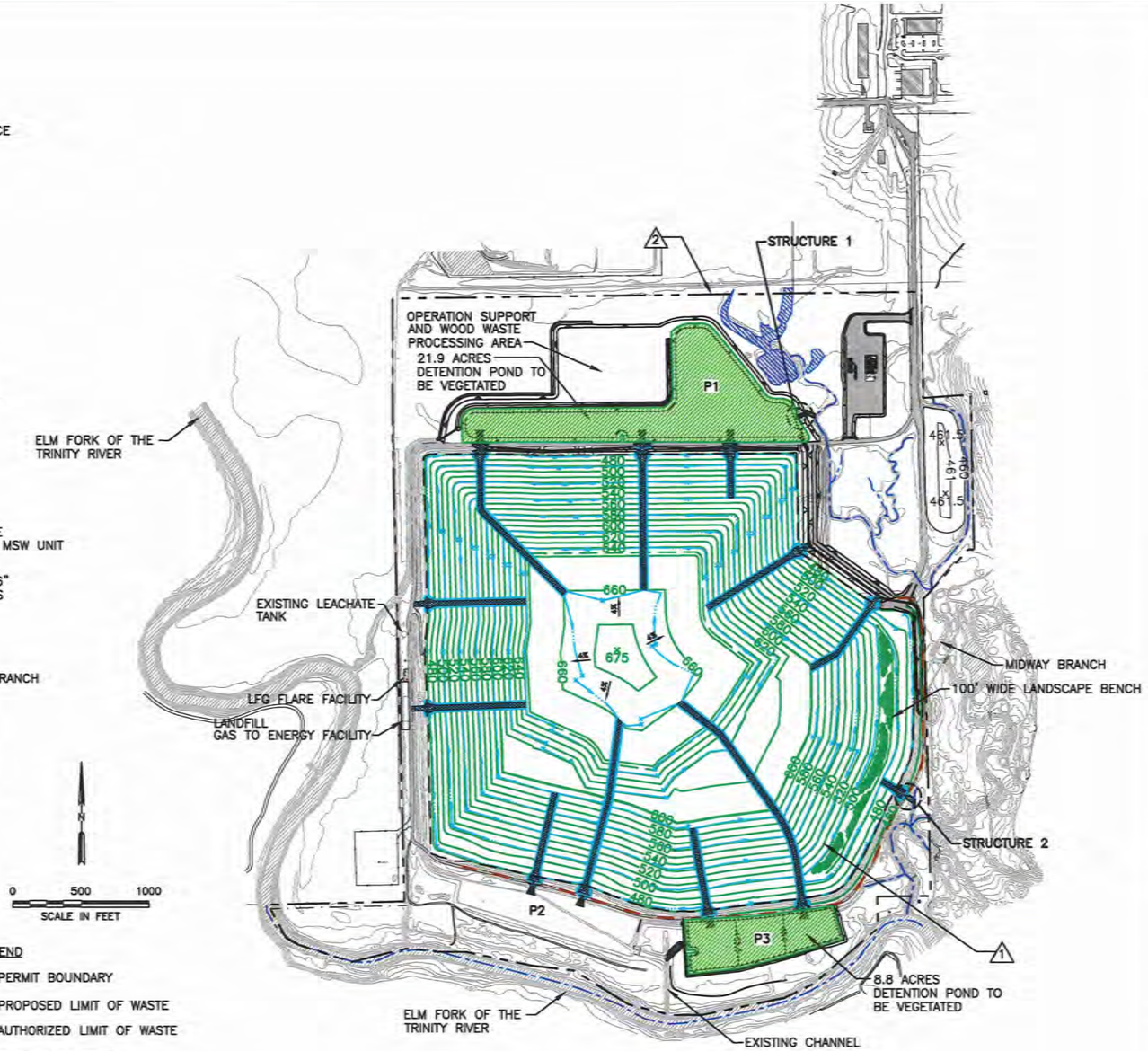
O:\1339\35\EXPANSION 2009\PARTS I-II\11.3-SITE PLAN.dwg, jwilson, 1:2



PERMITTED SITE PLAN



PROPOSED LANDFILL COMPLETION PLAN

0 500 1000
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- 500 EXISTING CONTOUR
- 600 FINAL COVER CONTOUR
- 600 REGRADED BUFFER ZONE (GREENFIELD/OPEN SPACE) AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- P1 DETENTION POND DESIGNATION
- USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 3)
- USACE SECTION 404 JURISDICTIONAL WETLANDS
- NON-JURISDICTIONAL WETLAND
- NON-JURISDICTIONAL WETLAND MITIGATION AREAS
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM PRELIMINARY SECTION 404 JURISDICTIONAL DETERMINATION REPORT PREPARED BY GOSHAWK ENVIRONMENTAL CONSULTING, INC (SEPTEMBER 17, 2010).

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. REVISED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: 5-COMPARISON.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
EXISTING AND PROPOSED
LANDFILL COMPLETION PLAN
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE I/II-11.4

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G:\1339\351\EXPANSION 2009\PARTS I-II\11.4-COMPARISON.dwg, jwilson, 1:2

8 TRANSPORTATION

8.1 Traffic Information

Access roads within one mile of the site include Huffines Boulevard, State Highway 121 Business, Midway Road, Holfords Prairie Road, State Highway 121, Railroad Street, and Hebron Parkway. The site entrance facilities are located at 580 Huffines Boulevard, approximately 1,800 feet south of State Highway 121 Business, and are easily accessed from area population centers via State Highway 121 business and Huffines Boulevard.

This section addresses §330.61(i).

A traffic impact study was prepared in February 2011 by WBC to address roadway and traffic issues throughout the expected life of the Camelot Landfill. The traffic study is included in Parts I/II, Appendix I/IID.

In summary, the traffic study concludes that the access roads within one mile of the landfill provide adequate access to the site. Coordination with TxDOT regarding traffic and location restrictions is included in Appendix I/IIB (TxDOT tab).

As noted in Section 2.1.2, the site life projection has been reduced by 3.5 years as a result of final contour plan revisions. The site life projection changed from 2039 to 2035 because of the capacity reduction (from 37.7 million cy to 30.3 million cy). This capacity reduction will result in a corresponding reduction in the amount of traffic over the life of the site.

Given that the 2011 Traffic Study included in Appendix I/IID was based on a longer projected life and higher traffic volumes, the conclusions listed in the study are still valid for the updated site configuration since they represent a conservative assessment of the future traffic loads associated with this project (i.e., the actual traffic loads on area access roads will be less than the analysis included in the 2011 Traffic Study).

8.2 Airport Impact

TCEQ distance restrictions set forth in §330.545 require municipal solid waste disposal facilities to be located no closer than 10,000 feet to any runway end used by turbojet aircraft or no closer than 5,000 feet to any runway end used by piston-engine aircraft. As shown on Figure I/II-8.1, the closest public airport is the Air Park-Dallas Airport, located approximately 6.1 miles south of the site.

In the FAA's letter dated January 4, 2011 (see correspondence in Appendix I/IIB), the FAA had no objection to the proposed changes from the standpoint of potential wildlife hazards to aircraft. In addition, the FAA also reviewed the proposed changes to determine the potential for the site to be a hazard to air navigation. As documented in a letter dated February 10, 2011, the FAA has determined that the proposed changes do not pose a hazard to air navigation (refer to Appendix I/IIB for more information). Appendix I/IIB also includes a letter from FAA that confirms that the FAA has completed the critical evaluation necessary to determine that an incompatibility does not exist with area airports and the landfill.

10 GROUNDWATER AND SURFACE WATER STATEMENT

10.1 Groundwater Statement

Although not classified as a regional aquifer, groundwater that occurs in the Alluvial Strata is the uppermost aquifer for groundwater monitoring purposes. The facility's uppermost aquifer groundwater flows west and south toward the Elm Fork Trinity River. The uppermost aquifer is discussed in Sections 2 and 3 of Part III, Appendix IIIG.

This section addresses §330.61(k).

Based on information obtained from area water well logs, expansion borehole WB-4, and presented in Figure IIIG-C-12 in Appendix IIIG, there is a minimum of 40 feet of low permeability Shale Strata separating the proposed expansion area sump EDE of 387 ft-msl elevation from the top of the underlying Woodbine Strata. Table 3-4 in Appendix IIIG of Part III indicates the low permeability Shale Strata have an arithmetic mean vertical hydraulic conductivity of 2.5×10^{-8} cm/sec. The elevations of the top of the Woodbine Strata are presented in Figure IIIG-C-12 of Part III. According to Harden, et al. (2004), Woodbine groundwater in this area flows to the east-southeast. Due to the very low Shale Strata hydraulic conductivity, the two water-bearing zones are not hydraulically connected.

10.2 Surface Water Statement

The ~~469.62~~ 459.76-acre Camelot Landfill permit boundary is located approximately two miles south of Lake Lewisville. The Elm Fork Trinity River forms the southern boundary of the site. Midway Branch, a tributary of the Elm Fork, flows along the east side of the permit boundary.

Lake Lewisville is one of the largest man made surface water impoundments in Texas with a 46.24 square mile (25,592 acres) surface area at the crest elevation of the Lake Lewisville Dam. The Lake Lewisville watershed encompasses approximately 1,660 square miles. The total drainage area of the Elm Fork (which includes Prairie Creek and Stewart Creek) downstream of the Lake Lewisville Dam and upstream of the permit boundary is approximately 1,674 square miles.

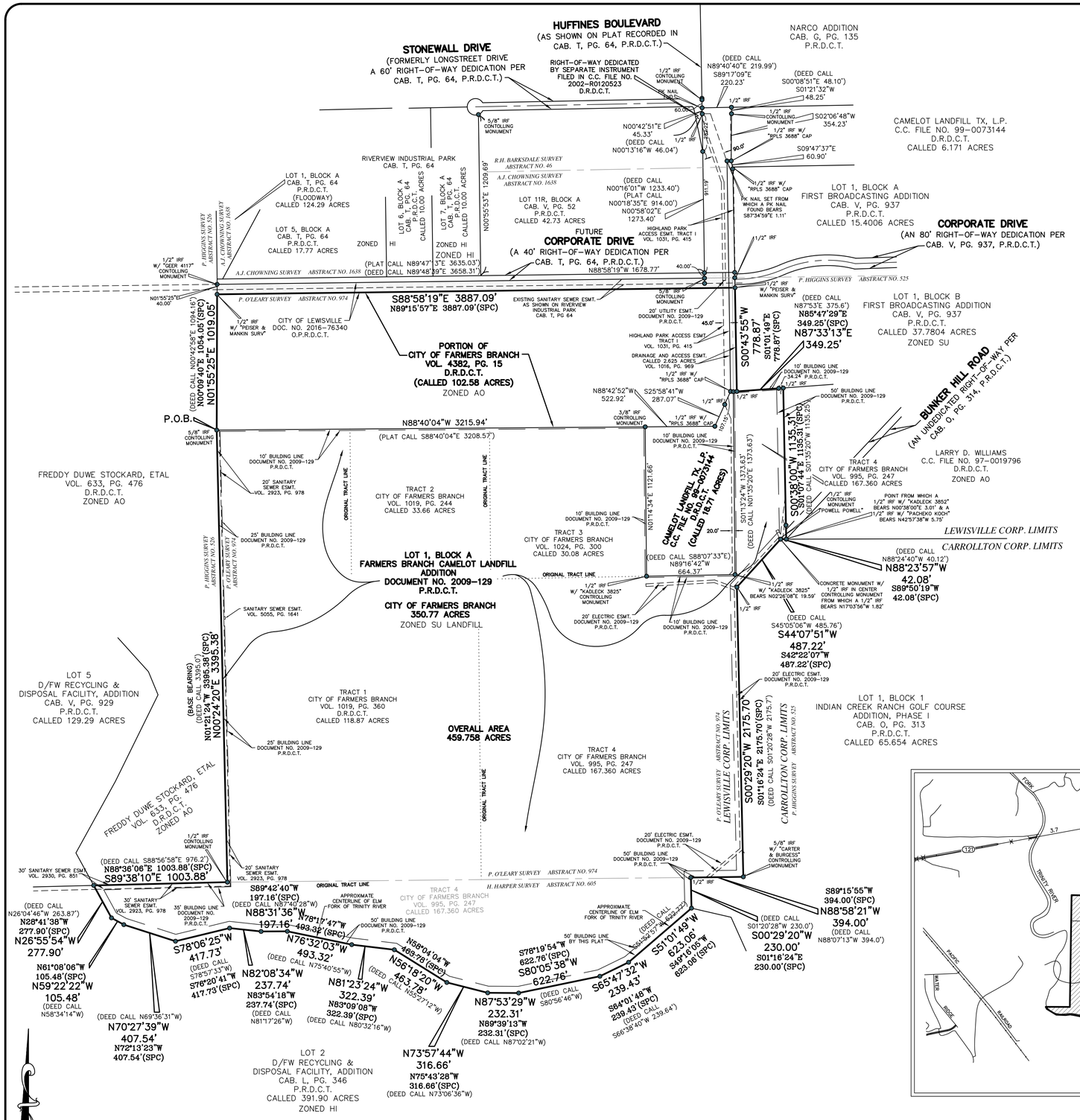
The local drainage basin, which includes the permit boundary and offsite areas discharging onto or directly receiving flow from the permit boundary, is 2.82 square miles (0.17 percent of the Elm Fork's drainage basin upstream of the site). The majority of the area within the permit boundary discharges south or west into the Elm Fork. A smaller

13 LEGAL DESCRIPTION

A legal description of the ~~469.62~~ 459.76-acre permit boundary is included on the following pages. The area is shown on the attached drawing and legal description.

This section addresses §330.59(d)(1).

The area within the permit boundary is owned by the City of Farmers Branch and Camelot Landfill TX, LP. Current ownership records for the property may be found in the Denton County Real Property records.



Being all that certain 459.758 acre lot, tract or parcel of land situated in the Patrick O'Leary Survey, Abstract No. 974, the H. Harper Survey, Abstract No. 605, and the P. Higgins Survey, Abstract No. 525, Denton County, Texas, and being all of Lot 1, Block A of Farmers Branch Camelot Landfill Addition, an addition to the City of Lewisville, as recorded in Document No. 2009-129, of the Plat Records of Denton County, Texas, and being all that certain tract of land described in deed dated March 24, 1967 from M.L. Ledbetter et al to The Town of Highland Park, as recorded in Volume 551, Page 136, Deed Records, Denton County, Texas, and being that called 0.238 acre tract of land described in deed dated May 23, 1988, from 121 County Venture to the Town of Highland Park, as recorded in Volume 2384, Page 64, said Deed Records, and being a portion of that certain called 102.58 acre tract of land described in deed dated July 13, 1999, from the Town of Highland Park to the City of Farmers Branch, as recorded in Volume 4382, Page 15, said Deed Records, also being that certain tract of land described in deed dated July 19, 1999 from Barfknecht Enterprises, L.C. to Camelot Landfill TX, L.P., as recorded in Volume 4383, Page 742, said Deed Records, and being more particularly described as follows:

BEGINNING at a 5/8 inch iron rod found for the southwest corner of said City of Farmers Branch tract, same being the northwest corner of said Lot 1, same being in the east line of that certain tract of land to Freddy Duwe Stockard, etal, by deed recorded in Volume 633, Page 476, of said Deed Records;

THENCE North 01 deg. 55 min. 25 sec. East, along the common line of said City of Farmers Branch tract, and said Stockard tract, a distance of 1,019.05 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northwest corner of the herein described tract, same being the southwest corner of that certain tract of land from City of Farmers Branch to City of Lewisville, by Special Warranty Deed dated June 28, 2016, and recorded under Document No. 2016-76340, Official Public Records, Denton County, Texas;

THENCE South 88 deg. 58 min. 19 sec. East, through the interior of said City of Farmers Branch tract, and along the south line of said City of Lewisville tract, a distance of 3,887.09 feet to a 1/2 inch iron rod found with "Peiser & Mankin Surv" red plastic cap for the northeast corner of the herin described tract, same being in the east line of said City of Farmers Branch tract, same being in the west line of Lot 1, Block B of First Broadcasting Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 937, aforesaid Plat Records;

THENCE South 00 deg. 43 min. 55 sec. West, along the common line of said Camelot Landfill TX tract, and said Lot 1, Block B, a total distance of 778.87 feet to a 1/2 inch iron rod found for the southwest corner of said Lot 1, Block B, same being in a north line of aforesaid Lot 1, Block A, Farmers Branch Camelot Landfill Addition;

THENCE North 87 deg. 33 min. 13 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B of First Broadcasting Addition, passing at a distance of 315.01 feet a 1/2 inch iron rod found for corner corner, and continuing a total distance of 349.25 feet a 1/2 inch iron rod found for corner, said point being the most northerly northeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being an internal corner of said Lot 1, Block B;

THENCE South 00 deg. 38 min. 00 sec. West, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block B, passing at a distance of 1030.53 feet a 1/2 inch iron rod found with "Powell Powell" cap, said point being the most southerly southwest corner of said Lot 1, Block B, same being the northwest corner of that certain tract of land to Larry D. Williams, by deed recorded in C.C. File No. 97-0019796, of aforesaid Deed Records, and continuing along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Williams tract, a total distance of 1135.31 feet to a point from which a 1/2 inch iron rod found with "Kadleck 3852" cap bears North 00 deg. 38 min. 00 sec. East, 3.01 feet, and another 1/2 inch iron rod found with "Pacheko Koch" cap bears North 42 deg. 57 min. 38 sec. West, 5.75 feet, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the southwest corner of said Williams tract, same being in the north line of Lot 1, Block 1 of Indian Creek Ranch Golf Course Addition, Phase I, an addition to the City of Carrollton, Denton County, Texas, according to the plat thereof recorded in Cabinet O, Page 313, of aforesaid Plat Records;

THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 1, Block 1 as follows:

North 88 deg. 23 min. 57 sec. West, a distance of 42.08 feet to a concrete monument with a 1/2 inch iron rod found;
South 44 deg. 07 min. 51 sec. West, a distance of 487.22 feet to a 1/2 inch iron rod found for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 2175.70 feet to a 5/8 inch iron rod found with "Carter & Burgess" cap for corner, said point being the most easterly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition;
North 88 deg. 58 min. 21 sec. West, a distance of 394.00 feet to a 1/2 inch iron rod set for corner;
South 00 deg. 29 min. 20 sec. West, a distance of 230.00 feet to a point for corner in the approximate centerline of Elm Fork of Trinity River, said point being the most southerly southeast corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being the most westerly southeast corner of said Lot 1, Block 1, same being the most northerly northeast corner of Lot 2, of D/FW Recycling & Disposal Facility, Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet L, Page 346, of aforesaid Plat Records;

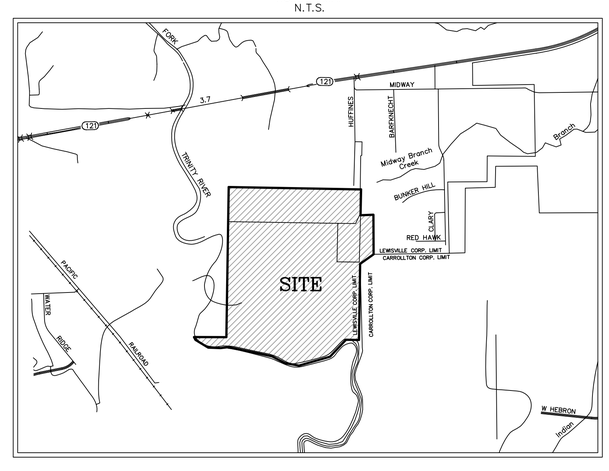
THENCE along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Lot 2, and along the approximate centerline of said Elm Fork of Trinity River as follows:

South 51 deg. 01 min. 49 sec. West, a distance of 623.06 feet to a point for corner;
South 65 deg. 47 min. 32 sec. West, a distance of 239.43 feet to a point for corner;
South 80 deg. 05 min. 38 sec. West, a distance of 622.76 feet to a point for corner;
North 87 deg. 53 min. 29 sec. West, a distance of 232.31 feet to a point for corner;
North 73 deg. 57 min. 44 sec. West, a distance of 316.66 feet to a point for corner;
North 56 deg. 18 min. 20 sec. West, a distance of 463.78 feet to a point for corner;
North 81 deg. 23 min. 24 sec. West, a distance of 322.39 feet to a point for corner;
North 76 deg. 32 min. 03 sec. West, a distance of 493.32 feet to a point for corner;
North 88 deg. 31 min. 36 sec. West, a distance of 197.16 feet to a point for corner;
North 82 deg. 08 min. 34 sec. West, a distance of 237.74 feet to a point for corner;
South 78 deg. 06 min. 25 sec. West, a distance of 417.73 feet to a point for corner;
North 70 deg. 27 min. 39 sec. West, a distance of 407.54 feet to a point for corner;
North 59 deg. 22 min. 22 sec. West, a distance of 105.48 feet to a point for corner;
North 26 deg. 55 min. 54 sec. West, a distance of 277.90 feet to a point for corner, said point being the most westerly southwest corner of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, same being a northeast corner of said Lot 2, same being the most southerly southeast corner of Lot 5, of D/FW Recycling & Disposal Facility Addition, an addition to the City of Lewisville, Denton County, Texas, according to the plat thereof recorded in Cabinet V, Page 929, of aforesaid Plat Records, same being the most southerly southwest corner of aforesaid Stockard tract;

THENCE South 89 deg. 38 min. 10 sec. East, along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 1003.88 feet to a 1/2 inch iron rod found for corner, said point being the southeast corner of said Stockard tract;

THENCE North 00 deg. 24 min. 20 sec. East (basis of bearing), along the common line of said Lot 1, Block A, Farmers Branch Camelot Landfill Addition, and said Stockard tract, a distance of 3395.38 feet to the POINT OF BEGINNING and containing 459.758 acres of computed land more or less.

VICINITY MAP
N.T.S.



NOTES:

1. IRF – Iron Rod Found
2. IRS – Iron Rod Set w/ Peiser Surveying red plastic cap
3. Basis of Bearing – Basis of Bearing – Based on the west line of that certain called 118.87 acre tract of land to the City of Farmers Branch, by deed recorded in Volume 1019, Page 360, of the Deed Records of Denton County, Texas.
4. This property has not been abstracted per the client's request, and this survey was performed without the benefit of a title commitment, all easements may not be shown.
5. No improvements have been shown.
6. The sole purpose of this survey is to show the permit boundary for the Camelot Landfill, as depicted on this survey. This survey is not intended for any other use by this or any other party.
7. SPC – State Plane Coordinate Direction.
8. The difference in the platted bearings and the SPC (State Plane Coordinate) bearings, both shown hereon, is 01°45'44".

PRELIMINARY, THIS DOCUMENT
SHALL NOT BE RECORDED
FOR ANY PURPOSE
08/05/2016

Timothy R. Mankin
Registered Professional Land Surveyor No. 6122

Errors: The Client or Client's Representatives will have 45 days from the date the survey was issued to change any misspellings or any errors on the survey report, after this time has expired all parties involved must accept the survey as issued.

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459.758 ACRE PERMIT BOUNDARY
CAMELOT LANDFILL
580 HUFFINES BOULEVARD
LEWISVILLE, TEXAS 75056

NO.	DATE	REVISION
1.	08/04/16	UPDATE BOUNDARY TO REFLECT CURRENT OWNERSHIP
2.		
3.		

JOB NO.:	P-4395_469AC
DATE:	11/01/2010
FIELD DATE:	09/29/2010
SCALE:	1" = 400'
FIELD:	J.D.H.
DRAWN:	T.R.M.
CHECKED:	J.B.W.

PEISER & MANKIN SURVEYING, LLC
www.peisersurveying.com
623 E. DALLAS ROAD
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BOUNDARIES
TOPOGRAPHY
MORTGAGE
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Member Since 1977
FIRM No. 100999-00

SHEET 1 OF 1

17 REQUEST FOR VOLUNTARY REVOCATION OF TCEQ PERMIT NO. MSW-946

As shown on Figure I/II-3.1, the permit boundary will be expanded to the north by adding ~~118.5~~ 108.99 acres to the existing 350.77-acre permit boundary. The area within the proposed permit boundary expansion includes an inactive municipal solid waste permit area (TCEQ Permit No. MSW-946). The current permittee of TCEQ Permit No. MSW-946 is the City of Farmers Branch. This permit was originally issued by the TCEQ on March 15, 1979 to the Town of Highland Park.

The 102.58-acre property and the permit were transferred to the City of Farmers Branch in 2000. A copy of the permit transfer is included in Appendix I/IIH. The permitted facility has never been developed; however, the record for this permit does indicate some waste filling occurred after the site was acquired by Highland Park in 1967 (refer to Section 3.1 for additional information). As discussed in Section 2.1, the historic waste fill within this tract will be relocated to the 236.8-acre waste disposal area within 6 months of the issuance of Permit No. MSW-1312B. Refer to Part III – Site Development Plan Narrative (Section 4.6) for more information.

The City of Farmers Branch requests that Permit No. MSW-946 be revoked upon approval of this permit amendment application, as the majority of the 102.58-acre permit boundary of TCEQ Permit No. MSW-946 will be incorporated into the ~~469.62~~ 459.76-acre permit boundary of TCEQ Permit No. 1312B. A request for voluntary revocation of TCEQ Permit No. MSW-946 is included on page I/II-17-2.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

APPENDIX I/IIA
FACILITY LAYOUT MAPS

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised June 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6A

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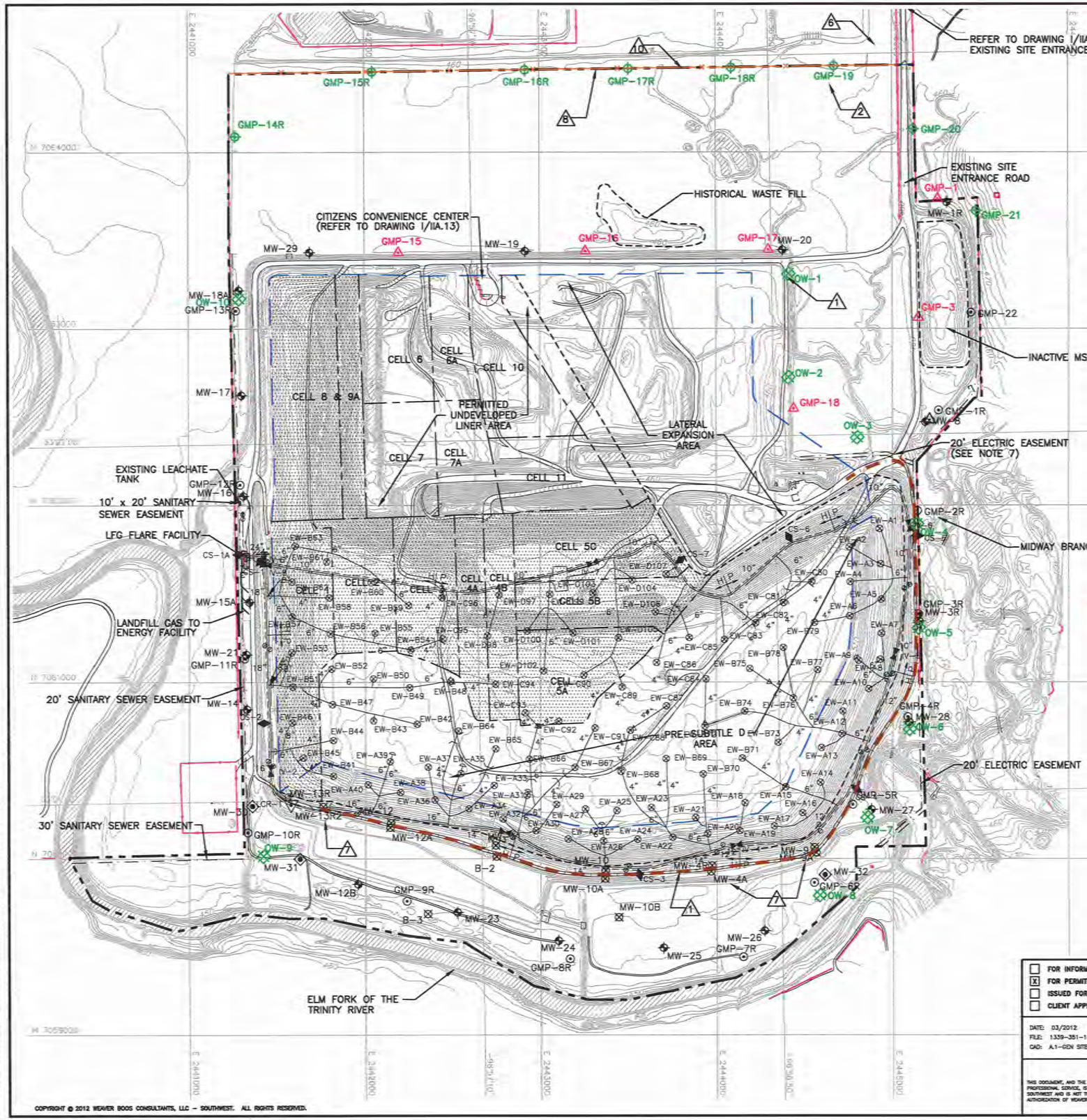

0 300 600
SCALE IN FEET

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 8.
5. REVISED NOTE 10.
6. REMOVED EASEMENTS.
7. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
8. REVISED PROPOSED FENCE LOCATION.
9. REVISED NOTE 6.
10. REVISED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMIT OF WASTE
- PROPOSED LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR (6)
- EASEMENT
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-13R — EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-8 — EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED) (2)
- GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE (7)
- MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 8 AND 9) (3)
- OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 9)
- EW-A15 — EXISTING LFG EXTRACTION WELL
- EXISTING SUBTITLE D COMPOSITE LINED AREA
- EXISTING FENCE (8)
- PROPOSED FENCE
- SITE BENCHMARK (SEE NOTE 3)
- EXISTING SLURRY WALL (SEE NOTE 10) (1)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. THE PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW-1312A IS SHOWN ON FIGURE I/II-3.1.
3. SITE BENCHMARK INFORMATION IS LISTED BELOW.

SITE BENCHMARK INFORMATION

MONUMENT	NORTHING	EASTING	ELEVATION (FT-MSL)
1	7062483.83	2445210.12	455.46

BENCHMARK WAS ESTABLISHED ON AUGUST 13, 2004. ELEVATION IS BASED ON NAVD 88.

4. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED ON DRAWINGS I/IIA.4 THROUGH I/IIA.7.
5. UNAUTHORIZED ACCESS TO THE EXISTING FILL AREA AND ENTRANCE FACILITIES IS CONTROLED WITH PERIMETER FENCING (MINIMUM 4-FOOT HIGH, 3-STRAND BARBED WIRE FENCE), GATED ENTRANCE, AND NATURAL BARRIERS (DENSE FOLIAGE, VEGETATION, AND ELM FORK OF THE TRINITY RIVER). REFER TO DRAWING I/IIA.12 FOR MORE INFORMATION.
6. A VARYING 20-FOOT AND 30-FOOT SANITARY SEWER EASEMENT IS LOCATED ALONG THE WESTERN SIDE OF THE PERMIT BOUNDARY. A 10-FOOT BY 20-FOOT SANITARY SEWER EASEMENT IS LOCATED ON THE WESTERN SIDE OF THE PERMIT BOUNDARY. A 20-FOOT ELECTRICAL EASEMENT IS LOCATED ALONG THE EASTERN SIDE OF THE PERMIT BOUNDARY. A 40-FOOT RIGHT-OF-WAY DEDICATION, A 35-FOOT RIGHT-OF-WAY DEDICATION AND A 40-FOOT SANITARY SEWER EASEMENT CROSS THE NORTHERN PORTION OF THE PERMIT BOUNDARY. A 20-FOOT UTILITY EASEMENT IS LOCATED IN THE NORTHEAST PORTION OF THE SITE NEAR THE EXISTING ENTRANCE FACILITIES. REFER TO PARTS I/II, FIGURE I/II-B.1 FOR THE LOCATION OF THE EXISTING EASEMENT.
7. THIS 20-FOOT ELECTRICAL EASEMENT PROVIDES ELECTRICITY TO THE TEMPORARY MAINTENANCE AREA. THE EASEMENT WILL BE ABANDONED PRIOR TO DEVELOPMENT IN THIS AREA.
8. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
9. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.
10. THE SLURRY WALL WAS INSTALLED IN 2015 UNDER TCEQ PERMIT NO. 1312A. REFER TO APPENDIX IIIA FOR SLURRY WALL INFORMATION.

☐ FOR INFORMATION PURPOSES ONLY
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: A.1-GEN SITE PLAN.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st. TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT GENERAL SITE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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DRAWING I/IIA.1

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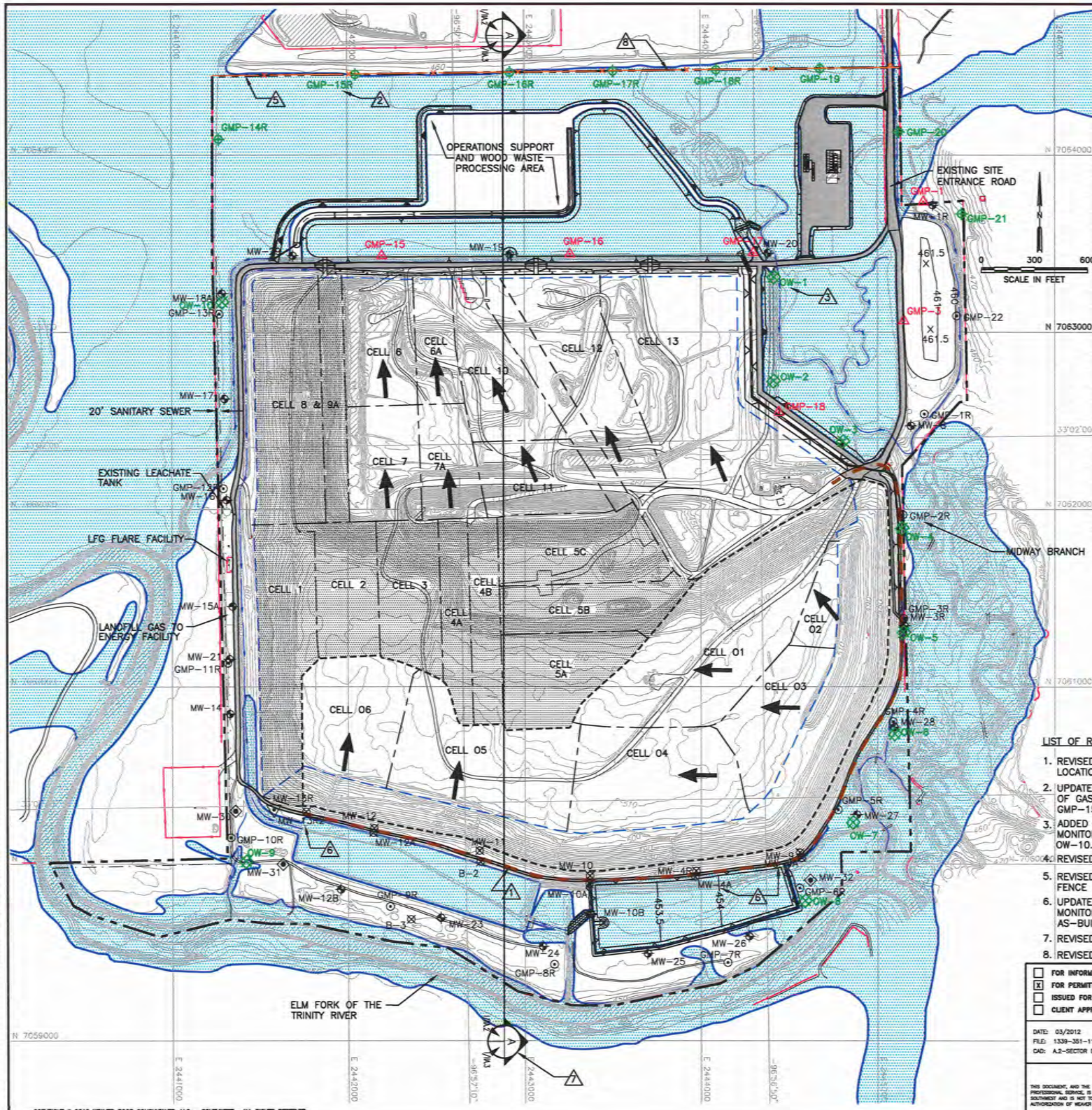
O:\1339\351\EXPANSION 2009\PARTS I-II\A.1-GEN SITE PLAN.dwg, jwilson, 1:2



CELL SUMMARY			
CELL	MAX LENGTH (FT)	MAX WIDTH (FT)	AREA (ACRES)
SUBTITLE D AREA			
1	761	346	10.34
2	759	473	6.25
3	897	351	6.67
4A	1166	164	4.12
4B	1168	170	4.54
5A	539	833	7.41
5B	320	1092	6.55
5C	466	1018	8.56
8	1384	408	12.18
9A	1381	134	4.24
6	730	408	6.69
6A	708	265	3.75
7	649	412	6.11
7A	649	369	4.72
10	922	557	7.45
11	429	730	6.30
12	1188	645	14.80
13	1674	1086	27.69
PRE-SUBTITLE D AREA*			
01	891	571	19.88
02	725	532	2.05
03	858	880	6.55
04	647	995	11.85
05	744	1049	12.78
06	767	641	8.62

*APPROXIMATLEY 26.70 ACRES OF PRE-SUBTITLE D AREA WILL NOT BE LINED WITH OVERLINER.

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED PRE-SUBTITLE D LIMIT OF WASTE
- AUTHORIZED SUBTITLE D LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- CELL BOUNDARY
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-13R — EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-8 — EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 9)
- MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 9 AND 10)
- EXISTING SUBTITLE D COMPOSITE LINED AREA
- EXISTING FENCE
- PROPOSED FENCE
- FILL DIRECTION (SEE NOTE 3)
- 100-YEAR FLOODPLAIN (SEE NOTE 8)
- PERIMETER ACCESS ROAD
- 3H:1V SLOPE (TYPICAL)
- EXISTING SLURRY WALL
- INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. CELL DESIGNATIONS INDICATE GENERAL PROGRESSION OF LANDFILL OPERATIONS. FILL DIRECTION ARROWS INDICATE GENERAL DIRECTION OF FILL WITHIN A CELL.
4. TYPICAL CROSS SECTION PROVIDED IN DRAWING I/IIA.3. ADDITIONAL SECTION INFORMATION PROVIDED IN APPENDIX IIIA-B – LANDFILL UNIT CROSS SECTIONS.
5. SEE DRAWINGS I/IIA.4 THROUGH I/IIA.7 FOR DETAILED SECTOR DEVELOPMENT PLANS.
6. WIDTH OF THE BUFFER ZONE BETWEEN THE LIMITS OF WASTE AND THE PERMIT BOUNDARY VARIES; HOWEVER, THE BUFFER ZONE IS A MINIMUM OF 50 FEET FOR EXISTING FILL AREAS AND 125 FEET FOR THE NEWLY PERMITTED AIRSPACE. REFER TO APPENDIX I/IIC FOR MORE INFORMATION REGARDING BUFFER ZONES.
7. EACH CELL, INCLUDING THE PRE-SUBTITLE D FILL AREA, WILL ACCEPT MUNICIPAL SOLID WASTE RESULTING FROM, OR INCIDENTAL TO, MUNICIPAL, COMMUNITY, COMMERCIAL, INSTITUTIONAL, RECREATIONAL AND INDUSTRIAL ACTIVITIES, INCLUDING GARBAGE, PUTRESCIBLE WASTES, RUBBISH, ASHES, BRUSH, STREET CLEANINGS, DEAD ANIMALS, ABANDONED AUTOMOBILES, CONSTRUCTION-DEMOLITION WASTE, YARD WASTE, CLASS 2 NON-HAZARDOUS INDUSTRIAL SOLID WASTE, CLASS 3 NON-HAZARDOUS INDUSTRIAL SOLID WASTE, AND CERTAIN SPECIAL WASTES.
8. FLOODPLAIN INFORMATION IS INCLUDED IN APPENDIX IIIO.
9. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
10. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 9.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. REVISED SECTION A LOCATION.
8. REVISED PERMIT BOUNDARY INFORMATION.

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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: A.2-SECTOR DEV SEQ.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SECTOR DEVELOPMENT SEQUENCE

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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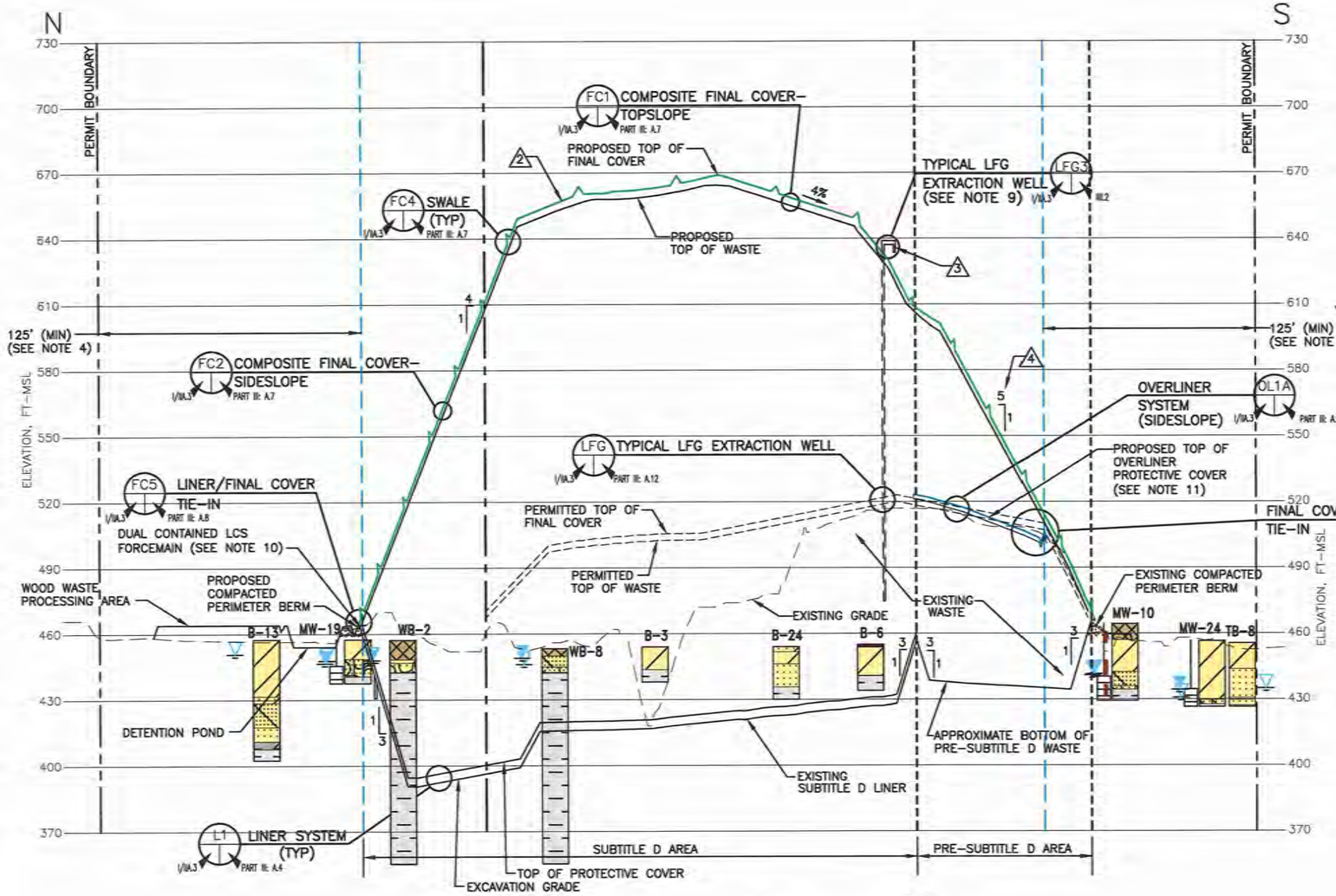
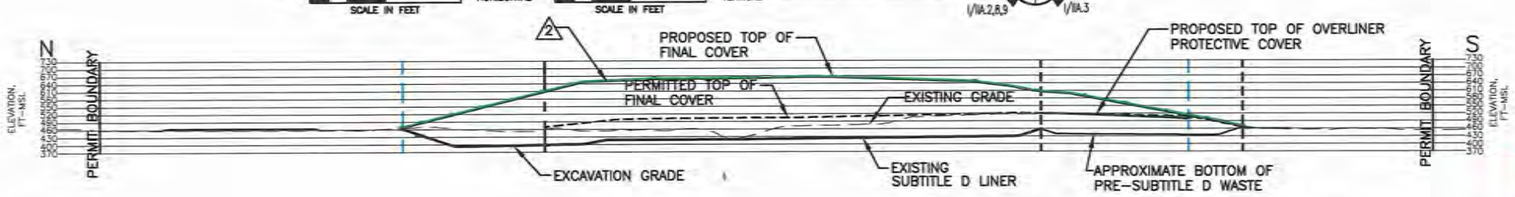


SECTION (EXAGGERATED VERTICAL SCALE) A

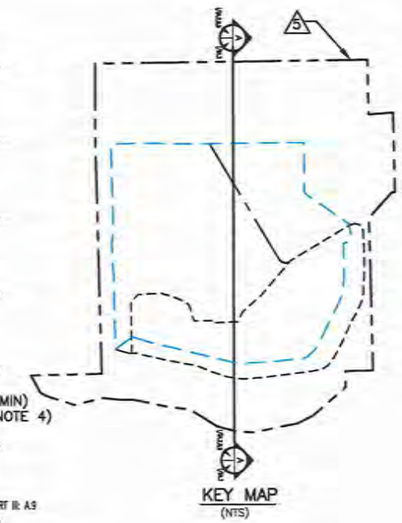
0 300 600 SCALE IN FEET HORIZONTAL

0 30 60 SCALE IN FEET VERTICAL



SECTION (1H:1V) A

0 300 600 SCALE IN FEET



LEGEND

- PERMIT BOUNDARY
- AUTHORIZED PRE-SUBTITLE D LIMIT OF WASTE
- AUTHORIZED SUBTITLE D LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- EXISTING GRADE
- TOP OF WASTE
- TOP OF FINAL COVER
- EXISTING PERMITTED FINAL COVER
- EXISTING SLURRY WALL
- CLAY AND SILTY CLAY
- EARTHEN FILL
- SAND
- SANDY CLAY
- CLAYEY GRAVEL
- GRAVEL
- GRAVELLY SAND
- UNWEATHERED SHALE
- SANDY GRAVEL
- WEATHERED SHALE
- SILTY SAND
- STATIC GROUNDWATER LEVEL AS DESCRIBED ON BORING LOG
- GROUNDWATER AT THE TIME OF DRILLING (ATD)

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. REVISED FINAL COVER.
3. LOWERED ELEVATION OF LFG EXTRACTION WELL.
4. REVISED SLOPE TO 5H:1V.
5. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING CONTOURS AND ELEVATIONS PREPARED BY METROPOLITAN AERIAL SURVEYS FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010.
2. REFER TO APPENDIX IIIA-A FOR LINER, OVERLINER, LEACHATE COLLECTION, AND FINAL COVER SYSTEM DETAILS.
3. SEE APPENDIX IIIG FOR BORING DATA. BORINGS PROJECTED INTO THE LINE OF SECTION. SEE DRAWING B.1 FOR LOCATION.
4. AS SHOWN IN APPENDIX I/IIC, THE BUFFER ZONES VARY AROUND THE PERIMETER OF THE SITE, BUT IN NO CASE ARE THEY LESS THAN 50-FEET FOR EXISTING WASTE. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND THE LATERAL EXPANSION IS AT LEAST 125-FEET. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND NEWLY PERMITTED (PERMIT NO. 1312B) WASTE DISPOSAL AIRSPACE IS AT LEAST 125-FEET.
5. REFER TO APPENDIX IIII, FOR DETAILS OF THE LANDFILL GAS MANAGEMENT PLAN.
6. DRAINAGE DESIGN INFORMATION IS PROVIDED IN APPENDIX IIIIF-SURFACE WATER DRAINAGE PLAN.
7. MINIMUM EXCAVATION ELEVATION AT LCS SUMPS IS 387 FT-MSL. MAXIMUM TOP OF FINAL COVER ELEVATION IS 725 FT-MSL.
8. STATIC GROUNDWATER ELEVATIONS AND GROUNDWATER AT TIME OF DRILLING NOT REPORTED IN ALL BOREHOLES.
9. LOCATIONS OF TYPICAL LFG EXTRACTION WELLS CAN BE FOUND IN APPENDIX IIII.
10. REFER TO APPENDIX IIIC FOR LEACHATE COLLECTION SYSTEM (LCS) FORCEMAIN INFORMATION.
11. REFER TO APPENDIX IIIA-A FOR THE OVERLINER DESIGN THAT WILL BE INSTALLED OVER THE PRE-SUBTITLE D AREA.

DRAFT

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: A.3-SECTION A.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT TYPICAL SECTION A

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

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DRAWING I/IIA.3

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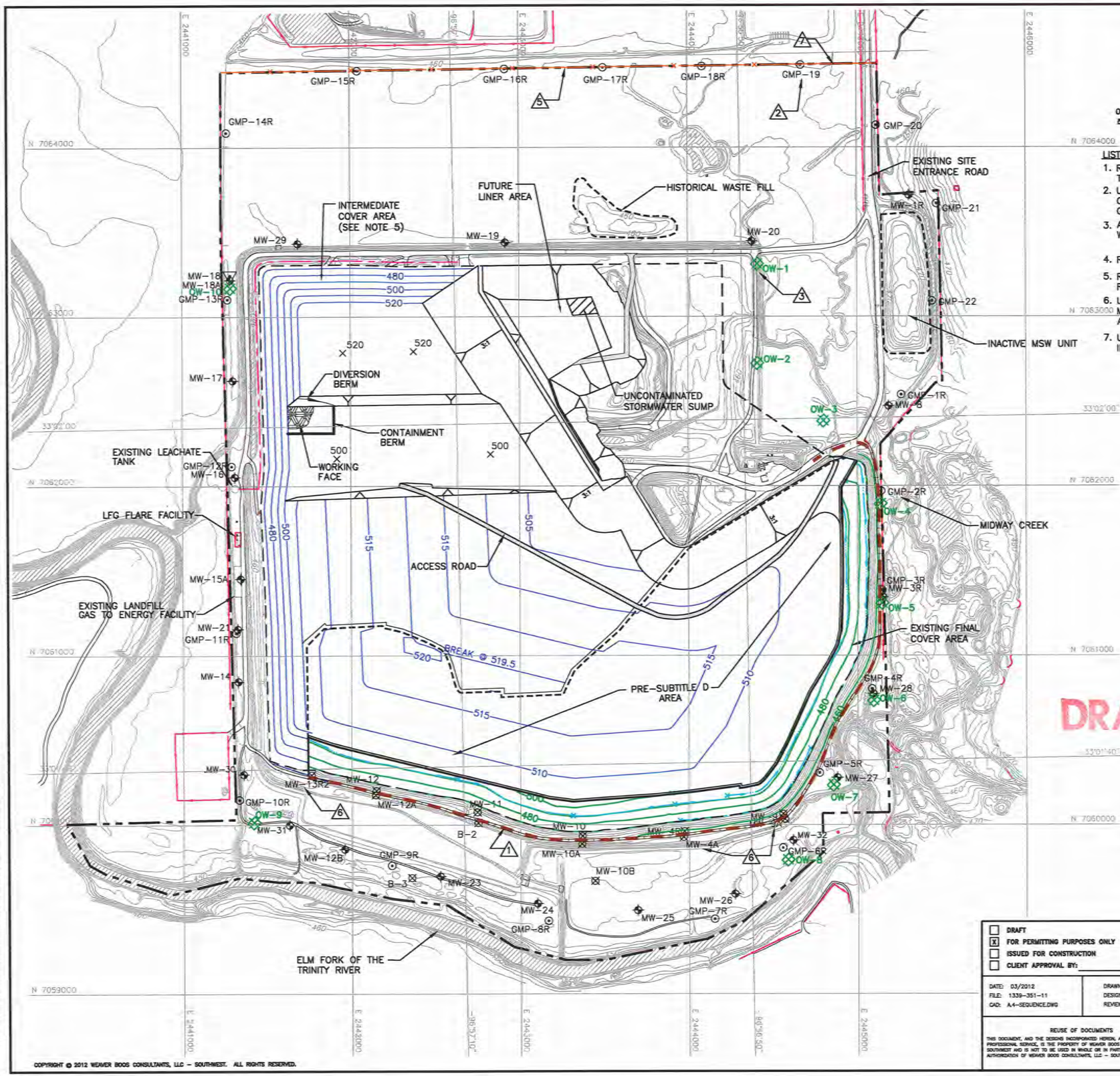

N

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 13.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- AUTHORIZED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 400 — PROPOSED FINAL COVER CONTOUR
- DRAINAGE SWALE
- 560 — PROPOSED INTERMEDIATE COVER CONTOUR (SEE NOTE 5)
- LEACHATE FORCEMAIN
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING SLURRY WALL
- OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 14)
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- GMP-13 — EXISTING LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 13 AND 14)
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN FOR CONTAMINATED WATER RUN-ON/RUN-OFF BERM DESIGN INFORMATION.
4. THE SECTOR DEVELOPMENT SHOWN ON THIS DRAWING SHOWS THE GENERAL SEQUENCE OF FILLING OPERATIONS. THE LOCATION OF THE ALL-WEATHER ACCESS ROAD FROM THE LANDFILL HAUL ROAD TO THE ACTIVE AREA WILL BE DETERMINED DURING SITE OPERATIONS.
5. INTERMEDIATE COVER CONSISTS OF A 12-INCH THICK SOIL LAYER. REFER TO PART IV – SITE OPERATING PLAN FOR ADDITIONAL SOIL COVER REQUIREMENTS.
6. LANDFILL HAUL ROAD WILL BE SURFACED WITH CRUSHED STONE TO PROVIDE ALL-WEATHER ACCESS.
7. REFER TO APPENDIX IIIF-SURFACE WATER DRAINAGE PLAN FOR THE EROSION AND SEDIMENTATION CONTROL PLAN. DRAINAGE STRUCTURES ARE SHOWN AS THE SITE DEVELOPS. ADDITIONALLY BMPs WILL BE USED TO CONTROL EROSION AS NEEDED.
8. MAXIMUM SLOPE ON THE TEMPORARY ACCESS ROAD IS 10%.
9. REFER TO APPENDIX IIII FOR LANDFILL GAS MANAGEMENT PLAN.
10. UNCONTAMINATED STORMWATER THAT HAS NOT COME INTO CONTACT WITH WASTE WILL BE COLLECTED IN SUMPS AND PERIODICALLY REMOVED FROM EXCAVATED AREAS BY PUMPING TO PERIMETER DRAINAGE CHANNELS OR USED IN SITE OPERATIONS (E.G., DUST CONTROL, COMPACTING, ETC.).
11. TEMPORARY CHUTES AND SWALES WILL BE PLACED OVER THE INTERMEDIATE COVER AREA TO MINIMIZE EROSION AND HELP ESTABLISH VEGETATION FOR INTERMEDIATE COVER AREAS THAT WILL NOT RECEIVE WASTE OR FINAL COVER WITHIN 180 DAYS AFTER PLACEMENT (REFER TO APPENDIX IIIF-G FOR MORE INFORMATION). MULCH, HYDROSEEDING OR SIMILAR METHODS WILL BE USED TO ESTABLISH VEGETATION OVER THE INTERMEDIATE COVER AREAS. SWALE AND LETDOWN SPACING WILL MEET THE REQUIREMENTS OF THE EROSION CONTROL PLAN INCLUDED IN APPENDIX IIIF-G.
12. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN APPENDIX IIIC-D FOR LEACHATE STORAGE TANK DETAILS.
13. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
14. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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CAD: A4-SEQUENCE.DWG

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DESIGN BY: RJS
REVIEWED BY: JAE

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SECTOR DEVELOPMENT PLAN I

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
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(817) 735-9770
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SPRINGFIELD, IL
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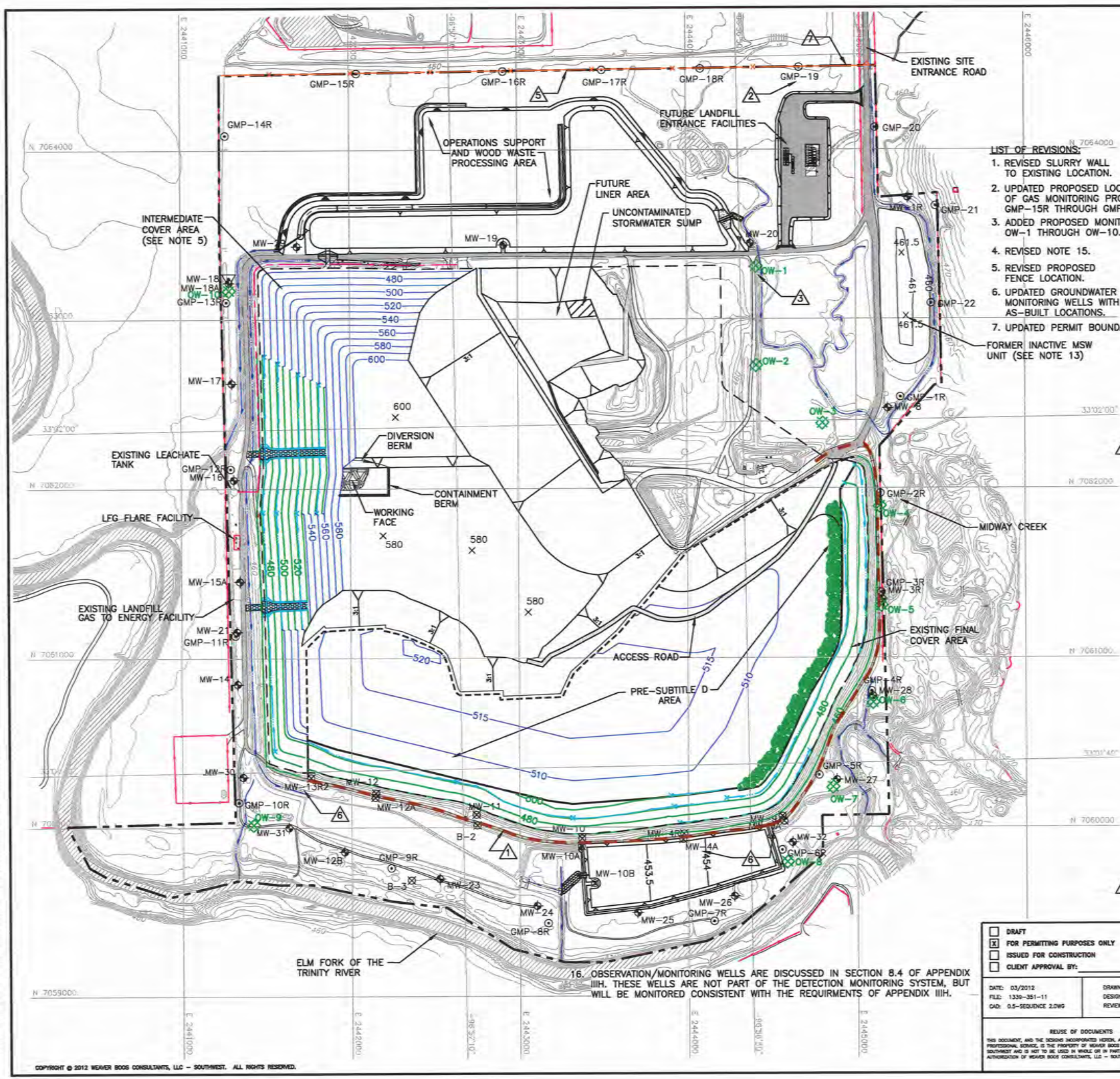

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 400 — PROPOSED FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- 560 — PROPOSED INTERMEDIATE COVER CONTOUR (SEE NOTE 5)
- 600 — REGRADED BUFFER ZONE AREA
- LEACHATE FORCEMAIN
- EXISTING FENCE
- (5) PROPOSED FENCE
- (1) EXISTING SLURRY WALL
- (3) OW-1 PROPOSED WOODBINE MONITOR WELL (SEE NOTE 16)
- MW-8 EXISTING GROUNDWATER MONITORING WELL
- (2) GMP-13 EXISTING LANDFILL GAS MONITORING PROBE
- (6) MW-12 OBSERVATION/MONITORING WELL (SEE NOTES 15 AND 16)
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

N

0 300 600
SCALE IN FEET

DRAFT

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 15.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. (7) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN FOR CONTAMINATED WATER RUN-ON/RUN-OFF BERM DESIGN INFORMATION.
4. THE SECTOR DEVELOPMENT SHOWN ON THIS DRAWING SHOWS THE GENERAL SEQUENCE OF FILLING OPERATIONS. THE LOCATION OF THE ALL-WEATHER ACCESS ROAD FROM THE LANDFILL HAUL ROAD TO THE ACTIVE AREA WILL BE DETERMINED DURING SITE OPERATIONS.
5. INTERMEDIATE COVER CONSISTS OF A 12-INCH THICK SOIL LAYER. REFER TO PART IV - SITE OPERATING PLAN FOR ADDITIONAL SOIL COVER REQUIREMENTS.
6. LANDFILL HAUL ROAD WILL BE SURFACED WITH CRUSHED STONE TO PROVIDE ALL-WEATHER ACCESS.
7. REFER TO APPENDIX IIIF-SURFACE WATER DRAINAGE PLAN FOR THE EROSION AND SEDIMENTATION CONTROL PLAN. DRAINAGE STRUCTURES ARE SHOWN AS THE SITE DEVELOPS. ADDITIONALLY BMPs WILL BE USED TO CONTROL EROSION AS NEEDED.
8. MAXIMUM SLOPE ON THE TEMPORARY ACCESS ROAD IS 10%.
9. REFER TO APPENDIX IIII FOR LANDFILL GAS MANAGEMENT PLAN.
10. UNCONTAMINATED STORMWATER THAT HAS NOT COME INTO CONTACT WITH WASTE WILL BE COLLECTED IN SUMPS AND PERIODICALLY REMOVED FROM EXCAVATED AREAS BY PUMPING TO PERIMETER DRAINAGE CHANNELS OR USED IN SITE OPERATIONS (E.G., DUST CONTROL, COMPACTING, ETC.).
11. TEMPORARY CHUTES AND SWALES WILL BE PLACED OVER THE INTERMEDIATE COVER AREA TO MINIMIZE EROSION AND HELP ESTABLISH VEGETATION FOR INTERMEDIATE COVER AREAS THAT WILL NOT RECEIVE WASTE OR FINAL COVER WITHIN 180 DAYS AFTER PLACEMENT (REFER TO APPENDIX IIIF-G FOR MORE INFORMATION). MULCH, HYDROSEEDING OR SIMILAR METHODS WILL BE USED TO ESTABLISH VEGETATION OVER THE INTERMEDIATE COVER AREAS. SWALE AND LETDOWN SPACING WILL MEET THE REQUIREMENTS OF THE EROSION CONTROL PLAN INCLUDED IN APPENDIX IIIF-G.
12. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN APPENDIX IIIC-D FOR LEACHATE STORAGE TANK DETAILS.
13. THE WASTE FROM THE INACTIVE MSW UNIT WILL BE RELOCATED PRIOR TO THE DEVELOPMENT OF CELL 12 AND WASTE FROM THE HISTORICAL WASTE FILL AREA WILL BE RELOCATED WITHIN 6 MONTHS OF THE ISSUANCE OF PERMIT MSW-1312B. REFER TO PART IV-SITE OPERATING PLAN, SECTION 4.25 FOR THE WASTE RELOCATION PLAN.
14. THE FUTURE LANDFILL ENTRANCE FACILITIES MAY BE CONSTRUCTED ANY TIME PRIOR TO THE CONSTRUCTION OF COORPRATE DRIVE ALONG NORTHERN PORTION OF THE PROPERTY.
15. (4) LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
16. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIREMENTS OF APPENDIX IIIH.

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DESIGN BY: RJS
REVIEWED BY: JAE

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SECTOR DEVELOPMENT PLAN II

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
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FORT WORTH, TX (817) 735-9770
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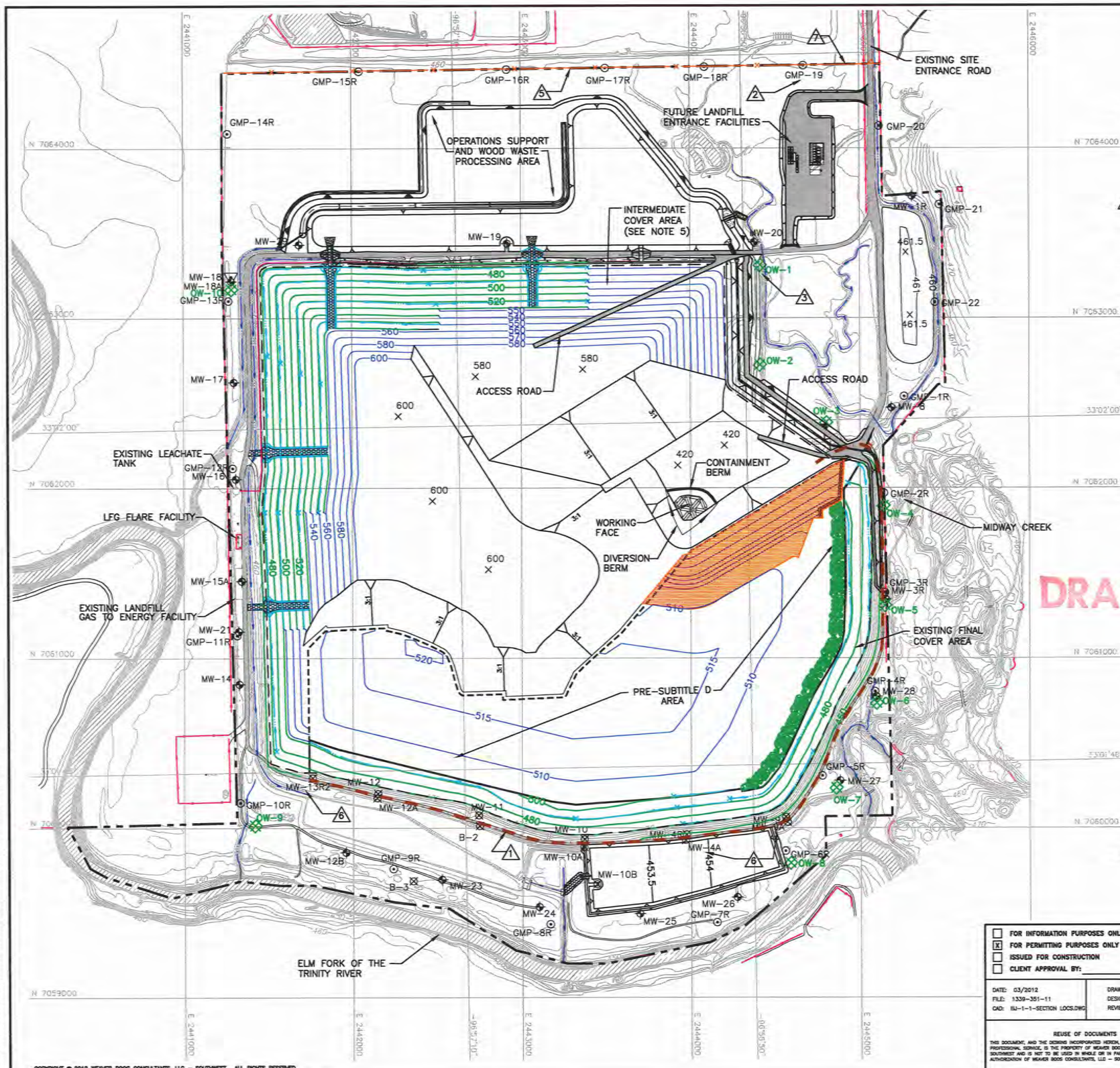

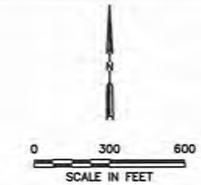

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 400 — PROPOSED FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- 560 — PROPOSED INTERMEDIATE COVER CONTOUR (SEE NOTE 5)
- 600 — REGRADED BUFFER ZONE AREA
- LEACHATE FORCEMAIN
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING SLURRY WALL
- OVERLINER AREA
- OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 14)
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- GMP-13 — EXISTING LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 13 AND 14)

△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 13.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN FOR CONTAMINATED WATER RUN-ON/RUN-OFF BERM DESIGN INFORMATION.
4. THE SECTOR DEVELOPMENT SHOWN ON THIS DRAWING SHOWS THE GENERAL SEQUENCE OF FILLING OPERATIONS. THE LOCATION OF THE ALL-WEATHER ACCESS ROAD FROM THE LANDFILL HAUL ROAD TO THE ACTIVE AREA WILL BE DETERMINED DURING SITE OPERATIONS.
5. INTERMEDIATE COVER CONSISTS OF A 12-INCH THICK SOIL LAYER. REFER TO PART IV – SITE OPERATING PLAN FOR ADDITIONAL SOIL COVER REQUIREMENTS.
6. LANDFILL HAUL ROAD WILL BE SURFACED WITH CRUSHED STONE TO PROVIDE ALL-WEATHER ACCESS.
7. REFER TO APPENDIX IIIF-SURFACE WATER DRAINAGE PLAN FOR THE EROSION AND SEDIMENTATION CONTROL PLAN. DRAINAGE STRUCTURES ARE SHOWN AS THE SITE DEVELOPS. ADDITIONALLY BMPs WILL BE USED TO CONTROL EROSION AS NEEDED.
8. MAXIMUM SLOPE ON THE TEMPORARY ACCESS ROAD IS 10%.
9. REFER TO APPENDIX IIII FOR LANDFILL GAS MANAGEMENT PLAN.
10. UNCONTAMINATED STORMWATER THAT HAS NOT COME INTO CONTACT WITH WASTE WILL BE COLLECTED IN SUMPS AND PERIODICALLY REMOVED FROM EXCAVATED AREAS BY PUMPING TO PERIMETER DRAINAGE CHANNELS OR USED IN SITE OPERATIONS (E.G., DUST CONTROL, COMPACTING, ETC.).
11. TEMPORARY CHUTES AND SWALES WILL BE PLACED OVER THE INTERMEDIATE COVER AREA TO MINIMIZE EROSION AND HELP ESTABLISH VEGETATION FOR INTERMEDIATE COVER AREAS THAT WILL NOT RECEIVE WASTE OR FINAL COVER WITHIN 180 DAYS AFTER PLACEMENT (REFER TO APPENDIX IIIF-G FOR MORE INFORMATION). MULCH, HYDROSEEDING OR SIMILAR METHODS WILL BE USED TO ESTABLISH VEGETATION OVER THE INTERMEDIATE COVER AREAS. SWALE AND LETDOWN SPACING WILL MEET THE REQUIREMENTS OF THE EROSION CONTROL PLAN INCLUDED IN APPENDIX IIIF-G.
12. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN APPENDIX IIIC-D FOR LEACHATE STORAGE TANK DETAILS.
13. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
14. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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- ☒ FOR PERMITTING PURPOSES ONLY
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- ☐ CLIENT APPROVAL BY: _____

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DRAWN BY: JDW
DESIGN BY: RJS
REVIEWED BY: JAE

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SECTOR DEVELOPMENT PLAN III

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO
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GRIFFITH, IN
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SPRINGFIELD, IL
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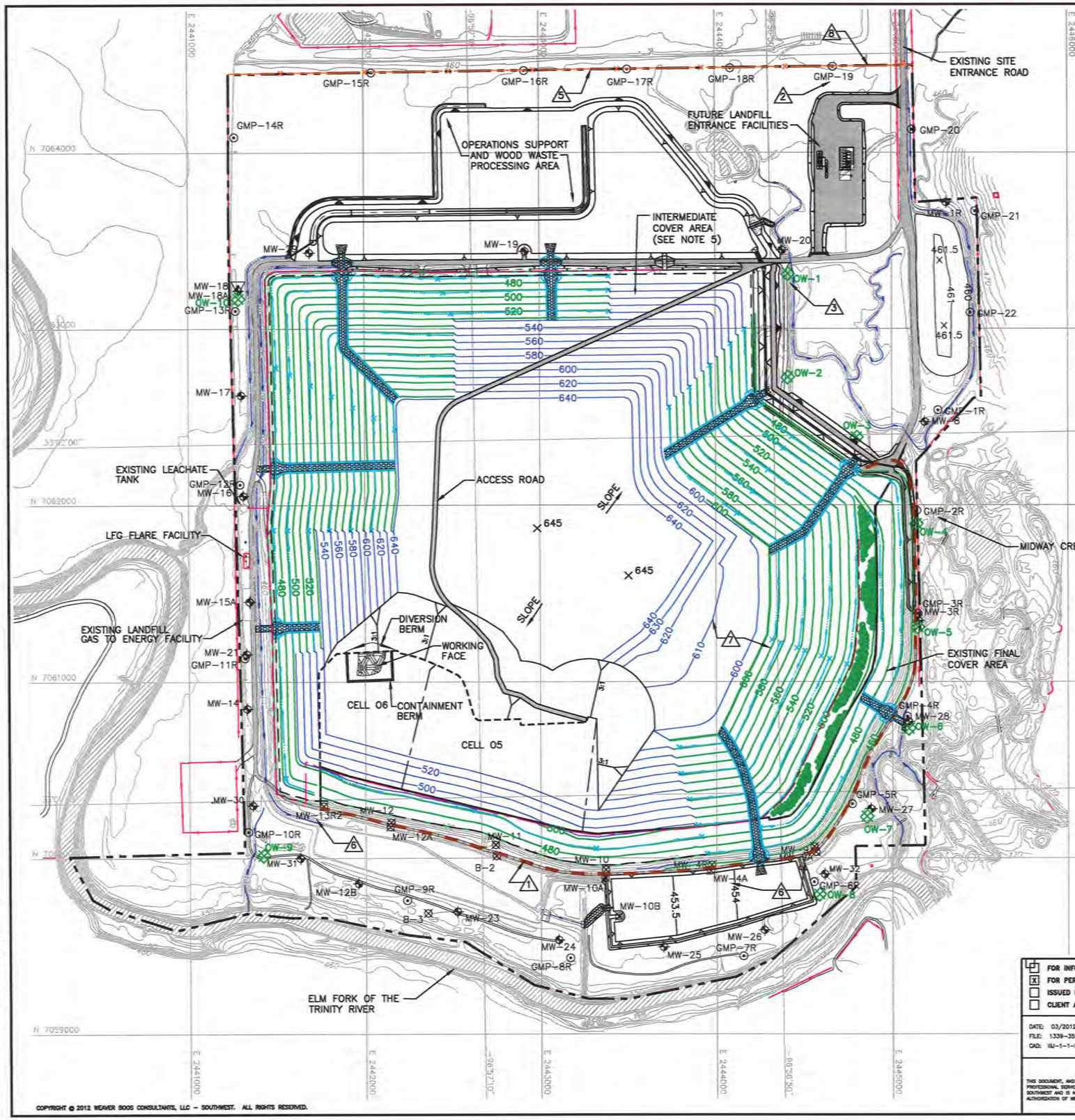

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM (N 7064000)
- GEODETIC COORDINATE SYSTEM (33°02'00")
- EXISTING CONTOUR (500)
- REGRADED BUFFER ZONE AREA (600)
- PROPOSED FINAL COVER CONTOUR (400) — 7
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- PROPOSED INTERMEDIATE COVER CONTOUR (SEE NOTE 5) (560) — 7
- LEACHATE FORCEMAIN
- EXISTING FENCE
- PROPOSED FENCE — 5
- EXISTING SLURRY WALL — 1
- PROPOSED WOODBINE MONITOR WELL (SEE NOTE 14) (OW-1) — 3
- EXISTING GROUNDWATER MONITORING WELL (MW-8)
- EXISTING LANDFILL GAS MONITORING PROBE (GMP-13) — 2
- OBSERVATION/MONITORING WELL (SEE NOTES 13 AND 14) (MW-12) — 6
- INDICATES REVISION (SEE LIST OF REVISIONS) — 1

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 13.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. REVISED FINAL COVER AND INTERMEDIATE CONTOURS.
8. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. — 8
3. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN FOR CONTAMINATED WATER RUN-ON/RUN-OFF BERM DESIGN INFORMATION.
4. THE SECTOR DEVELOPMENT SHOWN ON THIS DRAWING SHOWS THE GENERAL SEQUENCE OF FILLING OPERATIONS. THE LOCATION OF THE ALL-WEATHER ACCESS ROAD FROM THE LANDFILL HAUL ROAD TO THE ACTIVE AREA WILL BE DETERMINED DURING SITE OPERATIONS.
5. INTERMEDIATE COVER CONSISTS OF A 12-INCH THICK SOIL LAYER. REFER TO PART IV - SITE OPERATING PLAN FOR ADDITIONAL SOIL COVER REQUIREMENTS.
6. LANDFILL HAUL ROAD WILL BE SURFACED WITH CRUSHED STONE TO PROVIDE ALL-WEATHER ACCESS.
7. REFER TO APPENDIX IIIF-SURFACE WATER DRAINAGE PLAN FOR THE EROSION AND SEDIMENTATION CONTROL PLAN. DRAINAGE STRUCTURES ARE SHOWN AS THE SITE DEVELOPS. ADDITIONALLY BMPs WILL BE USED TO CONTROL EROSION AS NEEDED.
8. MAXIMUM SLOPE ON THE TEMPORARY ACCESS ROAD IS 10%.
9. REFER TO APPENDIX IIII FOR LANDFILL GAS MANAGEMENT PLAN.
10. UNCONTAMINATED STORMWATER THAT HAS NOT COME INTO CONTACT WITH WASTE WILL BE COLLECTED IN SUMPS AND PERIODICALLY REMOVED FROM EXCAVATED AREAS BY PUMPING TO PERIMETER DRAINAGE CHANNELS OR USED IN SITE OPERATIONS (E.G., DUST CONTROL, COMPACTING, ETC.).
11. TEMPORARY CHUTES AND SWALES WILL BE PLACED OVER THE INTERMEDIATE COVER AREA TO MINIMIZE EROSION AND HELP ESTABLISH VEGETATION FOR INTERMEDIATE COVER AREAS THAT WILL NOT RECEIVE WASTE OR FINAL COVER WITHIN 180 DAYS AFTER PLACEMENT (REFER TO APPENDIX IIIF-G FOR MORE INFORMATION). MULCH, HYDROSEEDING OR SIMILAR METHODS WILL BE USED TO ESTABLISH VEGETATION OVER THE INTERMEDIATE COVER AREAS. SWALE AND LETDOWN SPACING WILL MEET THE REQUIREMENTS OF THE EROSION CONTROL PLAN INCLUDED IN APPENDIX IIIF-G.
12. REFER TO APPENDIX IIIC-LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN, APPENDIX IIIC-D FOR LEACHATE STORAGE TANK DETAILS.
13. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL. — 4
14. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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- [x] FOR PERMITTING PURPOSES ONLY
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- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
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CAD: III-1-1-SECTION LOCS.DWG

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DESIGN BY: RJS
REVIEWED BY: JAE

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SECTOR DEVELOPMENT PLAN IV

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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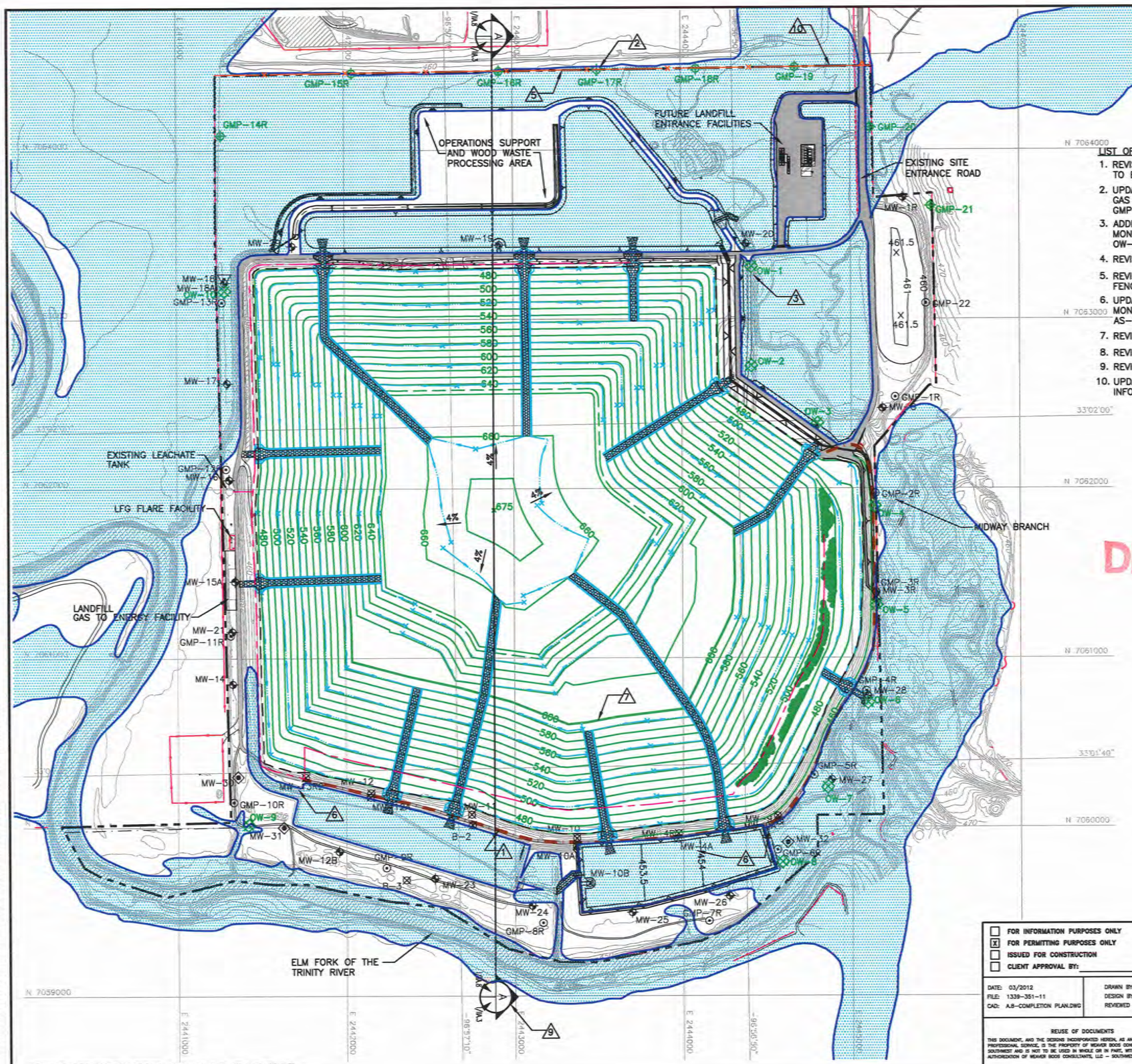

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF PROPOSED GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 6.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. REVISED FINAL COVER CONTOURS.
8. REVISED NOTE 4.
9. REVISED SECTION LOCATION.
10. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- (7) 600 — FINAL COVER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- (2) GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- (6) MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 6 AND 7)
- PROPOSED LEACHATE FORCEMAIN
- (5) PROPOSED FENCE
- EXISTING FENCE
- LANDSCAPE BENCH
- 100-YEAR FLOODPLAIN (SEE NOTE 5)
- PERIMETER ACCESS ROAD
- (1) EXISTING SLURRY WALL
- (3) OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 14)
- NOTE: (1) INDICATES REVISION (SEE LIST OF REVISIONS)

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. (10) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIF-SURFACE WATER DRAINAGE PLAN FOR DRAINAGE DESIGN INFORMATION.
4. (8) MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
5. FLOODPLAIN INFORMATION IS INCLUDED IN APPENDIX IIIO.
6. (4) LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
7. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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DATE: 03/2012
FILE: 1339-351-11
CAD: A.8-COMPLETION PLAN.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT LANDFILL COMPLETION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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DRAWING 1/IIA.8

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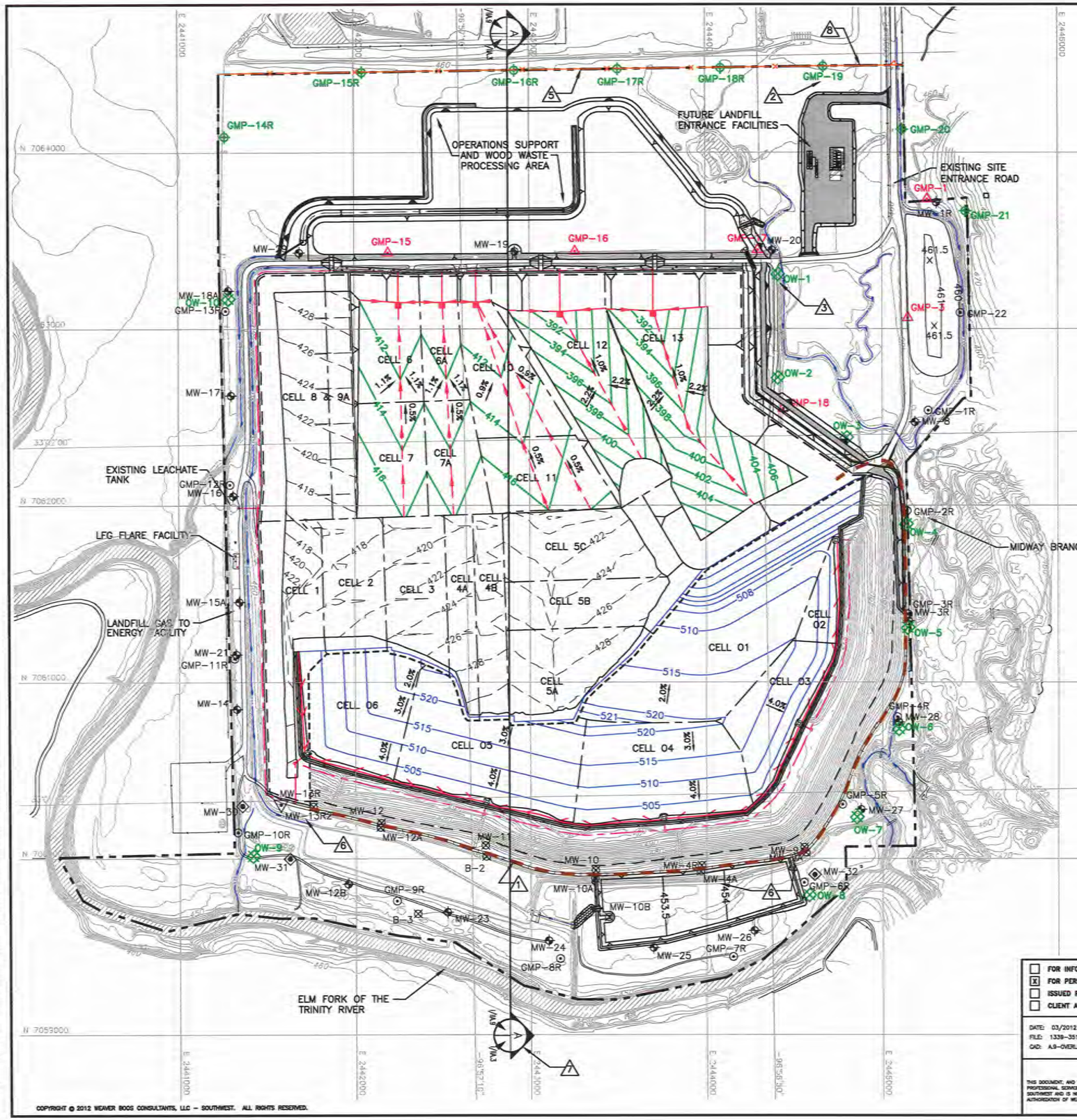

0 300 600
SCALE IN FEET

INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 13.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
7. UPDATED SECTION LOCATION.
8. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE (SEE NOTE 2)
- LIMIT OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — EXCAVATION CONTOUR
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 10)
- 515 — TOP OF OVERLINER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- OVERLINER LEACHATE LINE
- LEACHATE LINE
- LEACHATE COLLECTION SUMP
- LEACHATE RISER
- PROPOSED LEACHATE FORCEMAIN
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-13R — EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-8 — EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- (2) GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- (6) MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 13 AND 14)
- (3) OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 14)
- PERIMETER ACCESS ROAD
- (1) EXISTING SLURRY WALL
- (5) PROPOSED FENCE

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. (8) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (e.g., CHANNELS) ARE TYPICALLY 3H:1V.
4. REFER TO APPENDIX IIIC FOR LEACHATE FORCEMAIN STORAGE TANK INFORMATION.
5. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
6. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE IS A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPE WITH A MINIMUM 0.6% TO SUMPS.
7. LINER AND LEACHATE COLLECTION SYSTEM DETAILS ARE PRESENTED IN APPENDIX IIIA-A-LINER, OVERLINER AND FINAL COVER SYSTEM DETAILS.
8. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA DRAWINGS I/IIA.4 THROUGH I/IIA.7.
9. TYPICAL CROSS SECTION PROVIDED IN DRAWING I/IIA.3. ADDITIONAL SECTION INFORMATION IS PROVIDED IN APPENDIX IIIA-B – LANDFILL UNIT CROSS SECTIONS.
10. AS-BUILT TOP OF SUBTITLE D CLAY LINER CONTOURS WERE REPRODUCED FROM SLERS FROM 1997 THROUGH 2008.
11. REFER TO APPENDIX IIIF FOR DRAINAGE DESIGN INFORMATION.
12. REFER TO APPENDIX IIIB-OVERLINER POINT OF COMPLIANCE DEMONSTRATION, FOR THE OVERLINER DESIGN FOR THE PRE-SUBTITLE D AREA.
13. (4) LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
14. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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DATE: 03/2012
FILE: 1339-351-11
CAD: A.9-OVERLINER.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT EXCAVATION/OVERLINER PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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DRAWING I/IIA.9

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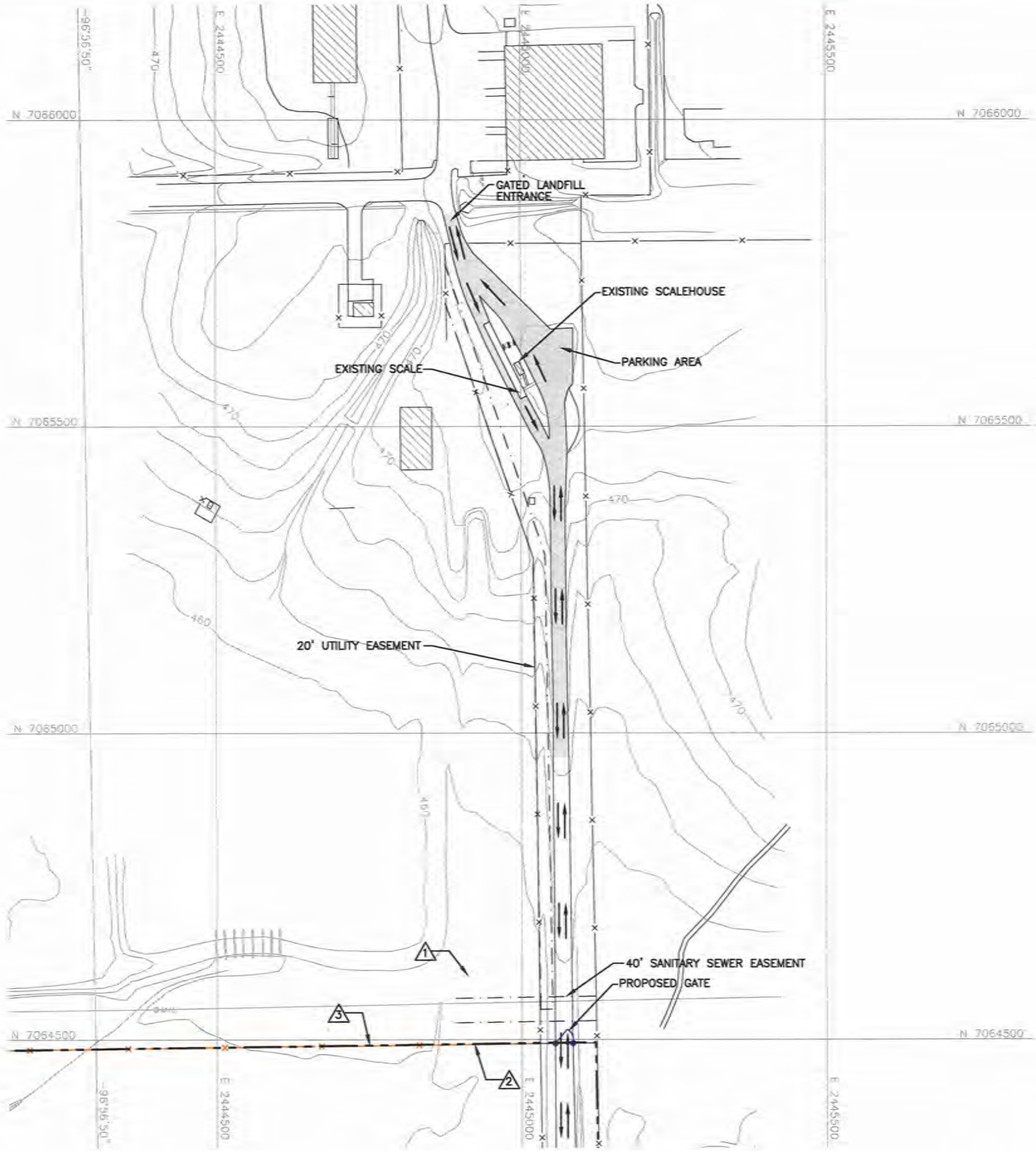

N

0 100 200
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- -96°56'50" — GEODETIC COORDINATE SYSTEM
- 470 — EXISTING CONTOUR
- EXISTING FENCE
- PROPOSED FENCE (SEE NOTE 3)
- 2 — PROPOSED GATE (SEE NOTE 4)
- VEHICLE TRAFFIC DIRECTION
- ASPHALT PAVED AREA
- EASEMENT
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. (3)
3. THE NORTHERN PERIMETER FENCE WILL BE INSTALLED WITHIN SIX MONTHS AFTER TCEQ PERMIT NO. MSW-1312B IS ISSUED.
4. THE PROPOSED GATE WILL BE INSTALLED PRIOR TO CORPORATE DRIVE BEING COMPLETED NORTH OF THE PERMIT BOUNDARY.

LIST OF REVISIONS:

1. REMOVED EASEMENT.
2. REVISED PROPOSED FENCE LOCATION.
3. REVISED PERMIT BOUNDARY INFORMATION.

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- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: A.10-ENTRANCE FACILITY.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT EXISTING SITE ENTRANCE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

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GRIFFITH, IN
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SPRINGFIELD, IL
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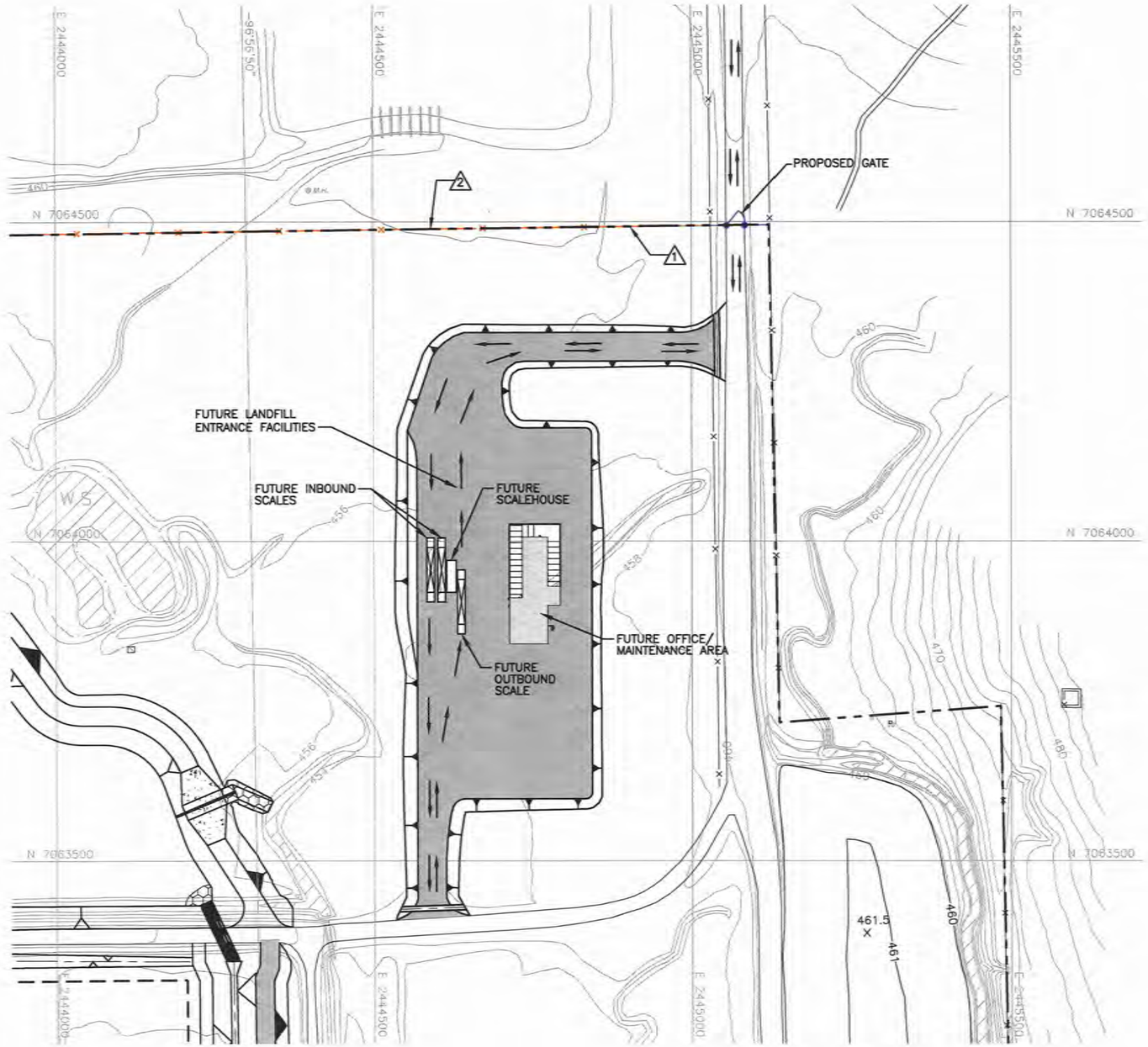
O:\1339\351\EXPANSION 2009\PARTS 1-11\A.10-EXISTING ENTRANCE FACILITY PLAN.dwg, rmorris, 1:2



0 100 200
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- -96°56'50" — GEODETIC COORDINATE SYSTEM
- 470 — EXISTING CONTOUR
- EXISTING FENCE
- PROPOSED FENCE
- 1 — PROPOSED GATE
- VEHICLE TRAFFIC DIRECTION
- GABIONS
- ASPHALT/GRAVEL
- 600 — REGRADED BUFFER ZONE AREA
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. CONSTRUCTION OF THE NEW ENTRANCE FACILITIES WILL COMPLETED PRIOR TO CONSTRUCTION OF CORPORATE DRIVE.

LIST OF REVISIONS:

1. REVISED PROPOSED FENCE LOCATION.
2. UPDATED PERMIT BOUNDARY INFORMATION.

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DATE: 03/2012
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REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FUTURE SITE ENTRANCE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F–3727

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DRAWING I/IIA.11

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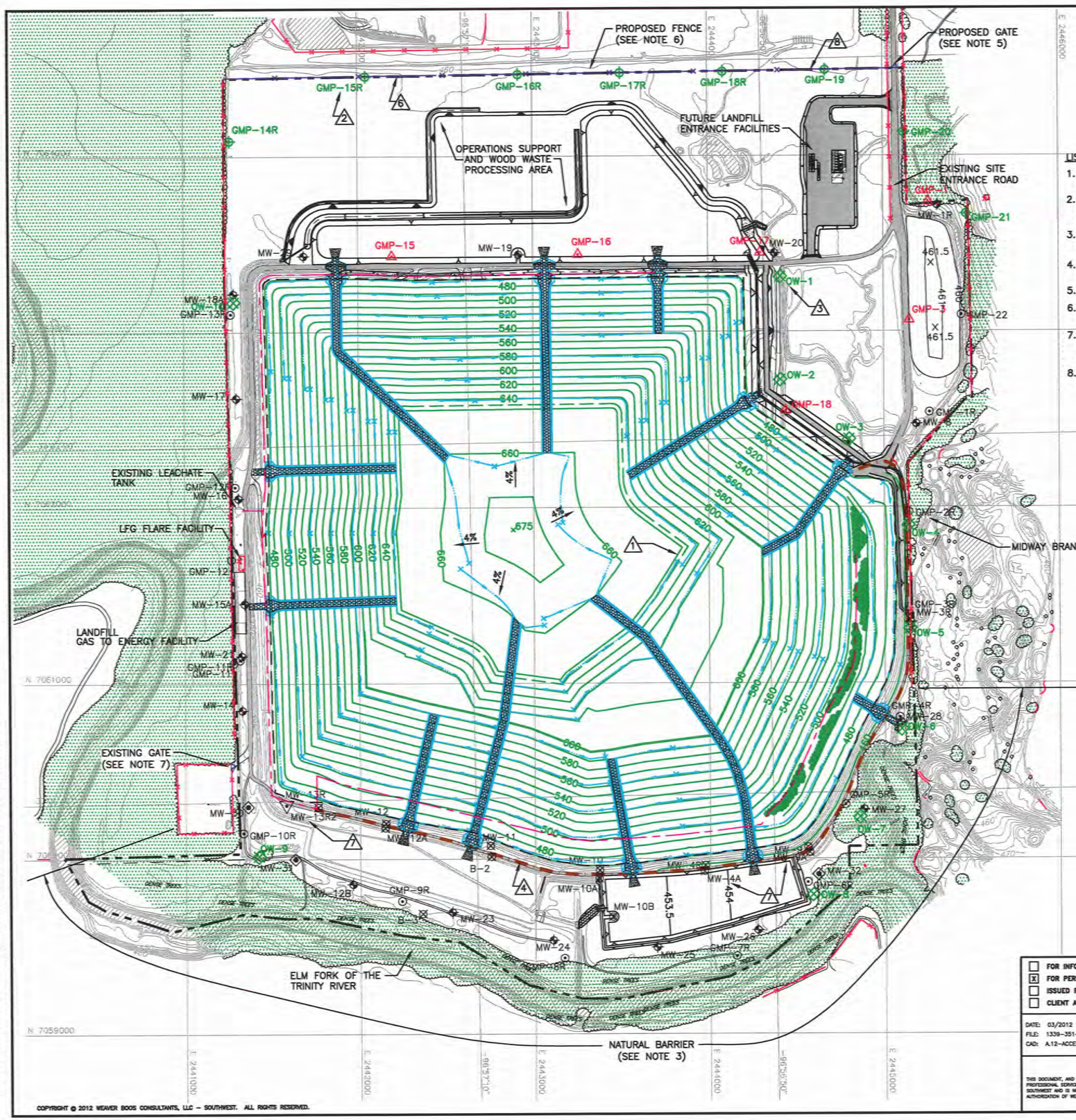

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED SLURRY WALL TO EXISTING LOCATION.
5. REVISED NOTE 8.
6. REVISED PROPOSED FENCE LOCATION.
7. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
8. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 600 — FINAL COVER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — GROUNDWATER MONITORING WELL
- 7 MW-13R — EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-8 — EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- 2 GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- 3 OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 9)
- 7 MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 8 AND 9)
- EXISTING FENCE
- PROPOSED FENCE (SEE NOTE 6)
- PROPOSED GATE (SEE NOTE 5)
- PROPOSED LEACHATE FORCEMAIN
- LANDSCAPE BENCH
- PERIMETER ACCESS ROAD
- EXISTING TREES
- 4 EXISTING SLURRY WALL (SEE NOTE 10)

DRAFT

NOTES: 1 INDICATES REVISION (SEE LIST OF REVISIONS)

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. 8 PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. ACCESS TO THE SITE WILL BE CONTROLLED BY PERIMETER FENCING (MINIMUM 4-FEET HIGH, 3-STRAND BARBED WIRE FENCE), A GATED ENTRANCE, AND NATURAL BARRIERS (e.g., DENSE FOLIAGE, VEGETATION, AND THE ELM FORK OF THE TRINITY RIVER). ADDITIONALLY IN AREAS OF NATURAL BARRIERS (THE SOUTHERN PORTION OF THE SITE), THE ACCESS CONTROL PLAN IS PROVIDED TO PREVENT THE ENTRY OF LIVESTOCK, TO PROTECT THE PUBLIC FROM EXPOSURE TO POTENTIAL HEALTH AND SAFETY HAZARDS, AND TO DISCOURAGE UNAUTHORIZED ENTRY OR UNCONTROLLED DISPOSAL OF SOLID WASTE OR HAZARDOUS MATERIALS. NO TRESPASSING SIGNS WILL BE ADDED TO DISCOURAGE UNAUTHORIZED ENTRY OR UNCONTROLLED DISPOSAL OF SOLID WASTE OR HAZARDOUS MATERIALS. SIGNS WILL BE PLACED APPROXIMATELY 300 FEET APART ALONG THE SOUTHERN PORTION OF THE SITE.
4. ALL THE GROUNDWATER MONITORING WELLS AND LFG MONITORING PROBES ARE LOCATED WITHIN THE PERIMETER FENCE.
5. A NEW GATE WILL BE INSTALLED ONCE CORPORATE DRIVE IS COMPLETED NORTH OF THE PERMIT BOUNDARY.
6. THE NORTHERN PERIMETER FENCE WILL BE INSTALLED WITHIN SIX MONTHS AFTER TCEQ PERMIT NO. MSW-1312B IS ISSUED.
7. THIS GATE IS NOT A PUBLIC SITE ACCESS POINT. THIS GATE IS ONLY USED BY THE OWNER OF THE NATURAL GAS DRILL PAD SITE LOCATED ADJACENT TO THE PERMIT BOUNDARY. THIS GATE REMAINS CLOSED AND LOCKED EXCEPT WHEN PERMISSION TO ACCESS THE PAD SITE IS GRANTED BY THE CITY OF FARMERS BRANCH OR THE LANDFILL MANAGER.
8. 5 LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE PRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
9. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
3	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
ACCESS CONTROL PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

APPENDIX I/IIC

LOCATION RESTRICTION DEMONSTRATIONS

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised June 2014

Revised April 2016

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8-6-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

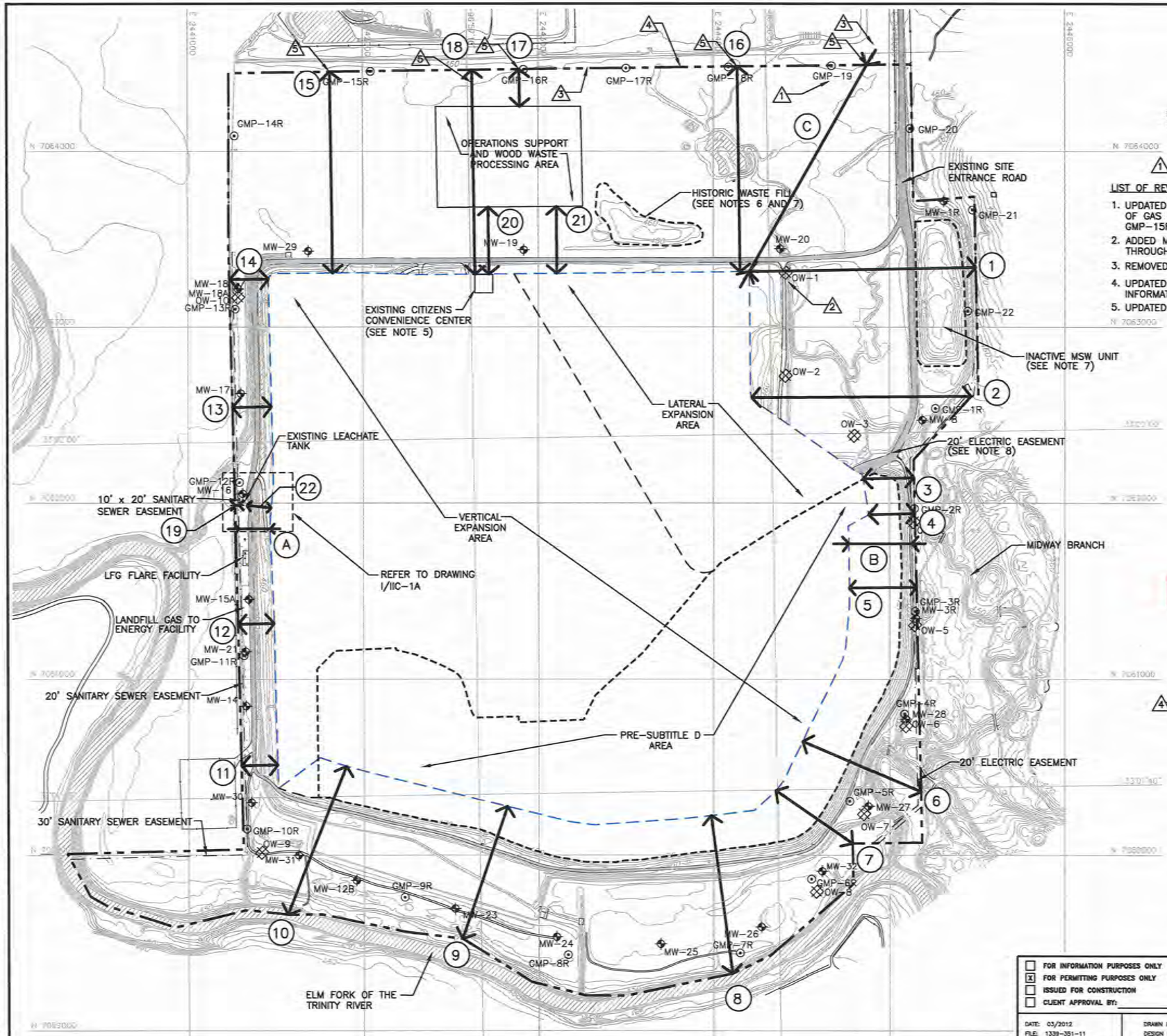
WBC Project No. 1339-351-11-02-6A

This document is intended for permitting purposes only.

The existing leachate tank is located next to the City of Lewisville sewer line to facilitate the transfer of leachate from the storage tank to the sanitary sewer. This leachate storage configuration maximizes the distance between the east side of the tank and the limits of waste. As shown on Figure I/IIC-1A, a buffer zone of 139 feet is provided between the limits of waste and the storage tank to facilitate site access and access for emergency vehicles. An all-weather perimeter road is located within this area. It is proposed that this area be authorized as an acceptable alternative buffer zone configuration, consistent with §330.543(b)(1).

~~Five~~ As shown on Drawing I/IIA.1, there are three easements ~~are~~ located within the permit boundary~~ at the site~~. A 20 to 30-foot-wide sanitary sewer easement is located along the western side of the permit boundary, a 10-foot by 20-foot sanitary sewer easement is located along the western side of the permit boundary adjacent to the 20 to 30-foot-wide sanitary sewer easement, and a 20-foot-wide electrical easement is located along the eastern side of the permit boundary~~, and a 40-foot-wide right-of-way dedication and a 40-foot-wide sanitary sewer easement cross the permit boundary on the north side of the site~~. The 20-foot-wide electrical easement ~~encroaches on the limit of waste; however, this~~ is for an electrical line that currently serves the existing maintenance area and will be abandoned prior to the development of this area. At their closest point for the remaining four easements, the easement boundaries are a minimum of 180 feet away from the limit of waste, providing the required separation between the easement and the waste footprint. In addition, all utility line and pipeline easements will be clearly marked in accordance with the Site Operating Plan.

Given the above, the site is in compliance with the easements and buffer zone location restrictions.



0 300 600
SCALE IN FEET

△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED MONITOR WELLS OW-1 THROUGH OW-10.
3. REMOVED EASEMENTS.
4. UPDATED PERMIT BOUNDARY INFORMATION.
5. UPDATED BUFFER ZONE DISTANCES.

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- EXISTING PERMITTED PRE-SUBTITLE D LIMIT OF WASTE (TCEQ PERMIT NO. 1312A)
- EXISTING PERMITTED SUBTITLE D LIMIT OF WASTE (TCEQ PERMIT NO. 1312A)
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE (SEE NOTE 4)
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- EASEMENT
- △3 MW-8 — EXISTING GROUNDWATER MONITORING WELL
- △1 GMP-13 — EXISTING LANDFILL GAS MONITORING PROBE
- △2 OW-1 — WOODBINE MONITOR WELL

DRAFT

LANDFILL BUFFER ZONE INFORMATION		
LOCATION	BUFFER ZONE BETWEEN PERMIT BOUNDARY AND EXISTING PERMITTED PRE-SUBTITLE D/ SUBTITLE D LIMIT OF WASTE	BUFFER ZONE BETWEEN PERMIT BOUNDARY AND NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
1	NA[1]	1289 FEET
2	NA[1]	1247 FEET
3	126 FEET	288 FEET
4	86 FEET	259 FEET
5	88 FEET	379 FEET
6	441 FEET	731 FEET
7	243 FEET	531 FEET
8	708 FEET	908 FEET
9	615 FEET	798 FEET
10	708 FEET	907 FEET
11	207 FEET	207 FEET
12	207 FEET	207 FEET
13	223 FEET	223 FEET
14	220 FEET	220 FEET
15	1146 FEET	1146 FEET
16	NA[1]	1168 FEET
PROCESSING/DISPOSAL UNIT BUFFER ZONE INFORMATION		
17	FUTURE WOOD WASTE PROCESSING AREA	212 FEET
18	CITIZENS CONVENIENCE CENTER	1163 FEET
19	EXISTING LEACHATE STORAGE TANK	25 FEET
20	FUTURE WOOD WASTE PROCESSING AREA/ EXISTING CITIZENS CONVENIENCE CENTER	381 FEET
21	FUTURE WOOD WASTE PROCESSING AREA/ NEWLY PERMITTED AIRSPACE LIMIT OF WASTE	381 FEET
22	EXISTING LEACHATE TANK/ NEWLY PERMITTED AIRSPACE LIMIT OF WASTE	139 FEET
LOCATION	BUFFER ZONE BETWEEN EASEMENT BOUNDARY AND EXISTING PERMITTED PRE-SUBTITLE D/ SUBTITLE D LIMIT OF WASTE	BUFFER ZONE BETWEEN EASEMENT BOUNDARY AND NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
A	175 FEET	175 FEET
B	63 FEET	357 FEET
C	1354 FEET	1354 FEET

[1] LATERAL EXPANSION AREA ONLY.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. △4 PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. AS SHOWN IN APPENDIX I/IIC, THE BUFFER ZONES VARY AROUND THE PERIMETER OF THE SITE, BUT IN NO CASE ARE THEY LESS THAN 50-FEET FOR EXISTING WASTE. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND THE LATERAL EXPANSION IS AT LEAST 125-FEET. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND NEWLY PERMITTED (PERMIT NO. 1312B) WASTE DISPOSAL AIRSPACE IS AT LEAST 125-FEET.
4. THE NEWLY PERMITTED AIRSPACE LIMIT OF WASTE REFLECTS THE LATERAL EXPANSION AREA AND THE LIMIT OF WASTE THAT IS ASSOCIATED WITH THE VERTICAL EXPANSION AREA FOR MSW PERMIT NO. 1312B.
5. THE CITIZENS CONVENIENCE CENTER WILL BE RELOCATED TO THE OPERATIONS SUPPORT AND WOOD WASTE PROCESSING AREA PRIOR TO THE DEVELOPMENT OF CELL 10.
6. THE HISTORIC WASTE FILL AREA LIMITS ARE APPROXIMATE. THE RECORD FOR TCEQ PERMIT NO. MSW-946 INDICATES WASTE WAS PLACED PRIOR TO THE ISSUANCE OF THE PERMIT IN 1979. HOWEVER, THERE IS NO DRAWING THAT SHOWS THE ACTUAL LIMITS OF WASTE. THE LIMITS WERE ESTABLISHED BY VISUAL OBSERVATIONS OF THE AREA.
7. WASTE IN THE INACTIVE MSW UNIT AND THE HISTORICAL WASTE FILL AREA WILL BE RELOCATED PRIOR TO THE DEVELOPMENT OF THE NORTH DETENTION POND.
8. THIS 20' ELECTRICAL EASEMENT PROVIDES ELECTRICITY TO THE TEMPORARY MAINTENANCE AREA. THE EASEMENT WILL BE ABANDONED PRIOR TO DEVELOPMENT IN THIS AREA.

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: I/IIC-1 BUFFER ZONE.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT BUFFER ZONE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING I/IIC-1

SHEET I/IIC-4

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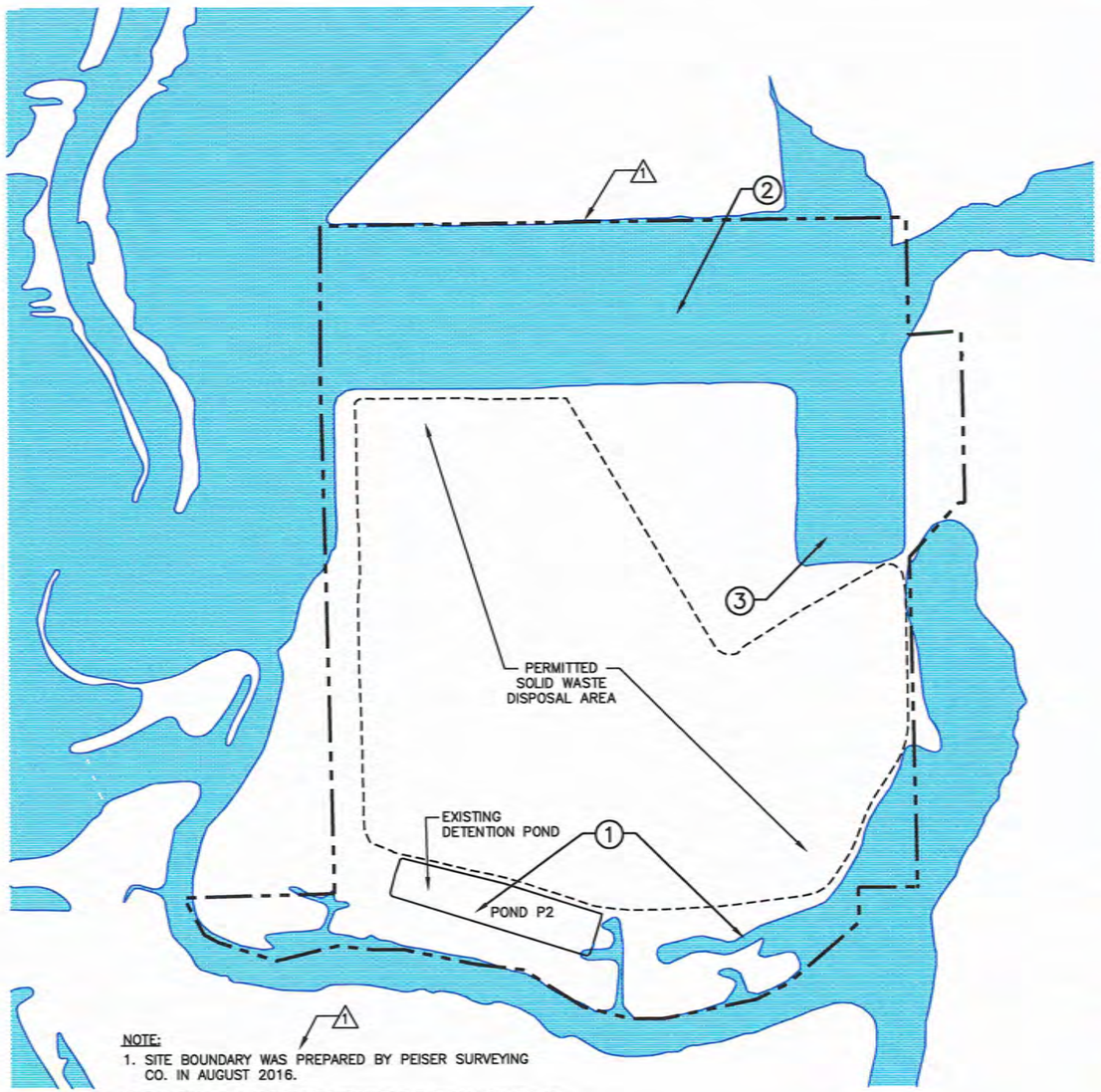
O:\1339\351\EXPANSION 2009\PARTS I-II\I-IIC\I-IIC-1 BUFFER ZONE PLAN.dwg, jwilson, 1:2

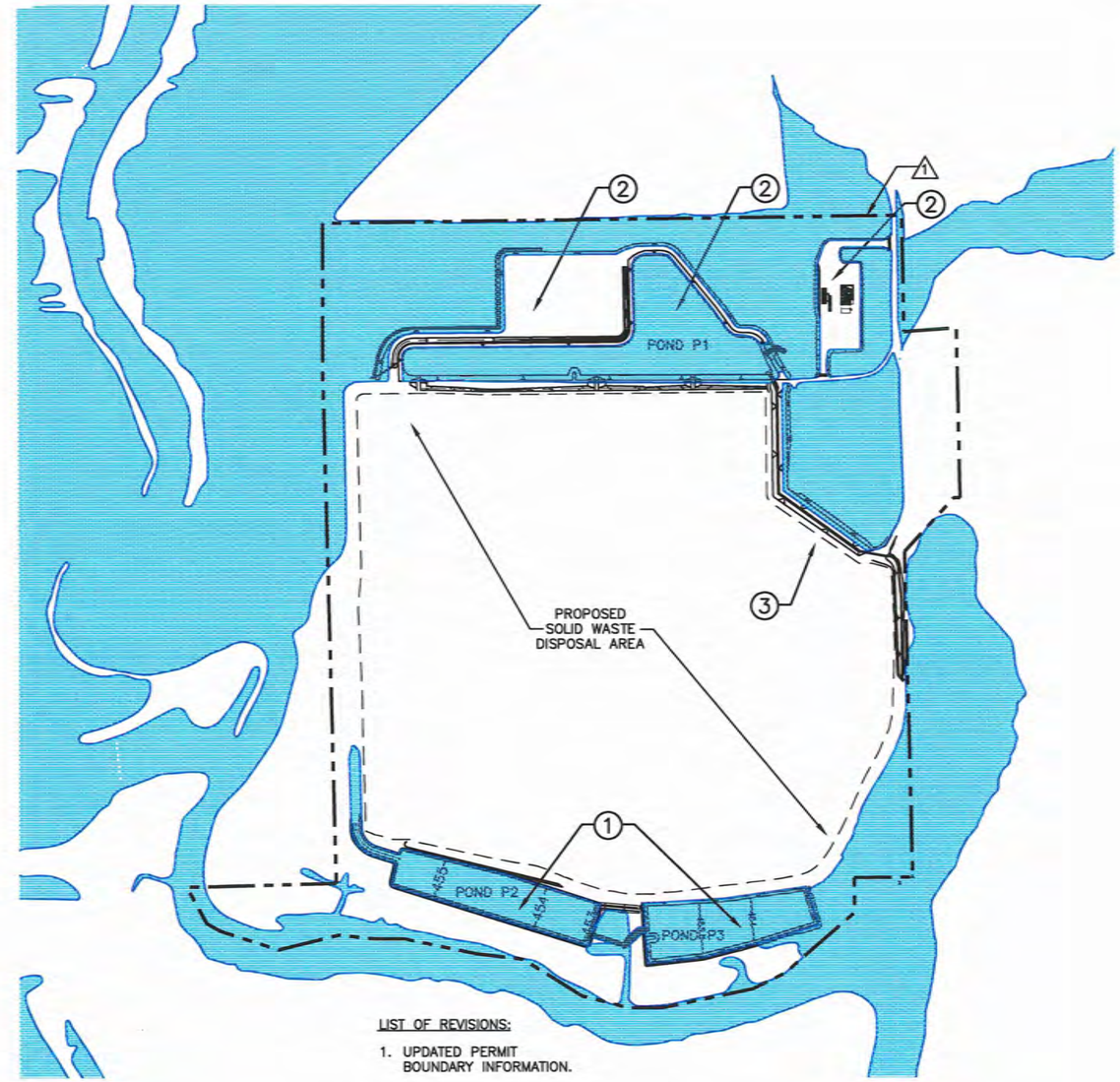
EXISTING PERMITTED CONDITION



NOTE:

1. SITE BOUNDARY WAS PREPARED BY PEISER SURVEYING CO. IN AUGUST 2016.
2. FLOODPLAIN REPRODUCED FROM FIRM NO. 48121C0565 G, EFFECTIVE DATE APRIL 18, 2011.

PROPOSED CONDITION



LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

CHANGES FROM EXISTING PERMITTED TO THE PROPOSED CONDITION

(1) ADDITION OF DETENTION POND, POND P3. THE SOUTHWEST POND (POND P2) WAS CONSTRUCTED AS AUTHORIZED BY THE CLOMR APPLICATION (CASE NO. 02-06-1950R APPROVED BY FEMA ON NOVEMBER 18, 2002 FOR THE EXISTING PERMITTED SITE). THE SOUTHEAST POND (POND P3) WILL FUNCTION SIMILAR TO THE PREVIOUSLY-PERMITTED SOUTHWEST POND.

(2) NORTHERN AREA DEVELOPMENT. TO ALLOW FOR THE DEVELOPMENT OF FACILITIES TO SUPPORT THE OPERATION OF THE LANDFILL, THIS PROJECT INCLUDES THE REMOVAL OF TWO AREAS FROM THE FLOODPLAIN IN THE NORTHERN PORTION OF THE SITE. THESE TWO AREAS WILL BE USED FOR (1) OFFICES AND MAINTENANCE FACILITIES, INCLUDING ACCESS ROADS AND (2) A 16-ACRE AREA THAT WILL BE USED TO SUPPORT OPERATIONS, SUCH AS EQUIPMENT STORAGE, A CITIZEN CONVENIENCE CENTER, ENTRANCE FACILITIES, ACCESS ROADS, AND/OR A WOOD WASTE PROCESSING AREA.

(3) REMOVAL OF NORTHEAST AREA FROM FLOODPLAIN TO ALLOW FOR THE CONTINUED DEVELOPMENT OF THE LANDFILL. THIS AREA IS PROPOSED TO BE REMOVED FROM THE INEFFECTIVE FLOW AREA OF THE 100-YEAR FLOODPLAIN.

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N

0 500 1000
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- 100-YEAR FLOODPLAIN
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

SHEET I/IIC-8

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: C-2-FLOODPLAIN COMP.DWG

DRAWN BY: VRS
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FLOODPLAIN CONDITION COMPARISON

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

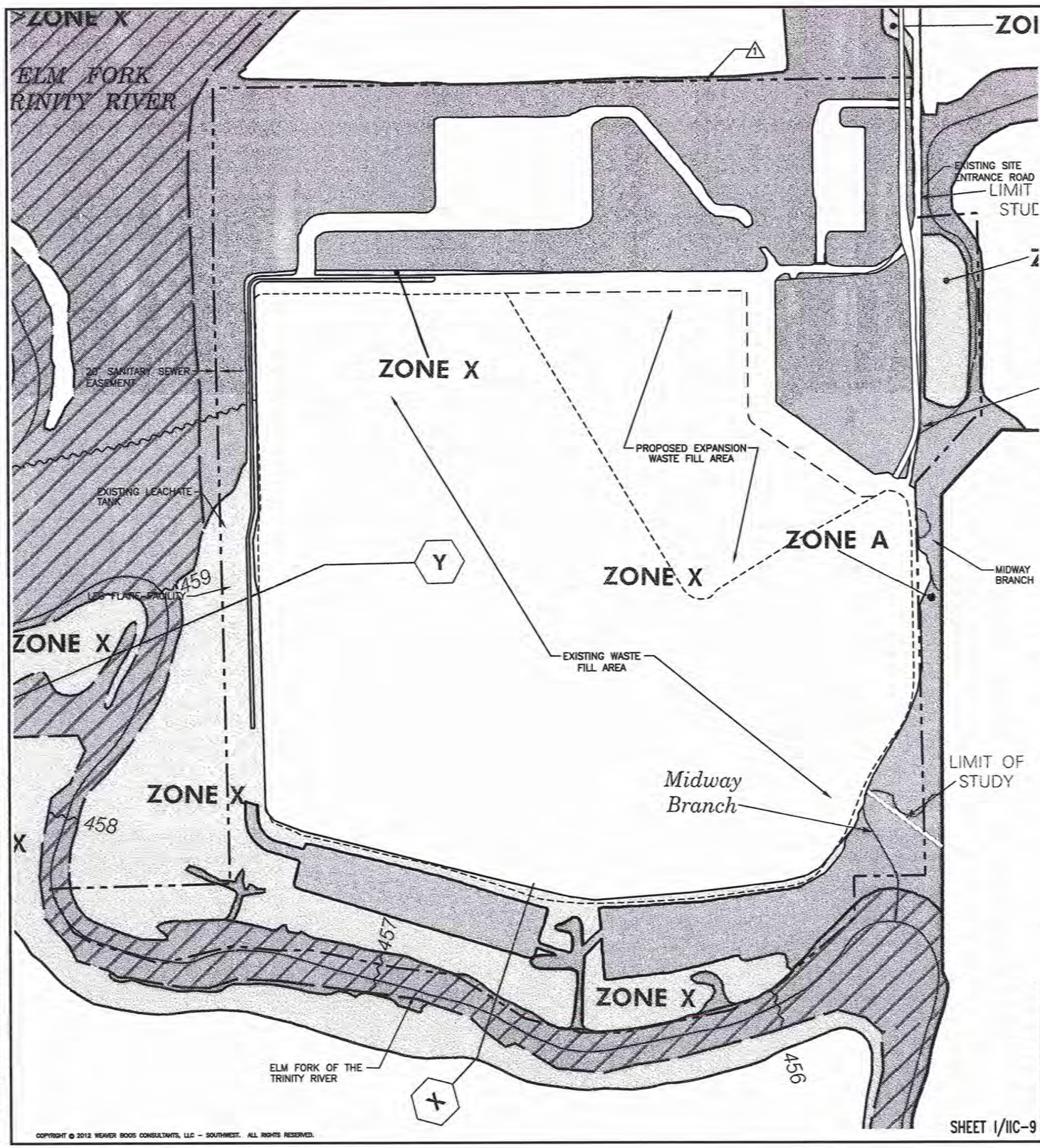
CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

DRAWING I/IIC-2

O:\1339\351\EXPANSION 2009\PARTS I-II\I-IIC\I-IIC-2-FLOODPLAIN COMPARISON-NEW.dwg, jwilson, 1:2



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

N

0 300 600
SCALE IN FEET

LEGEND

PERMIT BOUNDARY

PROPOSED LIMIT OF WASTE

AUTHORIZED LIMIT OF WASTE

1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. PORTIONS OF FLOODPLAIN AND FLOODWAY BOUNDARIES WERE REPRODUCED FROM FEMA FIRM NUMBER 48121C0565 F, EFFECTIVE DATE AUGUST 23, 2001.
2. PROPOSED PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.

1

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: I-IIC-3-REVISED FIRM.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
REVISED FLOOD INSURANCE RATE MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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DRAWING I/IIC-3

SHEET I/IIC-9

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O:\1339\351\EXPANSION 2009\PARTS I-IV\I-IIC\I-IIC-3-REVISED FIRM.dwg, jwilson, 1:2

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
SITE DEVELOPMENT PLAN NARRATIVE

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 98336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, TX 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B

This document is intended for permitting purposes only.

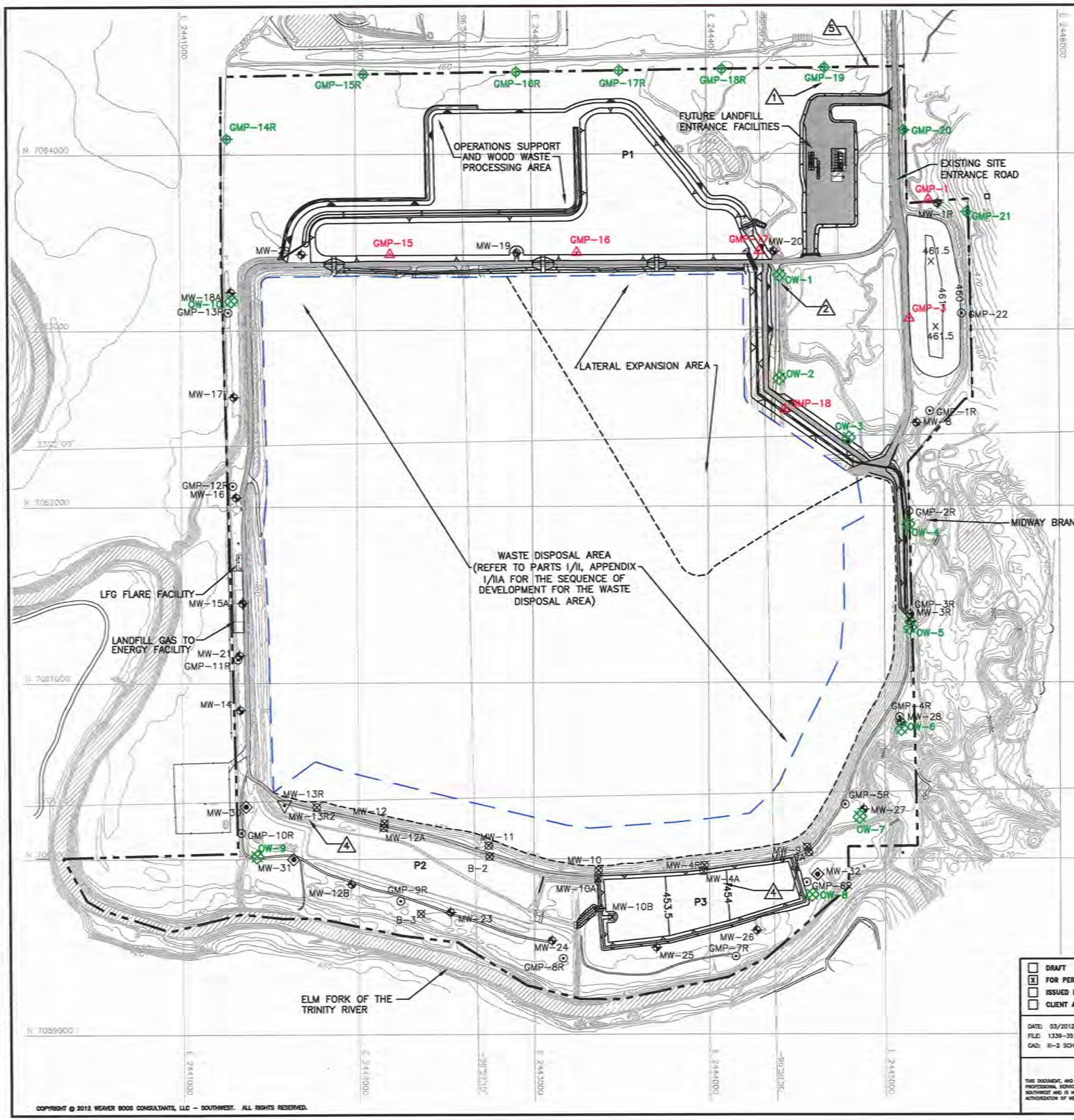
1 INTRODUCTION (§330.63(a))

This Site Development Plan (SDP) for the Camelot Landfill has been prepared consistent with the MSW regulations within Title 30 TAC Chapter 330, including §330.63. This SDP provides the design details needed to provide for the safeguarding of the health, welfare, and physical property of the people and the environment through consideration of geology, soil conditions, drainage, land use, zoning, and adequacy of access roads and highways.

This section addresses §330.63. Additional specific regulatory cites addressed by each section of Part III are listed in the heading.

The purpose of this Major Permit Amendment is to secure authorization for a vertical and horizontal expansion of the Camelot Landfill. The existing active 198.3-acre waste disposal area will be expanded by 38.5 acres. The existing permit boundary, surveyed in November 2010 as 350.77 acres, will be expanded by ~~118.85~~ 108.99 acres to ~~469.62~~ 459.76 acres. The maximum permitted final cover elevation will be increased from 523 ft-msl to ~~725~~ 675 ft-msl and the resulting capacity increase is ~~37,700,000~~ 30,300,000 cy. Other site improvements include the following.

- Expanded stormwater management system.
- Relocation of waste in the historic fill area associated with TCEQ Permit No. MSW-946.
- Relocation of waste from the 5.1-acre inactive MSW unit in the northeast portion of the site to create an additional buffer zone (greenfield/open space) area.
- ~~Installation of a slurry wall around the southern and eastern portion of the site as part of the containment system design.~~
- Enhanced landfill gas and groundwater monitoring systems.
- ~~Installation of a leachate removal system in the pre-Subtitle D area.~~



0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
3. REVISED NOTE 5.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR (SEE NOTE 1)
- 600 — REGRADED BUFFER ZONE AREA
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-13R — EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-8 — EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 5 AND 6)
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PROPOSED PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN APPENDIX I/IIA.
4. APPENDIX IIIA INCLUDES INFORMATION ON THE LANDFILL DESIGN.
5. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
6. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: III-2 SCHEMATICPLAN.DWG

DRAWN BY: JDW
DESIGN BY: JLG
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SCHEMATIC SITE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
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COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE III-2

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O:\1339\351\EXPANSION 2009\PART III-SDP\III-2 SCHEMATIC.dwg, jwilson, 1:2

3.2 Site Drainage Patterns

The ~~469.62~~ 459.76-acre Camelot Landfill permit boundary is located approximately 2 miles south of Lake Lewisville. The Elm Fork Trinity River forms the southern boundary of the site. Midway Branch, a tributary of the Elm Fork, flows along the east side of the permit boundary.

The local drainage basin, which includes the permit boundary and offsite areas discharging onto or directly receiving flow from the permit boundary, is 2.82 square miles (0.17 percent of the Elm Fork's drainage basin upstream of the site). The majority of the area within the permit boundary discharges south or west into the Elm Fork. A smaller portion of the area within the permit boundary drains east into Midway Branch and ultimately discharges into the Elm Fork approximately 200 feet southeast of the permit boundary. As discussed in Section 4 of Appendix IIIF – Surface Water Drainage Plan, the existing drainage conditions at the permit boundary, will not be adversely altered by the proposed development.

For the proposed expansion, the final cover system will include erosion control structures to effectively minimize erosion of final cover soils. The proposed drainage system also includes a perimeter channel system and detention ponds that will convey stormwater collected from the landfill area to the western portion of the site. The perimeter channels have been designed to carry the 25-year storm event to the detention ponds. The detention ponds have been designed to release the collected stormwater at a rate that is consistent with the existing permitted drainage conditions.

The site is designed to prevent discharge of pollutants into waters of the state or waters of the United States, as defined by the Texas Water Code and the Federal Clean Water Act, respectively. The Itasca Landfill is subject to TCEQ's storm water permit requirements. A copy of the TPDES permit is included in Appendix I/IIG. Surface water monitoring will be conducted consistent with TPDES requirements. Given the above, the applicant understands and is in full compliance with TPDES under the Clean Water Act, Section 402 as amended.

3.3 Perimeter Drainage System

The stormwater controls for the landfill have been designed consistent with the TCEQ regulations for Type I MSW landfills. The runon/runoff stormwater controls have been designed for a 25-year storm event. These include drainage controls for the final cover, perimeter drainage channels, culverts, and detention ponds. Details for the perimeter drainage system and associated calculations are included in Part III, Appendix IIIF-B.

The drainage system is detailed in Part III, Drawing IIIF.1 – Drainage Structure Plan. Drainage from the landfill itself is directed through a system of swales, chutes, and perimeter channels to the stormwater detention ponds. The detention ponds and pond outlet structures are detailed in Part III, Appendix IIIF – Surface Water Drainage Plan.

perimeter of the overliner area, as well as to sumps located in the Subtitle D area. The overliner system is described below, with layers listed from top to bottom.

Table III-2
Overliner System Components

Standard Subtitle D Composite Liner System
24-inch-thick Protective Cover Layer
Drainage Geocomposite Leachate Collection Layer
Textured 40-mil LLDPE Geomembrane
Geosynthetic Clay Liner (GCL)

The proposed overliner system design and details are also summarized in Appendix IIIA – Landfill Unit Design Information. The Point of Compliance (POC) Demonstration is included in Appendix IIIB. The purpose of the POC demonstration is to demonstrate that the proposed waste containment system design will meet the waste containment system requirements specified in §330.331(a) by showing that the predicted concentrations of selected leachate chemical constituents do not exceed maximum contaminant levels (as listed in Table 2 in §330.331(a)(1)) in the uppermost aquifer at the POC. The waste containment system design includes the overliner system, ~~and~~ a slurry wall that ~~will be~~ was constructed around the perimeter of the pre-Subtitle D area as shown on Drawing A.16 in Appendix IIIA-A, and a leachate removal system that is discussed in Section 4.2 of Appendix IIIA.

4.3.3 Leachate Collection System

An LCS has been designed to remove leachate from the Subtitle D areas of the landfill (including the overliner). The LCS layout is shown on Drawing A.1 – Excavation Plan in Appendix IIIA-A. Design of the proposed LCS and a demonstration of the adequacy of the existing LCS is discussed in Part III, Appendix IIIC – Leachate and Contaminated Water Management Plan. LCS details are provided in Part III, Appendix IIIA – Landfill Unit Design Information. Information regarding materials and construction quality assurance are included in Part III, Appendix IIID – Liner Quality Control Plan (Section 3.6).

4.3.4 Final Cover System

The final cover system includes a composite final cover system and an existing alternative soil final cover system. The final cover systems will provide a low maintenance cover, protect against erosion, reduce rainfall percolation through the cover system, and subsequently minimize leachate generation with the landfill. As depicted on Parts I/II, Drawing I/IIA.8 – Landfill Completion Plan, a maximum of 4 percent topslopes and 4H:1V sideslopes are provided to minimize erosion and facilitate drainage of the landfill. Final cover will be constructed over the existing pre-Subtitle D and Subtitle D waste disposal areas. The final cover system is described in the following table with layers listed from top to bottom.

on a generation rate of five pounds per capita per day and applied to situations involving solid waste not necessarily generated by individuals." Based on this definition, the population equivalent for the average waste stream over the active life of the site (~~29.3~~ 25.8 years – refer to Appendix IIIN) was calculated as follows:

$$\frac{(\cancel{1{,}073{,}358}\,960{,}388^{1}\text{ tons/year}) \times (2{,}000\text{ pounds/ton})}{(5\text{ pounds/person/day}) \times (365\text{ days/year})} = \cancel{1{,}176{,}283}\ 1{,}052{,}480\text{ persons}$$

[1] Average yearly waste inflow (based on a 286-day operating year) was calculated using the average daily waste inflow rate over the life of the site (~~3,753~~ 3,358 tons/day x 286 days/year = ~~1,073,358~~ 960,388 tons/year). Refer to Appendix IIIN for more information.

The major classifications of solid waste to be accepted by this facility for disposal include residential and commercial MSW. Such waste consists of household wastes, yard waste, commercial waste, construction-demolition waste, and special wastes as authorized by the TCEQ. Consistent with Title 30 TAC §330.15, the site will not accept liquid wastes, regulated hazardous wastes, prohibited PCBs, infectious medical wastes, or other wastes prohibited by TCEQ regulations. Waste classifications are provided in Parts I/II, Section 2.1.2 – Waste Acceptance Plan.

4.5 Typical Unit Cross-Sections (§§330.63(d)(4)(E) and (F))

Typical unit cross-sections are included in Appendix IIIA-B. The cross-sections are developed consistent with the requirements of §330.63(d)(4)(E) and (F).

4.6 Waste Relocation Plan

Existing waste within the inactive MSW unit located in the northeast portion of the site and the historical waste fill area located north of the current fill area will be relocated to the main disposal area within the Camelot Landfill. The general sequence of development of the landfill is shown on Parts I/II, Appendix I/IIA, Drawing I/IIA.4 through Drawing I/IIA.7. As shown on Drawing I/IIA.5, the waste relocation will occur for the historic waste fill area within six months of issuance of Permit MSW-1312B and waste in the inactive waste unit will be relocated prior to the development of Cell 12. The waste removal procedure is discussed in Part IV – SOP, Section 4.25.

As discussed in Parts I/II, Section 3.1, the limits of the historic waste fill associated with the 102.58-acre tract is shown on Figure I/II-3.1 in Parts I/II. The estimated limits is based on site topography and visual observations made during a July 2011 site visit. There are no drawings in the record for this permit that show the historic waste fill area. There is also no record that final cover was placed on this area; however, the historic waste fill area does include a soil cover that is vegetated. After the waste from this area is relocated, compacted soil backfill will be placed, if needed, to achieve the final detention pond grades shown on the drawings in Appendix IIIF.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIA
LANDFILL UNIT DESIGN INFORMATION

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised April 2014
Revised October 2014

Revised August 2016

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8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES

Prepared by

Weaver Boos Consultants, LLC–Southwest
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WBC Project No. 1339-351-11-02-6B.1

This document is intended for permitting purposes only.

CONTENTS (Continued)

APPENDIX IIIA-B
Landfill Unit Cross Sections
DRAWING B.1 – Typical Section Site Plan
DRAWING B.2 – Landfill Completion Plan
DRAWING B.3 – Excavation/Overliner Plan
DRAWING B.4 – Typical Section A
DRAWING B.5 – Typical Section B
DRAWING B.6 – Typical Section C
DRAWING B.7 – Typical Section D
DRAWING B.8 – Typical Section E
DRAWING B.9 – Typical Section F
DRAWING B.10 – Typical Section G
DRAWING B.11 – Typical Section H

~~**APPENDIX IIIA-C**~~
~~Construction Quality Assurance Plan for the Slurry Wall~~

Table IIIA-2
Existing Liner System Components

Cells 1, 2, 4B, and 5	Cells 3, 4A, 8, and 9A
24-inch-thick Soil Protective Cover	12-inch-thick Soil Protective Cover plus 12-inch-thick Tire Chip Layer
Drainage Geocomposite Leachate Collection System Layer	Drainage Geocomposite Leachate Collection System Layer
60-mil HDPE Geomembrane Liner	60-mil HDPE Geomembrane Liner
2-foot-thick CCL	2-foot-thick CCL

The existing composite liner systems include a hydrostatic pressure relief system, as discussed in the LQCP (Appendix IIID).

The liner systems for the pre-Subtitle D areas vary (e.g., the pre-Subtitle D area includes in-situ and 3-foot-thick compacted clay liners). Refer to Parts I/II, Section 3.2.1 for additional information regarding the existing pre-Subtitle D liner system.

The impact of differential settlement on the performance of the currently constructed leachate collection systems in the Subtitle D areas is analyzed in Appendix IIIJ-B and summarized in Table IIIA-3.

Table IIIA-3
Leachate Collection Layer Analysis Summary for the Developed Subtitle D Areas

Cell	Design Slope between Cell Ridgeline and Leachate Collection Pipe (percent)	Design Slope of Leachate Collection Pipe (percent)	Post-Settlement Slope between Cell Ridgeline and Leachate Collection Pipe (percent)	Post-Settlement Slope of Leachate Collection Pipe (percent)
1, 2, 4B, 5	1.17	0.50	~~1.16~~ 1.19	~~0.44~~ 0.35
3, 4A, 8, 9A	1.17	0.50	~~1.16~~ 1.19	~~0.44~~ 0.35

As shown, the slope between (1) the cell ridgeline and the leachate collection pipe and (2) the slope of the leachate collection pipe from the upstream portion of the cell to the sump is reduced by an insignificant amount due to the development of the landfill. A demonstration that the existing leachate collection system will continue to function in a manner that meets all regulatory requirements is included in Appendix IIIC.

4.0 Overliner System for the Pre-Subtitle D Area (Cells O1 through O6)

4.1 Overliner Design

The proposed overliner system for the pre-Subtitle D area of the landfill has been designed consistent with the requirements listed in Title 30 TAC §330.331(a)(1). The

proposed system is designed to convey leachate generated over the existing pre-Subtitle D area to leachate collection sumps located along the perimeter of the overliner area, as well as to sumps located in the Subtitle D area. The proposed system is described in Table IIIA-4.

The proposed top of overliner plan is shown on Drawing A.2 in Appendix IIIA-A. Details for the proposed overliner system are presented on Drawings A.9 through A.12 in Appendix IIIA-A. Material specifications, construction, and testing requirements for the proposed overliner system are provided in Appendix IIID – LQCP.

The design of the proposed overliner system is presented in Appendix IIIB – Overliner Point of Compliance Demonstration. The purpose of the POC demonstration is to demonstrate that the proposed waste containment system design will meet the POC requirements specified in §330.331(a) by showing that the predicted concentrations of selected leachate chemical constituents do not exceed maximum contaminant levels (as listed in Table 1 in §330.331(a)(1)) in the uppermost aquifer at the POC. The waste containment system design includes the overliner system and a slurry wall ~~that will be~~ constructed around the perimeter of the pre-Subtitle D area (refer to Section 5.0 for more information on the ~~proposed~~ slurry wall).

Additionally, the demonstration discussed in Section 5 of Appendix IIIB shows that the proposed overliner system, which includes a GCL/40-mil LLDPE FML/leachate collection system/protective cover, will result in a greater level of protection than the composite liner specified in Title 30 TAC §330.331(a)(2) and §330.331(b). As noted in Title 30 TAC §330.331, a point of compliance demonstration would not be needed if the prescriptive overliner system listed in Title 30 TAC §330.331(a)(2) was used (note that the prescriptive liner just replaces the GCL with 2 feet of clay). As noted in Appendix IIIB, the selected overliner system that includes a GCL not only creates a more effective hydraulic barrier, it also has the ability to withstand differential settlement better than a compacted clay liner. Furthermore, Section 6 of Appendix IIIB demonstrates that the overliner has been added to the solid waste containment system to provide for a very conservative design. Appendix IIIB includes a POC demonstration that shows the site design would meet the POC criteria specified in Title 30 TAC §330.331(a)(1), even without the installation of the overliner system.

- The leachate/condensate level in each LFG extraction well located in the pre-Subtitle D area will be monitored at least once per year.
- If the leachate/condensate level in the extraction well is more than 3 feet above the bottom of the extraction well, then a pump will be used to remove the collected leachate/condensate. The pumps will be rotated, as needed, to remove leachate/condensate in the extraction wells.
- The extracted leachate/condensate will be conveyed to a temporary storage tank or to the on-site storage tank before being discharged to a POTW, consistent with Appendix IIIC – Leachate and Contaminated Water Management Plan.
- Records of the leachate/condensate level monitoring and the volume of leachate/condensate removed from each well per year will be maintained in the Site Operating Record.

Once the overliner is constructed, it is anticipated that the leachate generation in the pre-Subtitle D area below the overliner will become negligible. At this point, the site may request authorization from the TCEQ to discontinue monitoring and pumping of the pre-Subtitle D extraction wells. The leachate/condensate removal will continue until written approval is obtained from TCEQ.

4.2.2 Dedicated Pre-Subtitle D Area Leachate Removal Wells

To minimize buildup of leachate in the bottom of the landfill, dedicated leachate removal wells (LRW) ~~will be~~ have been installed in the pre-Subtitle D area. These pre-Subtitle D area leachate removal wells were authorized by the TCEQ in September 2014 per a permit modification to TCEQ Permit No. MSW-1312A titled, "Pre-Subtitle D Area Leachate Removal Well Installation." The installation criteria included in the above referenced modification is reproduced in this section. Following installation, a construction report was submitted to TCEQ in June 2015. The operating criteria discussed below is different than the criteria listed in the September 2014 permit modification. Under TCEQ Permit No. MSW-1312B, all ten of the pre-Subtitle D area leachate removal wells will be operated during the life of the site and nine of them will be operated during the postclosure period (under TCEQ Permit No. MSW-1312A, these wells were to be decommissioned at closure).

As shown on Drawing A.22, 10 leachate removal wells ~~will be~~ have been installed to remove leachate from the pre-Subtitle D area. Typical leachate removal well details are shown on Drawing A.12A. As shown on Drawings A.22 and A.12A, the following criteria ~~will be~~ was used to install the leachate removal wells.

- The leachate removal wells shall be installed at the locations shown on Drawing A.22, which are outside the areas shown as Excavated & Recompacted Zones on Attachment 25 of the August 1993 Soil and Liner Evaluation Report (SLER) prepared by Reed Engineering), and the September 1991 SLER (prepared by Reed Engineering). As long as they remain outside such areas, the locations may be adjusted up to 50 feet to facilitate installation and avoid obstacles that would make installation difficult.
- During drilling for a leachate removal well, if material identified as recompacted shale is encountered below the bottom of waste, drilling shall stop and the well shall be completed at that depth (refer to Drawing A.12A).

Leachate removal wells LRW-1 through LRW-9 (shown on Drawing A.22) ~~will be~~ were installed within the existing final cover. These wells will be operated during the life of the site and the postclosure period. Leachate removal well LRW-10 (shown on Drawing A.22) ~~will be~~ was installed within the future overliner area and will be decommissioned prior to overliner area construction.

The leachate removal wells will be operated following the procedure listed below.

- The leachate level in each LRW will be monitored once per week and documented in the Site Operating Record (refer to Part IV – SOP, Section 4.23).
- As shown on Drawing A.12A, a leachate removal pump will be placed in each well to remove any collected leachate. The pumps will be used to remove the collected leachate if the leachate level in the LRW is more than 3 feet above the bottom of the LRW.
- Leachate sensing floats, transducers, or an equivalent level monitoring device will be used to automatically activate the pumps. The pumps' outlet hoses will be connected to a forcemain that will convey leachate to the aboveground leachate storage tank. The dual-contained forcemain (either a separate forcemain or the LFG condensate forcemain) is shown on Drawings A.20 and A.22.
- The extracted leachate will be conveyed to the on-site leachate storage tank before being discharged to a POTW, consistent with procedures listed in the Leachate and Contaminated Water Plan included in Appendix IIIC.

5.0 Slurry Wall Design

A slurry wall, or soil bentonite cutoff wall, is included as a component of the waste containment system design. The slurry wall ~~will be~~ was constructed following the schedule included in a permit modification titled, "Permit Modification and Correction Plan Revision Slurry Wall Installation" and submitted to TCEQ in December 2012 under TCEQ Permit No. MSW-1312A. This modification was approved by the TCEQ in September 2014. ~~If TCEQ Permit No. MSW-1312B is issued prior to the construction of the slurry wall, then the slurry wall will be constructed under TCEQ Permit No. MSW-1312B. The slurry wall CQA plan is included in Appendix IIIA-C and t~~The slurry wall design is provided in Appendix IIIA-A. The extent of the slurry wall is shown on Drawing A.16. As shown, the slurry wall extends around the southern and eastern perimeter of the pre-Subtitle D area. The slurry wall ~~will be~~ is keyed 3 feet into the unweathered shale stratum as shown on Drawings A.17, A.18, and A.19, and ~~will~~ provides an additional hydraulic barrier between the pre-Subtitle D area and groundwater. As shown on Drawing A.19, the slurry wall backfill ~~will have~~ has a permeability of no more than $1x10^{-7}$ cm/s. Since the slurry wall ~~will be~~ was constructed prior to the development of Cell 13, a detail that shows the tie-in between the Cell 13 sidewall liner and the slurry wall is shown on Drawing A.19a. ~~Appendix IIIA-C – Construction Quality Assurance Plan for the Slurry Wall includes the construction quality assurance activities associated with the construction of the slurry wall.~~

Slurry walls are commonly used to control groundwater movement. The major characteristics of slurry wall construction are the use of a bentonite and water slurry during excavation to support the trench excavation without the use of other lateral supports such as shoring. Slurry walls are built by excavating a narrow trench, which in this case will be 3 feet wide, while pumping slurry into the trench and maintaining its level at or near the top of the trench during the excavation. The trench is extended to key into the aquitard material (i.e., the unweathered shale) to form a bottom seal. The ~~proposed~~ slurry wall ~~will be~~ has been keyed a minimum of 3 feet into the aquiclude below the alluvial stratum.

Bentonite clay is a montmorillonite clay and the most common amendment in soil-bentonite slurry walls. Bentonite has the ability to swell as much as 20 times its volume upon contact with water. The slurry trench construction method is a proven method to construct a barrier wall. The soil-bentonite trench technique has been in use in the United States for over 25 years. After the trench has been excavated using a bentonite slurry, more slurry is mixed with the soil adjacent to the trench. A bulldozer and/or hydraulic excavator is used to work the materials to a

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIA-A
LINER, OVERLINER, AND FINAL COVER SYSTEM DETAILS

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014
Revised October 2014

Revised August 2016

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8-5-16

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Prepared by

Weaver Boos Consultants, LLC–Southwest
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WBC Project No. 1339-351-11-02-6B.1

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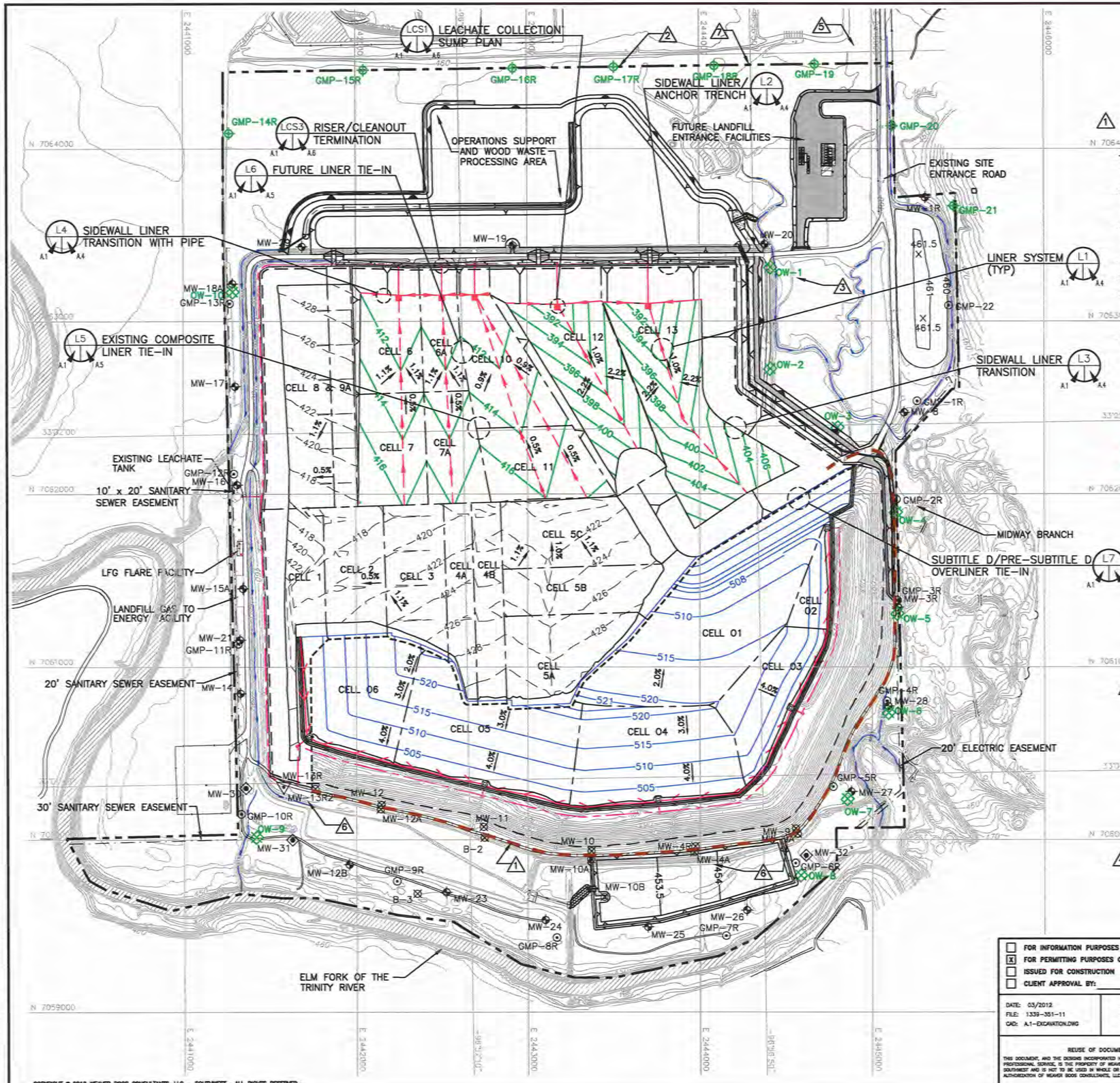

DRAFT

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- EASEMENT
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 7)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-13R — EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- 3 OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 11)
- 2 GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- 6 MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 10 AND 11)
- PERIMETER ACCESS ROAD
- 1 — EXISTING SLURRY WALL

N

0 300 600
SCALE IN FEET

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 10.
5. REMOVED EASEMENTS.
6. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. SEE APPENDIX IIIC FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
4. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
5. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE IS A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPES SHOWN ON DRAWING A.2.
6. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
7. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
8. REFER TO APPENDIX IIID FOR DEWATERING SYSTEM DESIGN INFORMATION.
9. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).
10. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
11. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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- [ ] CLIENT APPROVAL BY:

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DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT EXCAVATION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING A.1

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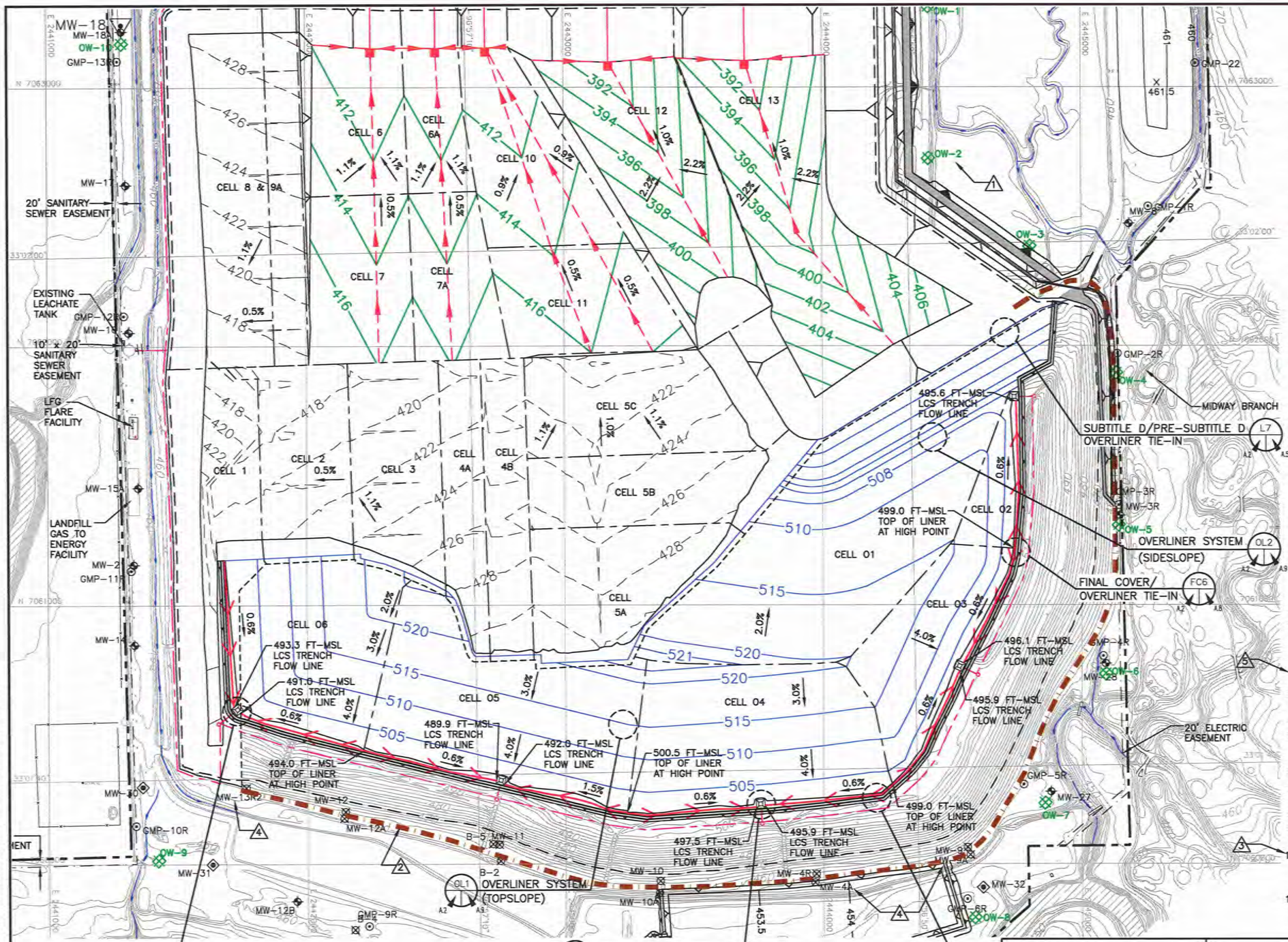

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LIST OF REVISIONS:

1. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
2. REVISED SLURRY WALL TO EXISTING LOCATION.
3. REVISED NOTE 10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

SHEET IIIA-A.2

DRAFT

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- EASEMENT
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
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- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- 1 OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 11)
- 4 MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 10 AND 11)
- 2 — EXISTING SLURRY WALL
- 600 — REGRADED BUFFER ZONE AREA
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. SEE APPENDIX IIIC FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
4. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
5. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE IS A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPE WITH A MINIMUM OF 0.6%.
6. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
7. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
8. REFER TO APPENDIX IIID FOR DEWATERING SYSTEM DESIGN INFORMATION.
9. REFER TO APPENDIX IIIJ FOR OVERLINER LEACHATE COLLECTION PIPE PROFILES.
10. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
11. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIREMENTS OF APPENDIX IIIH.

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- [ ] CLIENT APPROVAL BY:

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DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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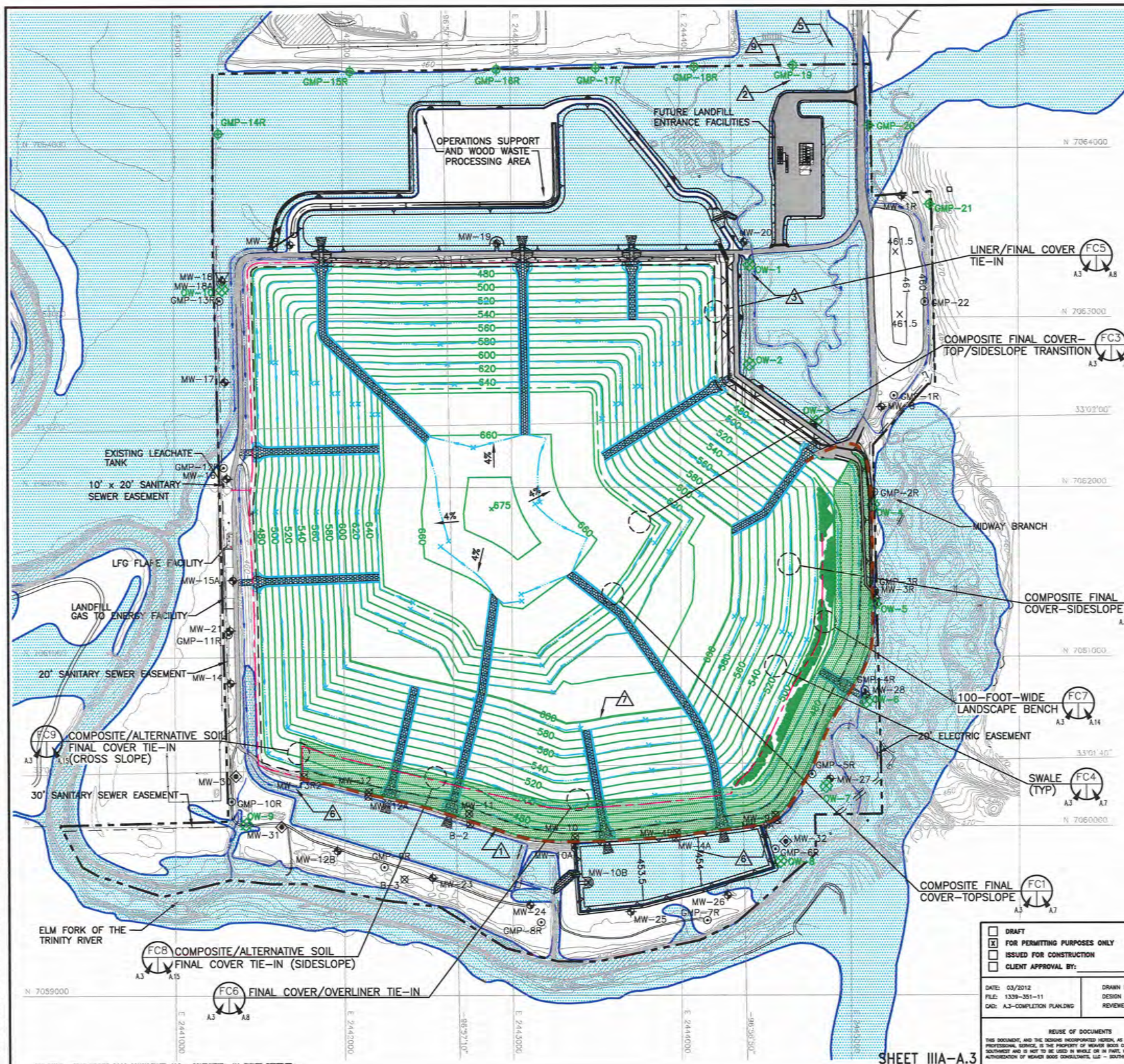
DRAWING A.2

O:\1339\351\EXPANSION 2009\PART III-SDP\IIIA\A.2-OVERLINER PLAN.dwg, jwilson, 1:2



LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 7 — 600 — FINAL COVER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- EASEMENT
- 5 — DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- 1 — GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- 2 — GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- 6 — MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 8 AND 9)
- 3 — OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 9)
- PROPOSED LEACHATE FORCEMAIN
- EXISTING FENCE
- LANDSCAPE BENCH
- EXISTING ALTERNATIVE SOIL FINAL COVER AREA
- 100-YEAR FLOODPLAIN (SEE NOTE 6)
- PERIMETER ACCESS ROAD
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 8.
5. REMOVED EASEMENTS.
6. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
7. REVISED FINAL COVER CONTOURS.
8. REVISED NOTE 5.
9. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIF FOR POST DEVELOPMENT DRAINAGE INFORMATION.
4. FINAL COVER DETAILS ARE PROVIDED IN APPENDIX IIIA-A-LINER, OVERLINER AND FINAL COVER SYSTEM DETAILS
5. MAXIMUM FINAL COVER ELEVATION: 675 FT-MSL. MAXIMUM WASTE ELEVATION: 671.5 FT-MSL.
6. FLOODPLAIN INFORMATION IS INCLUDED IN APPENDIX IIIO.
7. REFER TO FIGURE I/II-8.2 IN PARTS I/II FOR INFORMATION ON RED OBSTRUCTION LIGHTS REQUIRED BY THE FAA.
8. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
9. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

- [ ] DRAFT
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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: A.3-COMPLETION PLAN.DWG
DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
LANDFILL COMPLETION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING A.3

SHEET IIIA-A.3

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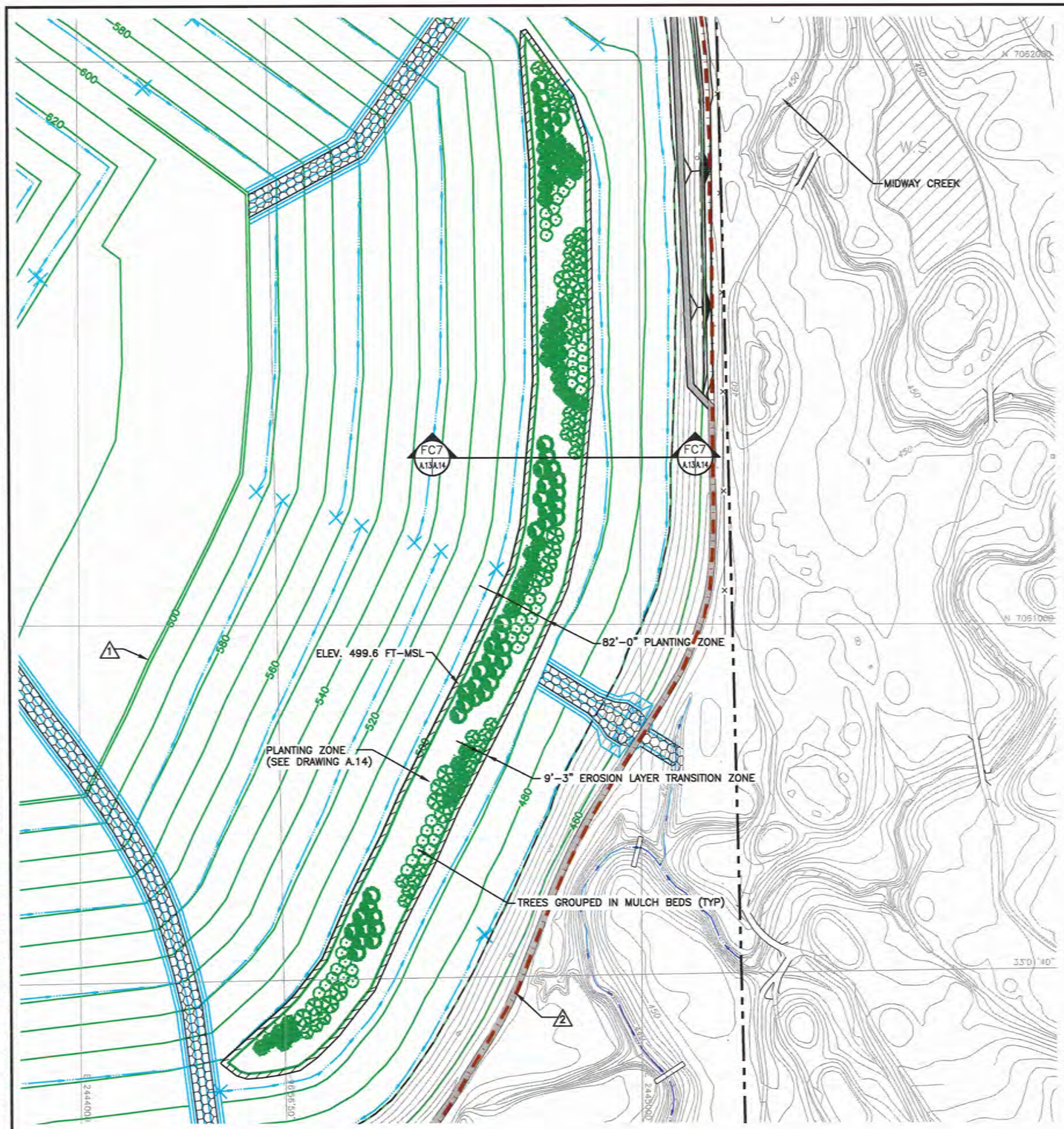
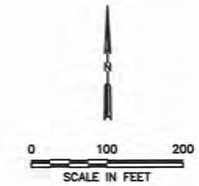
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIA\A\A.3-COMPLETION PLAN.dwg, jwilson, 1:2





LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EROSION LAYER TRANSITION ZONE
- 2 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

DRAFT

PLANTING PLAN *

PLANT SYMBOL	QTY. (MIN)	BOTANICAL NAME	COMMON NAME	SPECIFICATION
	45	PINUS TAEDA	LOBLOLLY PINE	12' HT. MIN., PLAND 20' O.C.
	43	PINUS THUNDERGII	JAPANESE BLACK PINE	8' HT. MIN., PLAND 20' O.C.
	20	BETULA NIGRA	RIVER BIRCH	14' HT. MIN., PLAND 25' O.C.
	48	ACER BUERGERANUM	TRIDENT MAPLE	12' HT. MIN., PLAND 20' O.C.
	34	LAGERSTOEMIA INDICA	CRAPEMYRTLE	12' HT. MIN., PLAND 20' O.C.

* REFER TO DRAWINGS A.14 AND A.14a FOR PLANTING DETAILS.

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. REVISED SLURRY WALL TO EXISTING LOCATION.
3. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

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DATE: 03/2012
FILE: 1339-351-11
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DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
EAST SIDESLOPE BENCH PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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DRAWING A.13

SHEET IIIA-A.13

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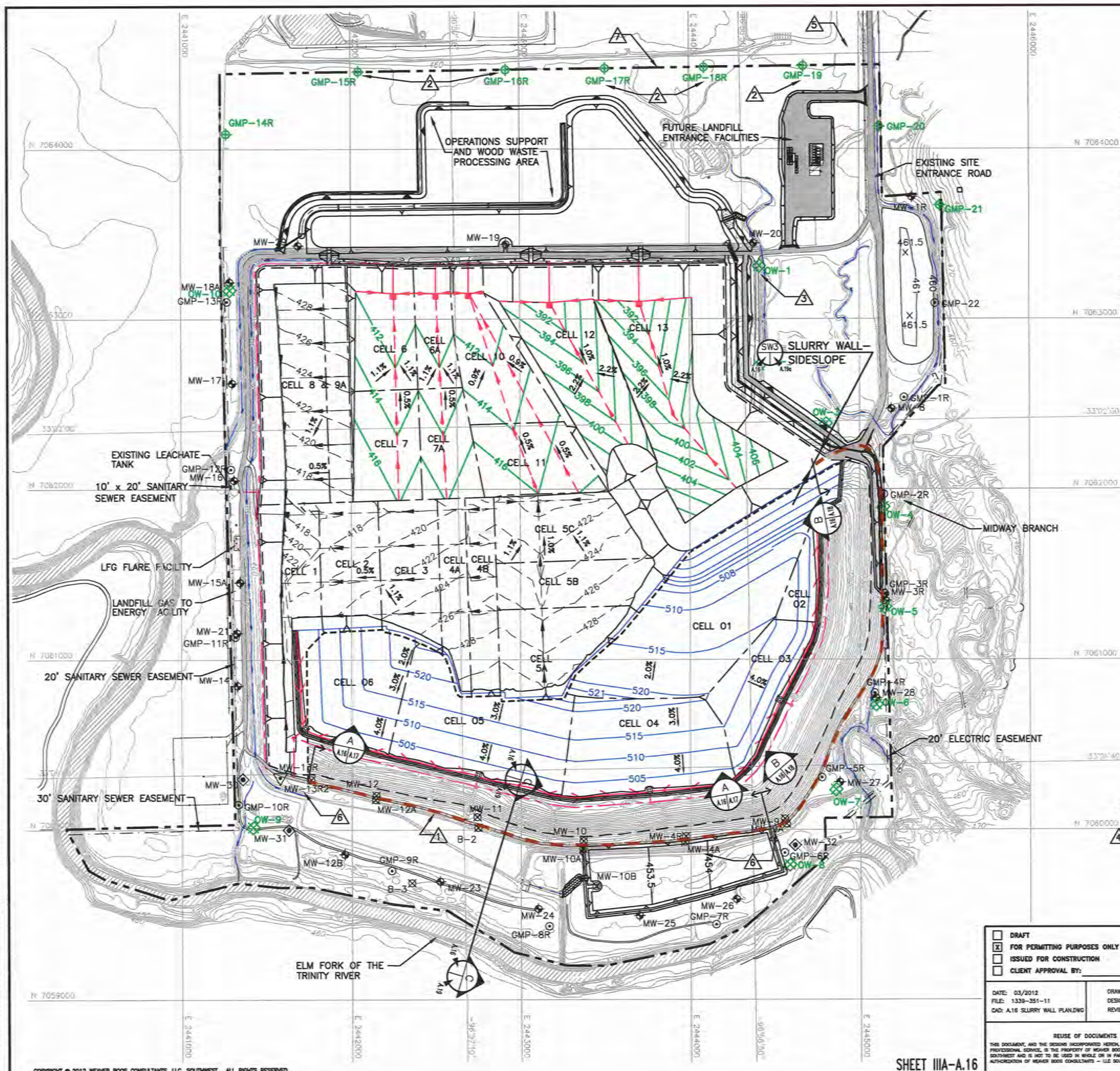

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 3.
5. REMOVED EASEMENTS.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- EASEMENT
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 7)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-13R — EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- 3 OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 4)
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- 1 MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 3 AND 4)
- PERIMETER ACCESS ROAD
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
4. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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DATE: 03/2012
FILE: 1339-351-11
CAD: A.16 SLURRY WALL PLAN.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SLURRY WALL SITE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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FORT WORTH, TX (817) 735-9770
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DRAWING A.16

SHEET IIIA-A.16

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIA\A.16- SLURRY WALL SITE PLAN.dwg, jwilson, 1:2

REFER TO DRAWING I/IIA.10 FOR EXISTING SITE ENTRANCE PLAN

EXISTING SITE ENTRANCE ROAD

HISTORICAL WASTE FILL

CITIZENS CONVENIENCE CENTER

INACTIVE MSW UNIT

PERMITTED UNDEVELOPED LINER AREA

LATERAL EXPANSION AREA

20' ELECTRIC EASEMENT (SEE NOTE 6)

EXISTING LEACHATE TANK

10' x 20' SANITARY SEWER EASEMENT

LFG FLARE FACILITY

LANDFILL GAS TO ENERGY FACILITY

20' SANITARY SEWER EASEMENT

30' SANITARY SEWER EASEMENT

MIDWAY BRANCH

PRE-SUBTITLE D AREA

20' ELECTRIC EASEMENT

REFER TO DRAWING A.21 FOR LFG EXTRACTION WELL INFORMATION AND DRAWING A.22 FOR LEACHATE REMOVAL WELL INFORMATION.

ELM FORK OF THE TRINITY RIVER

SCALE IN FEET: 0 300 600

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 5.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. REVISED NOTE 3.
8. REMOVED EASEMENTS.
9. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMIT OF WASTE
- PROPOSED LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- EASEMENT
- MW-8 EXISTING GROUNDWATER MONITORING WELL
- MW-13R EXISTING GROUNDWATER MONITORING WELL (TO BE DECOMMISSIONED)
- MW-30 PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R EXISTING LANDFILL GAS MONITORING PROBE
- GMP-8 EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- GMP-20 PROPOSED LANDFILL GAS MONITORING PROBE
- MW-12 OBSERVATION/MONITORING WELL (SEE NOTES 3 AND 4)
- EW-A15 EXISTING LFG EXTRACTION WELL
- EXISTING SUBTITLE D COMPOSITE LINED AREA
- EXISTING FENCE
- PROPOSED FENCE
- PROPOSED LEACHATE FORCEMAIN
- EXISTING SLURRY WALL (SEE NOTE 5)
- EXISTING LFG SYSTEM PIPING
- EXISTING AIR SUPPLY LINE
- EXISTING CONDENSATE FORCEMAIN
- CS-1A EXISTING CONDENSATE SUMP
- OW-1 PROPOSED WOODBINE MONITOR WELL (SEE NOTE 4)
- INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. THE PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW-1312A IS SHOWN ON FIGURE I/II-3.1.
3. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE PRODUCED FROM A SURVEY BY WCG AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
4. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.
5. THE SLURRY WALL WAS INSTALLED IN 2015 UNDER TCEQ PERMIT NO. 1312A. REFER TO APPENDIX IIIA FOR SLURRY WALL INFORMATION.
6. THIS 20-FOOT ELECTRICAL EASEMENT PROVIDES ELECTRICITY TO THE TEMPORARY MAINTENANCE AREA. THE EASEMENT WILL BE ABANDONED PRIOR TO DEVELOPMENT IN THIS AREA.

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 11/2012
FILE: 1339-351-11
CAD: A.20-GCCS SYSTEM.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1ST TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
3	12/2013	SUPPLEMENTAL SUBMITTAL
4	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT EXISTING GCCS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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DRAWING A.20

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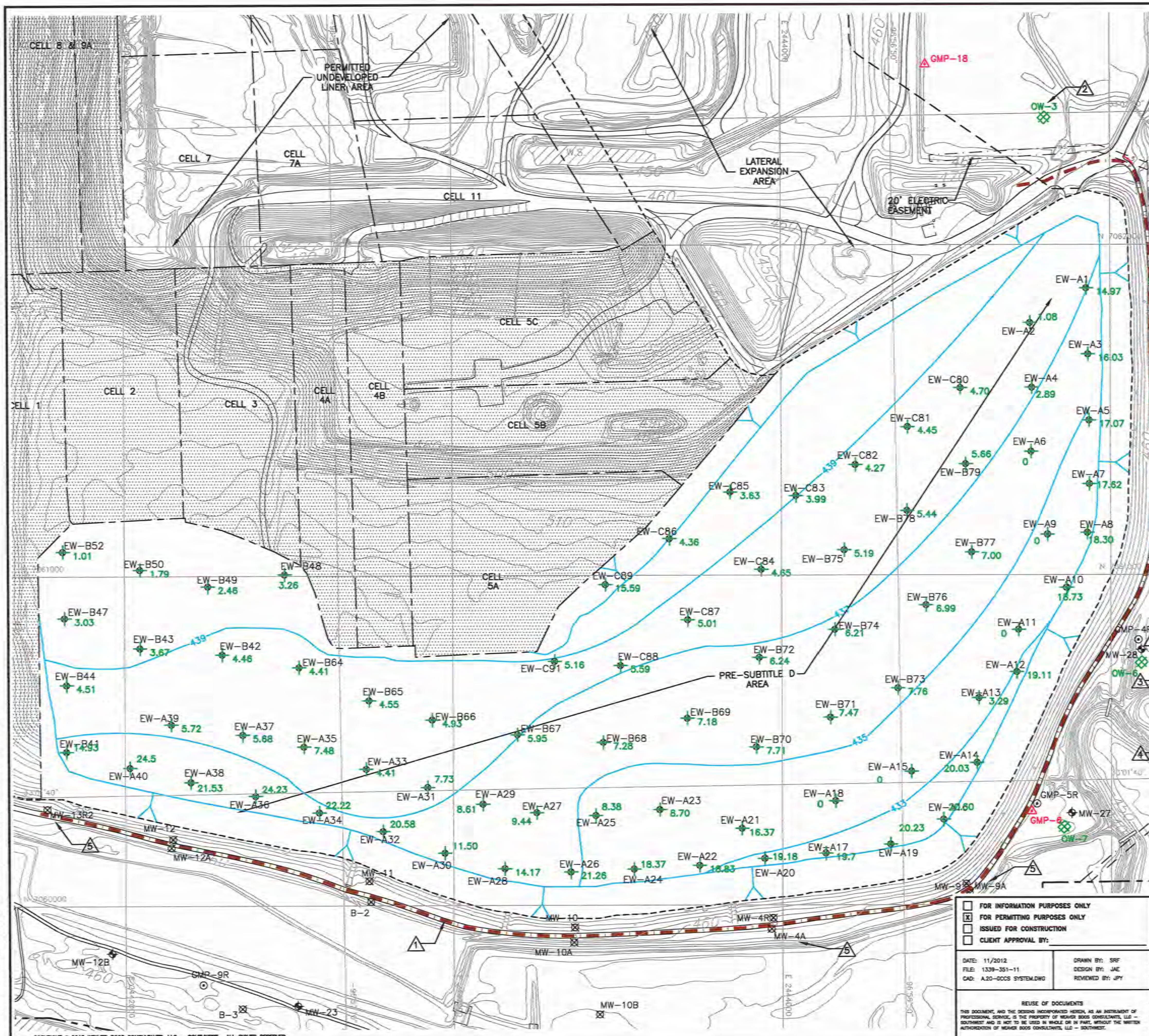

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMIT OF WASTE
- PROPOSED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- EASEMENT
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- GMP-9 — EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 3 AND 4)
- EW-A15 — EXISTING LFG EXTRACTION WELL
- OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 14)
- EXISTING SUBTITLE D COMPOSITE LINED AREA
- EXISTING SLURRY WALL (SEE NOTE 5)
- 433 — APPROXIMATE BOTTOM OF WASTE CONTOUR IN PRE-SUBTITLE D AREA (SEE NOTE 5)
- +2.89 — DEPTH FROM BOTTOM OF WASTE TO BOTTOM OF LANDFILL GAS EXTRACTION WELL
- INDICATES REVISION (SEE LIST OF REVISIONS)

0 150 300
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. REVISED NOTE 3.
4. REVISED NOTE 5.
5. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
6. UPDATED PERMIT BOUNDARY INFORMATION.

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. THE PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW-1312A IS SHOWN ON FIGURE I/II-3.1.
3. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE PRODUCED FROM A SURVEY BY WCG AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
4. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.
5. THE SLURRY WALL WAS INSTALLED IN 2015 UNDER TCEQ PERMIT NO. 1312A. REFER TO APPENDIX IIIA FOR SLURRY WALL INFORMATION.

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: ____

DATE: 11/2012
FILE: 1339-351-11
CAD: A.20-GCCS SYSTEM.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
PRE-SUBTITLE D AREA
LFG EXTRACTION WELL INFORMATION
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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DRAWING A.21

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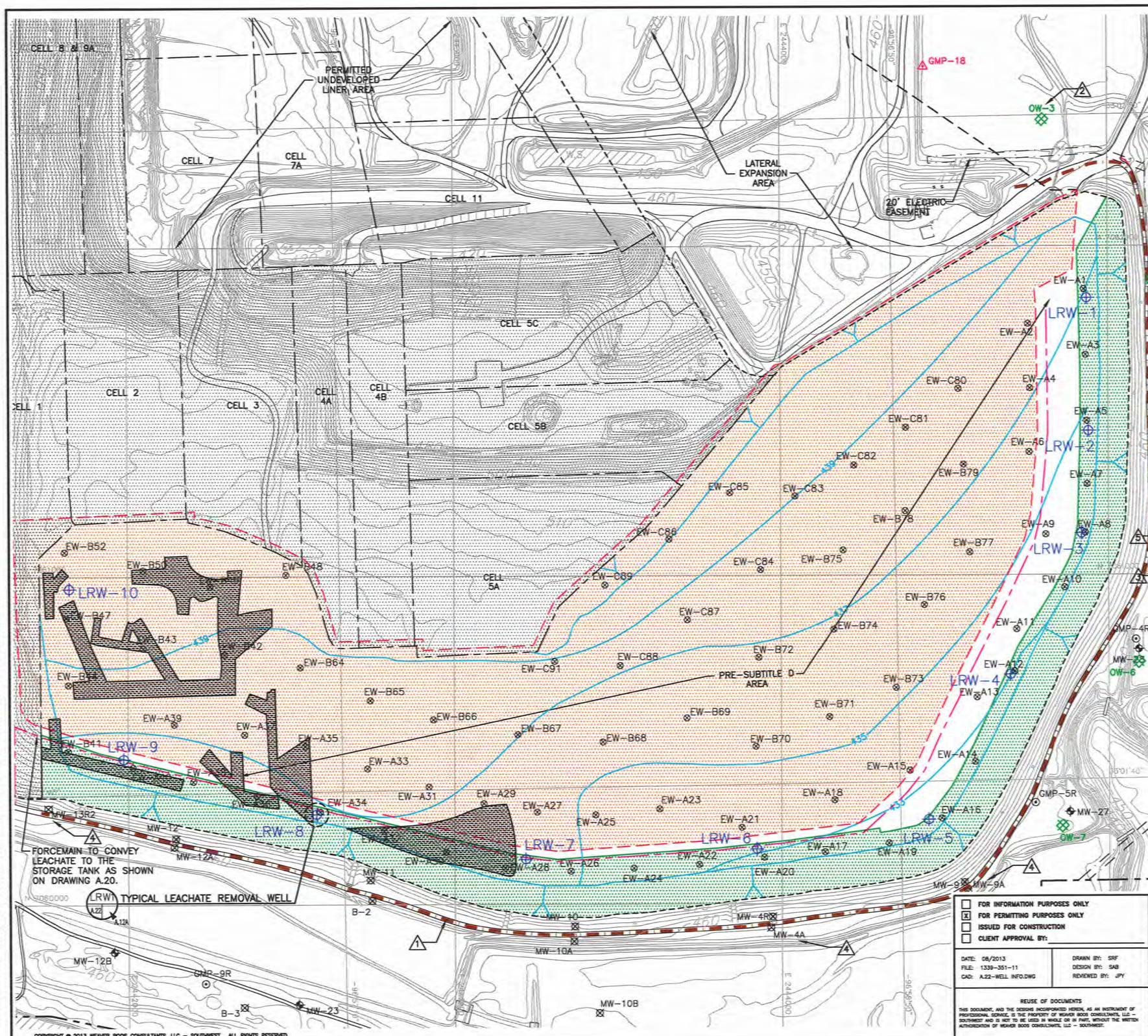

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMIT OF WASTE
- PROPOSED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- EASEMENT
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- GMP-9 — EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- 4 MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 3 AND 4)
- EW-A15 — EXISTING LFG EXTRACTION WELL
- LRW-1 — LEACHATE REMOVAL WELL
- 2 OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 4)
- EXISTING SUBTITLE D COMPOSITE LINED AREA
- LIMITS OF OVERLINER
- LIMITS OF CONSTRUCTED FINAL COVER
- PROPOSED LEACHATE FORCEMAIN
- 1 EXISTING SLURRY WALL
- 433 — APPROXIMATE BOTTOM OF WASTE CONTOUR IN PRE-SUBTITLE D AREA
- RECOMPACTED SHALE AREA (SEE NOTE 7)
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

0 150 300
SCALE IN FEET

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. THE PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW-1312A IS SHOWN ON FIGURE I/II-3.1.
3. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE PRODUCED FROM A SURVEY BY WCG AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
4. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.
5. LEACHATE COLLECTED IN LEACHATE REMOVAL WELLS WILL BE PUMPED TO LEACHATE FORCEMAIN OR CONDENSATE REMOVAL SYSTEM. REFER TO DETAIL LRW1 ON DRAWING A.12A.
6. THE LEACHATE REMOVAL WELLS SHALL BE INSTALLED CONSISTENT WITH THE LOCATIONS SHOWN ON THIS FIGURE. THE LOCATIONS MAY BE ADJUSTED UP TO 50 FEET, PROVIDED THEY REMAIN OUTSIDE THE RECOMPACTED SHALE AREA SHOWN, TO FACILITATE INSTALLATION AND AVOID EXISTING OBSTACLES.
7. THE RECOMPACTED SHALE AREAS SHOWN ARE BASED ON AREAS SHOWN AS EXCAVATED & RECOMPACTED ZONES ON ATTACHMENT 25 OF THE AUGUST 1993 SLER AND THE SEPTEMBER 1991 SLER INFORMATION.

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. REVISED NOTE 3.
4. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

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- ☒ FOR PERMITTING PURPOSES ONLY
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- ☐ CLIENT APPROVAL BY:

DATE: 08/2013
FILE: 1339-351-11
CAD: A.22-WELL INFO.DWG

DRAWN BY: SRF
DESIGN BY: SAB
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	2nd TCEQ COMMENT RESPONSE
2	06/2014	TCEQ COMMENT RESPONSE
3	10/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
PRE-SUBTITLE D AREA
LEACHATE REMOVAL WELL INFORMATION

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

DRAWING A.22

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G:\1339\351\EXPANSION 2009\PART III-SDP\IIA\A\A.22-LEACHATE REMOVAL WELL INFO.dwg; jwilson; 1:2

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIA-B
LANDFILL UNIT CROSS SECTIONS

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised June 2014
Revised October 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

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Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B.1

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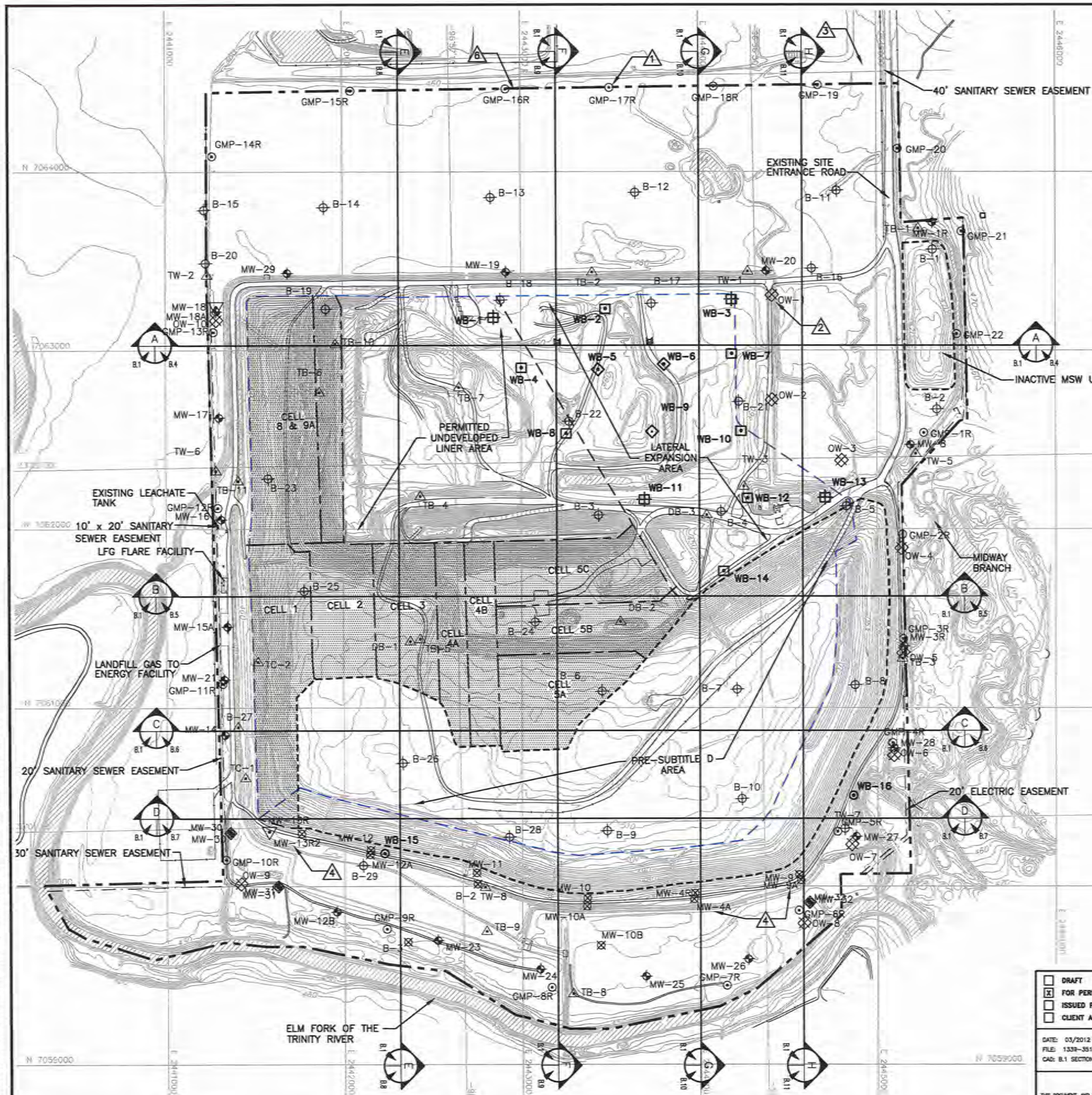

LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. REMOVED EASEMENTS.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. REVISED NOTE 3.
6. UPDATED PERMIT BOUNDARY INFORMATION.

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- EXISTING PERMITTED PRE-SUBTITLE D LIMIT OF WASTE
- EXISTING PERMITTED SUBTITLE D LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING TOPOGRAPHIC CONTOUR
- EASEMENT
- MW-8 PERMITTED GROUNDWATER MONITORING WELL
- GMP-1 PERMITTED GAS MONITORING PROBE
- MW-12 PERMITTED OBSERVATION/MONITORING WELL (SEE NOTES 3 AND 4)
- B-22 RONE 1980 BORING LOCATION
- TC-1 REED ENGINEERING 1994 BORING LOCATION
- WB-5 WBC BORING AT LEAST 5 FEET BELOW EDE
- WB-2 WBC BORING AT LEAST 30 FEET BELOW EDE
- WB-1 WBC BORING AT LEAST 5 FEET BELOW EDE WITH PIEZOMETER INSTALLED
- WB-15 WBC GEOTECHNICAL BORING FOR STRENGTH TESTING
- MW-18 DECOMMISSIONED MONITORING WELL OR MONITORING WELL TO BE DECOMMISSIONED
- OW-1 WOODBINE MONITOR WELL (SEE NOTE 4)
- EXISTING SUBTITLE D COMPOSITE LINER AREA
- INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE PRODUCED FROM A SURVEY BY WCG AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
4. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

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DATE: 03/2012
FILE: 1339-351-11
CAD: B.1 SECTION LOCS.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT TYPICAL SECTION SITE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING B.1

SHEET IIIA-B.1

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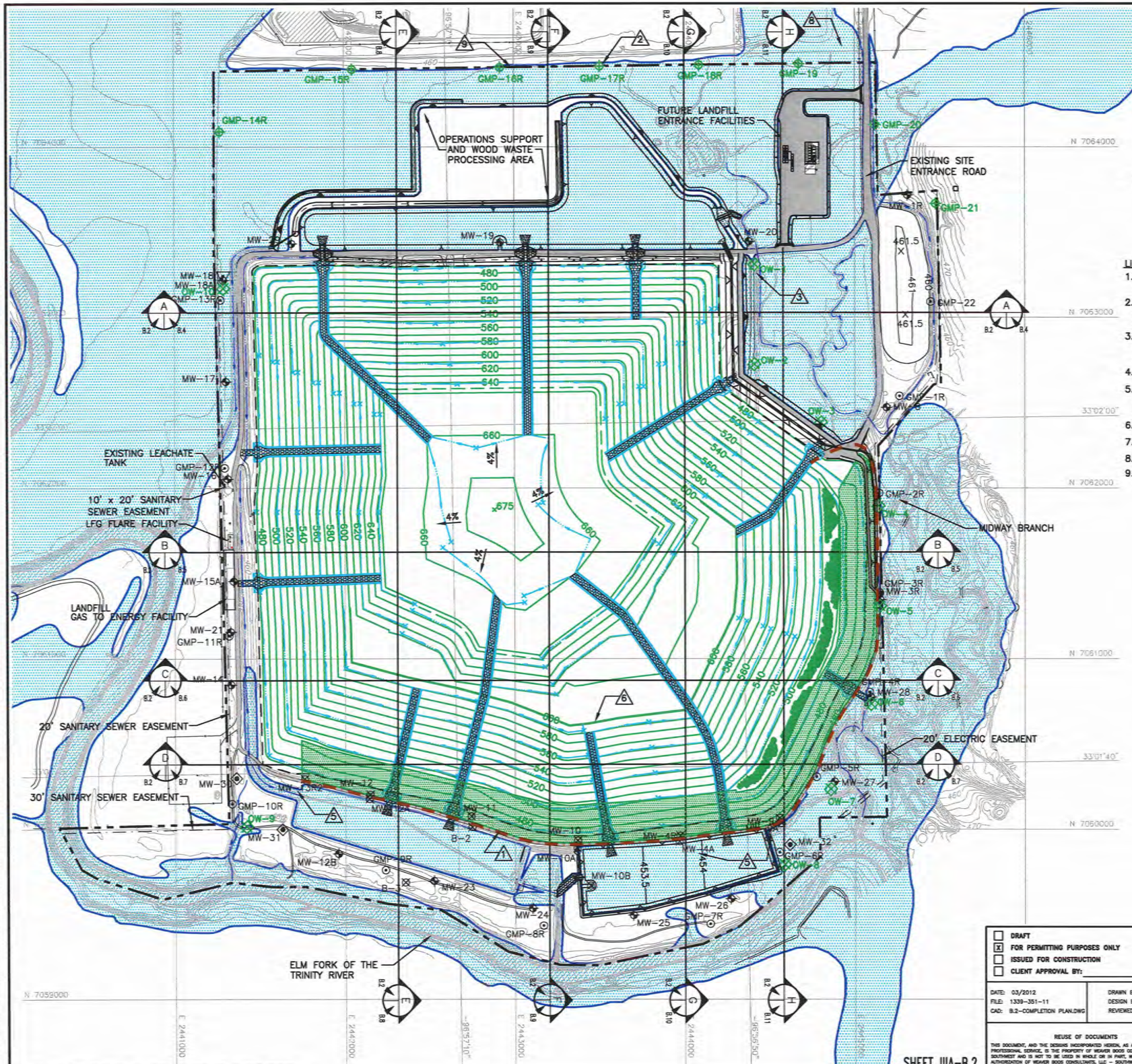
O:\1339\351\EXPANSION 2008\PART III-SDP\IIIA\B.1 CROSS SEC LOC.dwg, jwilson, 1:2



LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- PROPOSED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- EASEMENT
- 500 — EXISTING CONTOUR
- (6) 600 — FINAL COVER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- (8) EASEMENT BOUNDARY
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — PERMITTED GAS MONITORING PROBE
- (2) GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- (5) MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 5 AND 6)
- (3) OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 6)
- 100-YEAR FLOODPLAIN (SEE NOTE 4)
- PERIMETER ACCESS ROAD
- 3H:1V SLOPE (TYPICAL)
- CONSTRUCTED FINAL COVER
- LANDSCAPE BENCH
- PERIMETER ACCESS ROAD
- (1) EXISTING SLURRY WALL
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 5.
5. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
6. REVISED FINAL COVER CONTOURS.
7. REVISED NOTE 3.
8. REMOVED EASEMENTS.
9. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. (9) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED NOVEMBER 2010.
3. (7) MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
4. FLOODPLAIN INFORMATION IS INCLUDED IN APPENDIX IIIO.
5. (4) LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE PRODUCED FROM A SURVEY BY WCG AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
6. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

- [ ] DRAFT
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DATE: 03/2012 | DRAWN BY: SRF
FILE: 1339-351-11 | DESIGN BY: MDM
CAD: B.2-COMPLETION PLAN.DWG | REVIEWED BY: JPY

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
LANDFILL COMPLETION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO | FORT WORTH, TX (817) 735-9770 | GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING B.2

SHEET IIIA-B.2

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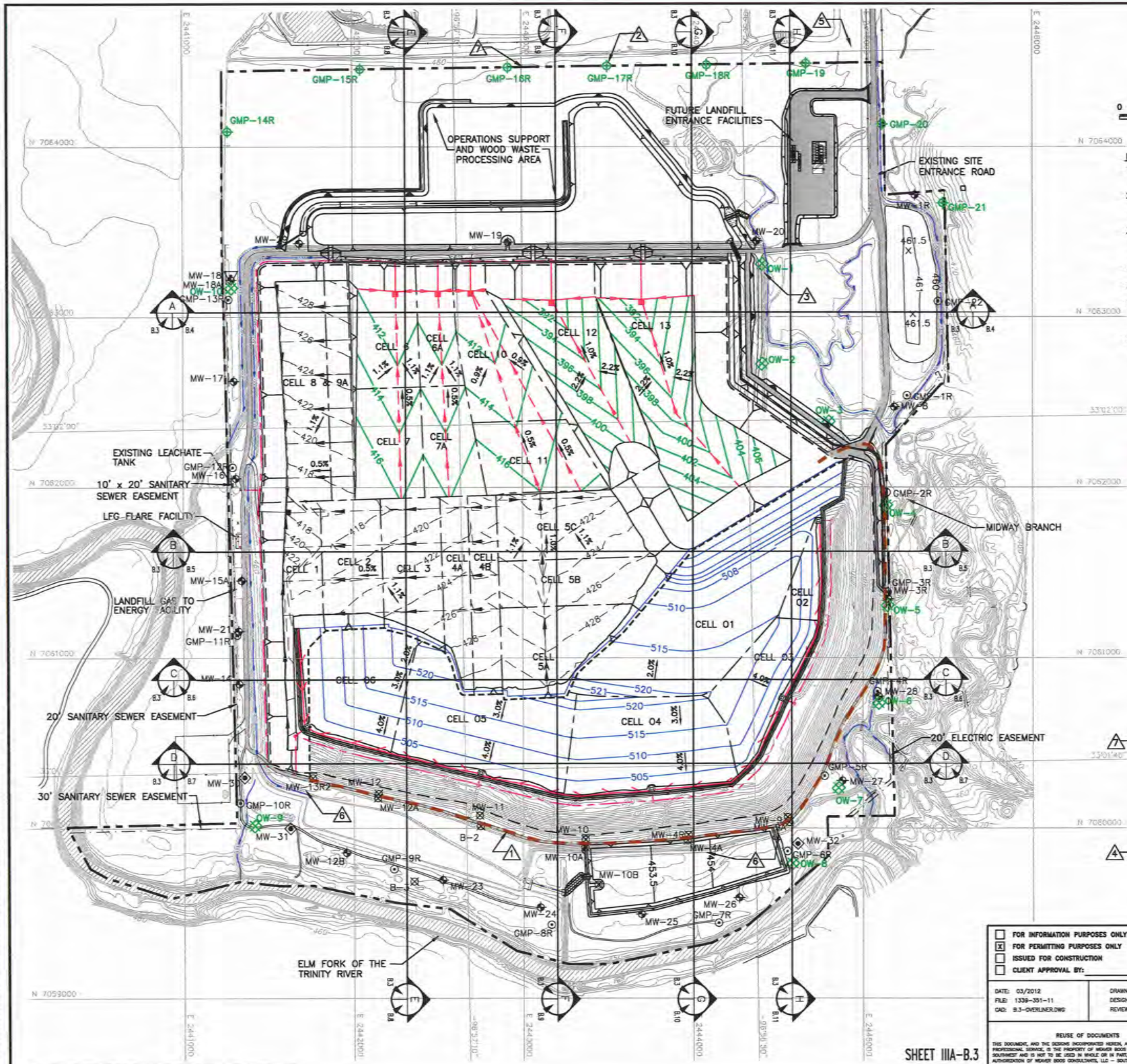

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
4. REVISED NOTE 6.
5. REMOVED EASEMENTS.
6. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- LIMIT OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 5 — EASEMENT
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 5)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- EASEMENT
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — PERMITTED GAS MONITORING PROBE
- 2 GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- 6 MW-12 — OBSERVATION/MONITORING WELL (SEE NOTES 6 AND 7)
- 3 OW-1 — PROPOSED WOODBINE MONITOR WELL (SEE NOTE 7)
- PERIMETER ACCESS ROAD
- 3H:1V SLOPE (TYPICAL)
- 1 — EXISTING SLURRY WALL
- PROPOSED LEACHATE FORCEMAIN
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
4. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE IS A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPE WITH A MINIMUM 0.6% TO SUMPS.
5. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
6. LOCATION OF MONITOR WELLS MW-9A, MW-4A, AND MW-13R2 WERE REPRODUCED FROM A SURVEY BY WBC AND THE DECEMBER 2012 PERMIT MODIFICATION THAT ALSO ADDRESSES THE INSTALLATION OF THE SLURRY WALL.
7. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.

SHEET IIIA-B.3

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- [ ] CLIENT APPROVAL BY:

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CAD: B.3-OVERLINER.DWG

DRAWN BY: SRF
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT EXCAVATION/OVERLINER PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
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FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING B.3

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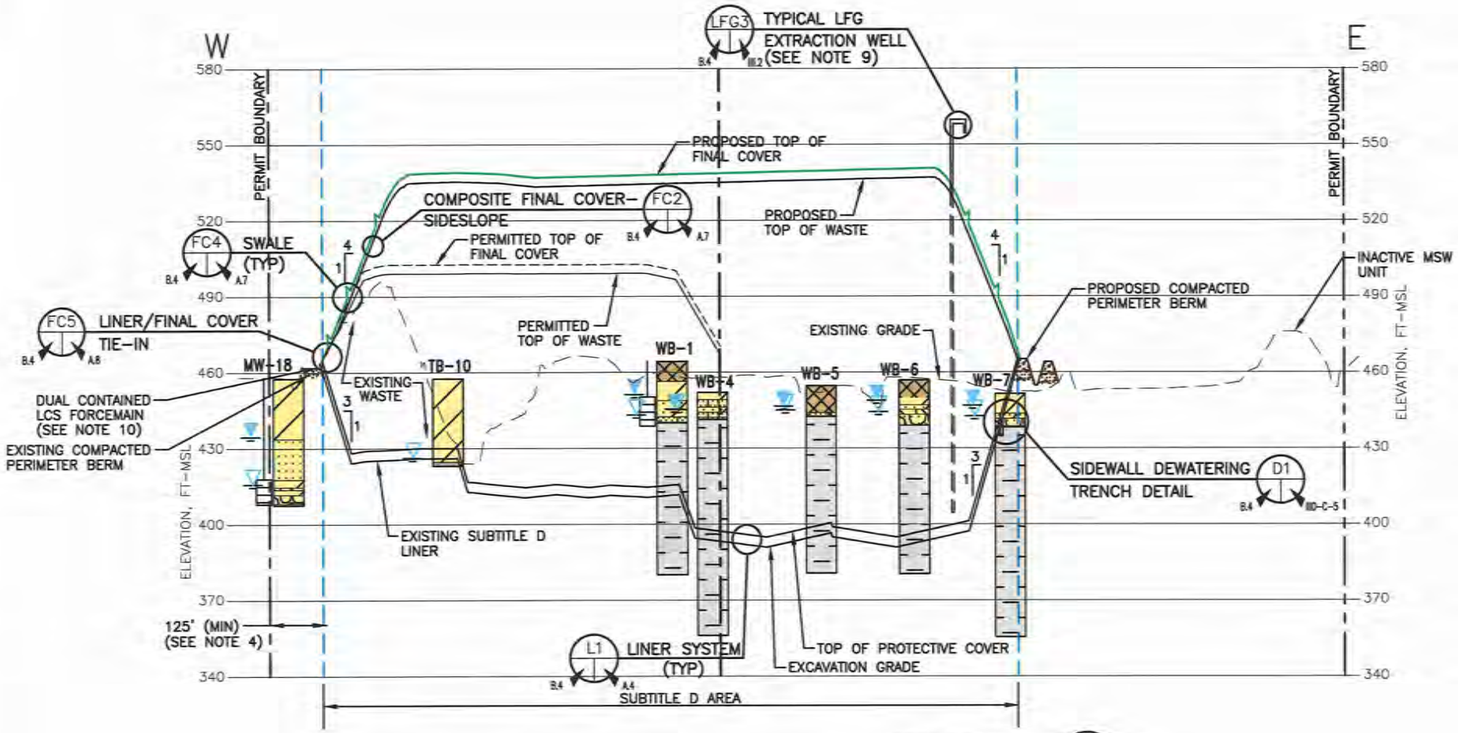
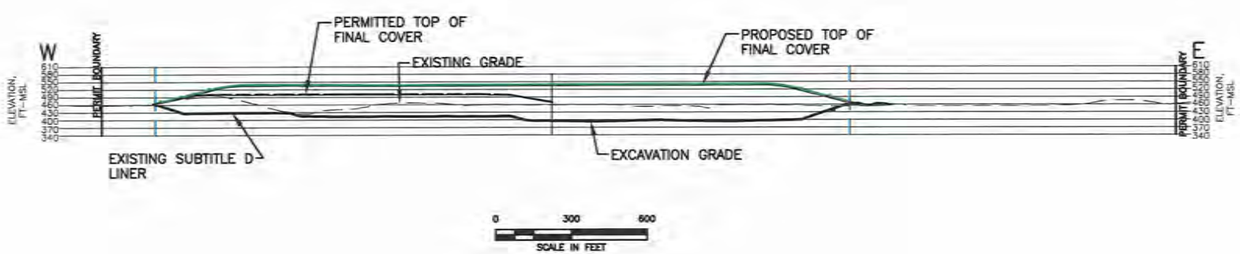
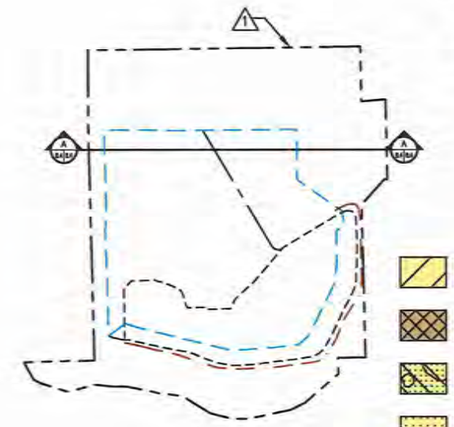


SECTION A
(EXAGGERATED VERTICAL SCALE)
B.1,B.2,B.3 B.4





KEY MAP
(NTS)

LEGEND

- PERMIT BOUNDARY
- EXISTING PERMITTED PRE-SUBTITLE D LIMIT OF WASTE
- EXISTING PERMITTED SUBTITLE D LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- EXISTING GRADE
- TOP OF WASTE
- TOP OF FINAL COVER
- EXISTING PERMITTED FINAL COVER
- CLAY AND SILTY CLAY
- EARTHEN FILL
- GRAVELLY SANDY CLAY
- SAND
- SANDY CLAY
- CLAYEY GRAVEL
- GRAVEL
- GRAVELLY SAND
- GRAVELLY SANDY CLAY
- UNWEATHERED SHALE
- SANDY GRAVEL
- WEATHERED SHALE
- SILTY SAND
- GROUNDWATER AT THE TIME OF DRILLING (ATD)
- STATIC GROUNDWATER LEVEL AS DESCRIBED ON BORING LOG
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. EXISTING CONTOURS AND ELEVATIONS PREPARED BY METROPOLITAN AERIAL SURVEYS FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010.
2. REFER TO APPENDIX IIIA-A FOR LINER, OVERLINER, LEACHATE COLLECTION, AND FINAL COVER SYSTEM DETAILS.
3. SEE APPENDIX IIIG FOR BORING DATA. BORINGS PROJECTED INTO THE LINE OF SECTION. SEE DRAWING B.1 FOR LOCATION.
4. AS SHOWN IN APPENDIX I/IIC, THE BUFFER ZONES VARY AROUND THE PERIMETER OF THE SITE, BUT IN NO CASE ARE THEY LESS THAN 50-FEET FOR EXISTING WASTE. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND THE LATERAL EXPANSION IS AT LEAST 125-FEET. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND NEWLY PERMITTED (PERMIT NO. 1312B) WASTE DISPOSAL AIRSPACE IS AT LEAST 125-FEET.
5. REFER TO APPENDIX IIII, FOR DETAILS OF THE LANDFILL GAS MANAGEMENT PLAN.
6. DRAINAGE DESIGN INFORMATION IS PROVIDED IN APPENDIX IIIF-SURFACE WATER DRAINAGE PLAN.
7. MINIMUM EXCAVATION ELEVATION AT LCS SUMPS IS 387 FT-MSL. MAXIMUM TOP OF FINAL COVER ELEVATION IS 725 FT-MSL.
8. STATIC GROUNDWATER ELEVATIONS AND GROUNDWATER AT TIME OF DRILLING NOT REPORTED IN ALL BOREHOLES.
9. LOCATIONS OF TYPICAL LFG EXTRACTION WELLS CAN BE FOUND IN APPENDIX IIII.
10. REFER TO APPENDIX IIIC FOR LEACHATE COLLECTION SYSTEM (LCS) FORCEMAIN INFORMATION.

DRAFT

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

SHEET IIIA-B.4

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- [x] FOR PERMITTING PURPOSES ONLY
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- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: B.4-B-11-SECTIONS.DWG

DRAWN BY: JCW
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SECTION A

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING B.4

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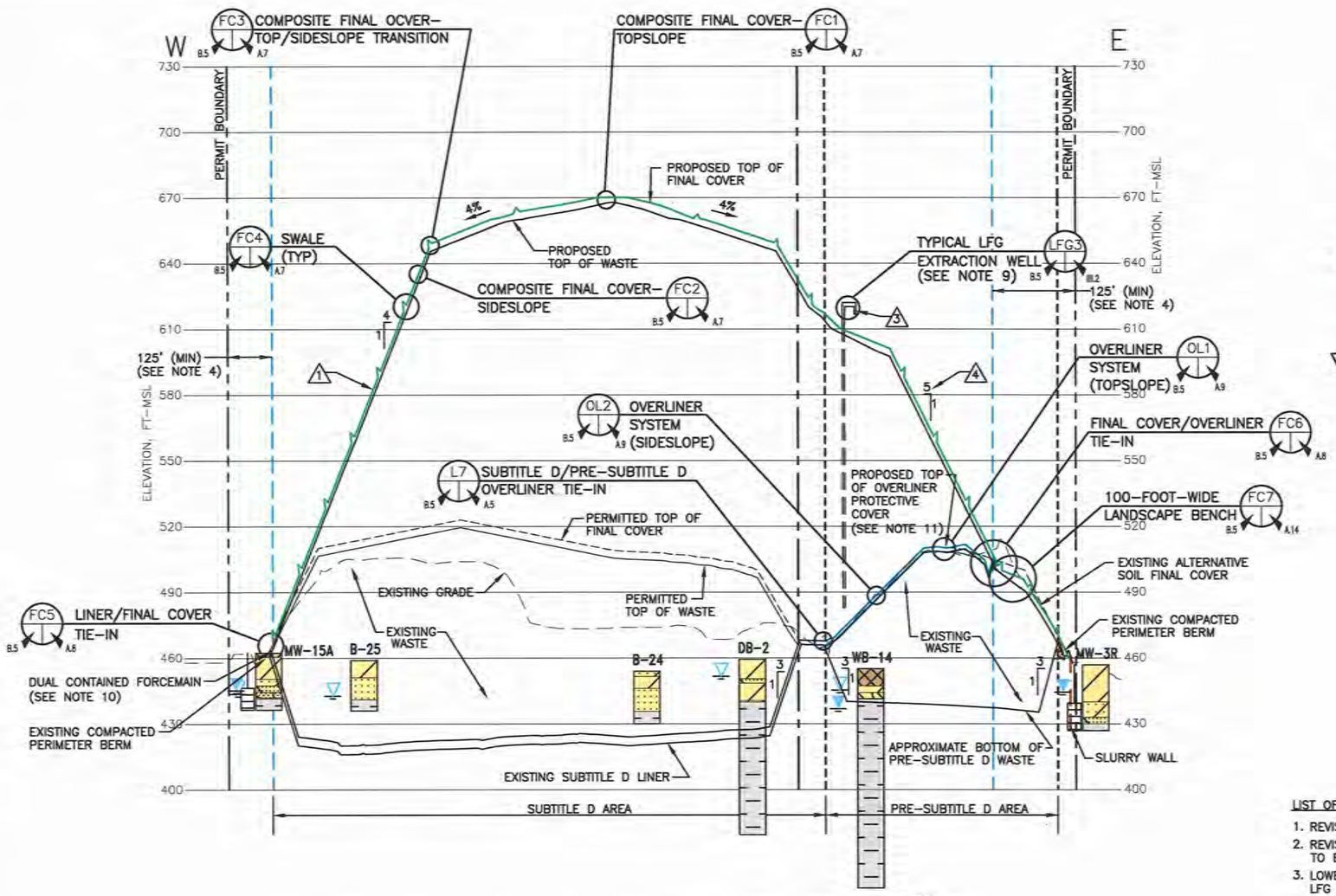
G:\1339\36\EXPANSION 2009\PART III-SDP\IIIA\B\B.4-B.11-SECTIONS.dwg, jwilson, 1:2

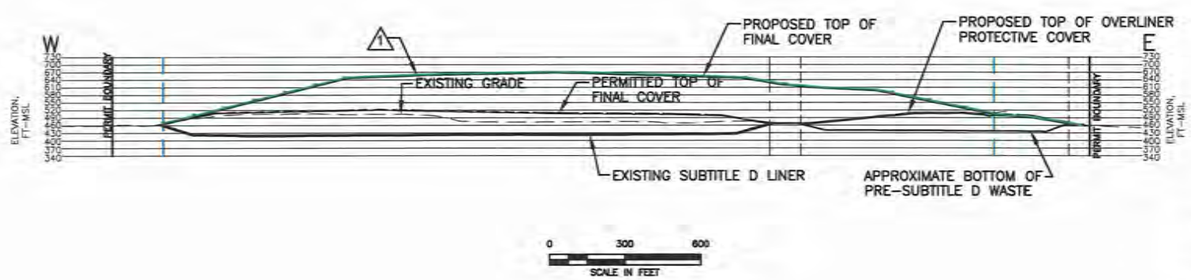


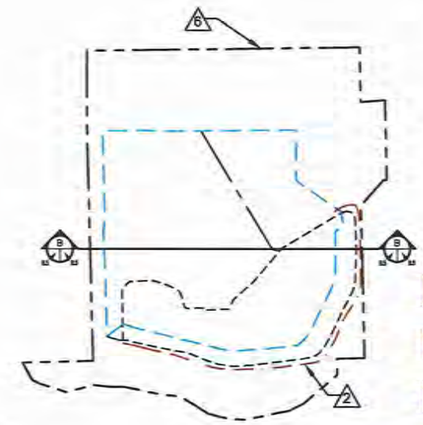
0 300 600 SCALE IN FEET HORIZONTAL

0 30 60 SCALE IN FEET VERTICAL

SECTION B (EXAGGERATED VERTICAL SCALE)

B.1,B.2,B.3 B.5





KEY MAP (NTS)

LEGEND

- PERMIT BOUNDARY
- EXISTING PERMITTED PRE–SUBTITLE D LIMIT OF WASTE
- EXISTING PERMITTED SUBTITLE D LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- EXISTING GRADE
- TOP OF WASTE
- TOP OF FINAL COVER
- EXISTING PERMITTED FINAL COVER
- EXISTING SLURRY WALL
- INDICATES REVISION (SEE LIST OF REVISIONS)
- CLAY AND SILTY CLAY
- EARTHEN FILL
- GRAVELLY SANDY CLAY
- SAND
- SANDY CLAY
- CLAYEY GRAVEL
- GRAVEL
- GRAVELLY SAND
- GRAVELLY SANDY CLAY
- UNWEATHERED SHALE
- SANDY GRAVEL
- WEATHERED SHALE
- SILTY SAND
- GROUNDWATER AT THE TIME OF DRILLING (ATD)
- STATIC GROUNDWATER LEVEL AS DESCRIBED ON BORING LOG

LIST OF REVISIONS:

1. REVISED FINAL COVER.
2. REVISED SLURRY WALL TO EXISTING LOCATION.
3. LOWERED ELEVATION OF LFG EXTRACTION WELL.
4. REVISED SLOPE TO 5H:1V.
5. REVISED NOTE 7.
6. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING CONTOURS AND ELEVATIONS PREPARED BY METROPOLITAN AERIAL SURVEYS FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010.
2. REFER TO APPENDIX IIIA–A FOR LINER, OVERLINER, LEACHATE COLLECTION, AND FINAL COVER SYSTEM DETAILS.
3. SEE APPENDIX IIIG FOR BORING DATA. BORINGS PROJECTED INTO THE LINE OF SECTION. SEE DRAWING B.1 FOR LOCATION.
4. AS SHOWN IN APPENDIX I/IIC, THE BUFFER ZONES VARY AROUND THE PERIMETER OF THE SITE, BUT IN NO CASE ARE THEY LESS THAN 50–FEET FOR EXISTING WASTE. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND THE LATERAL EXPANSION IS AT LEAST 125–FEET. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND NEWLY PERMITTED (PERMIT NO. 1312B) WASTE DISPOSAL AIRSPACE IS AT LEAST 125–FEET.
5. REFER TO APPENDIX IIII, FOR DETAILS OF THE LANDFILL GAS MANAGEMENT PLAN.
6. DRAINAGE DESIGN INFORMATION IS PROVIDED IN APPENDIX IIIF–SURFACE WATER DRAINAGE PLAN.
7. MINIMUM EXCAVATION ELEVATION AT LCS SUMPS IS 387 FT–MSL. MAXIMUM TOP OF FINAL COVER ELEVATION IS 675 FT–MSL.
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11. REFER TO APPENDIX IIIA–A FOR THE OVERLINER DESIGN THAT WILL BE INSTALLED OVER THE PRE–SUBTITLE D AREA.

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- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339–351–11
CAD: B.4–B–11–SECTIONS.DWG

DRAWN BY: JDW
DESIGN BY: MCM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT TYPICAL SECTION B

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F–3727

CHICAGO, IL · NAPERVILLE, IL · COLUMBUS, OH · DENVER, CO · FORT WORTH, TX (817) 735–9770 · GRIFFITH, IN · SOUTH BEND, IN · SPRINGFIELD, IL · ST. LOUIS, MO

DRAWING B.5

SHEET IIIA–B.5

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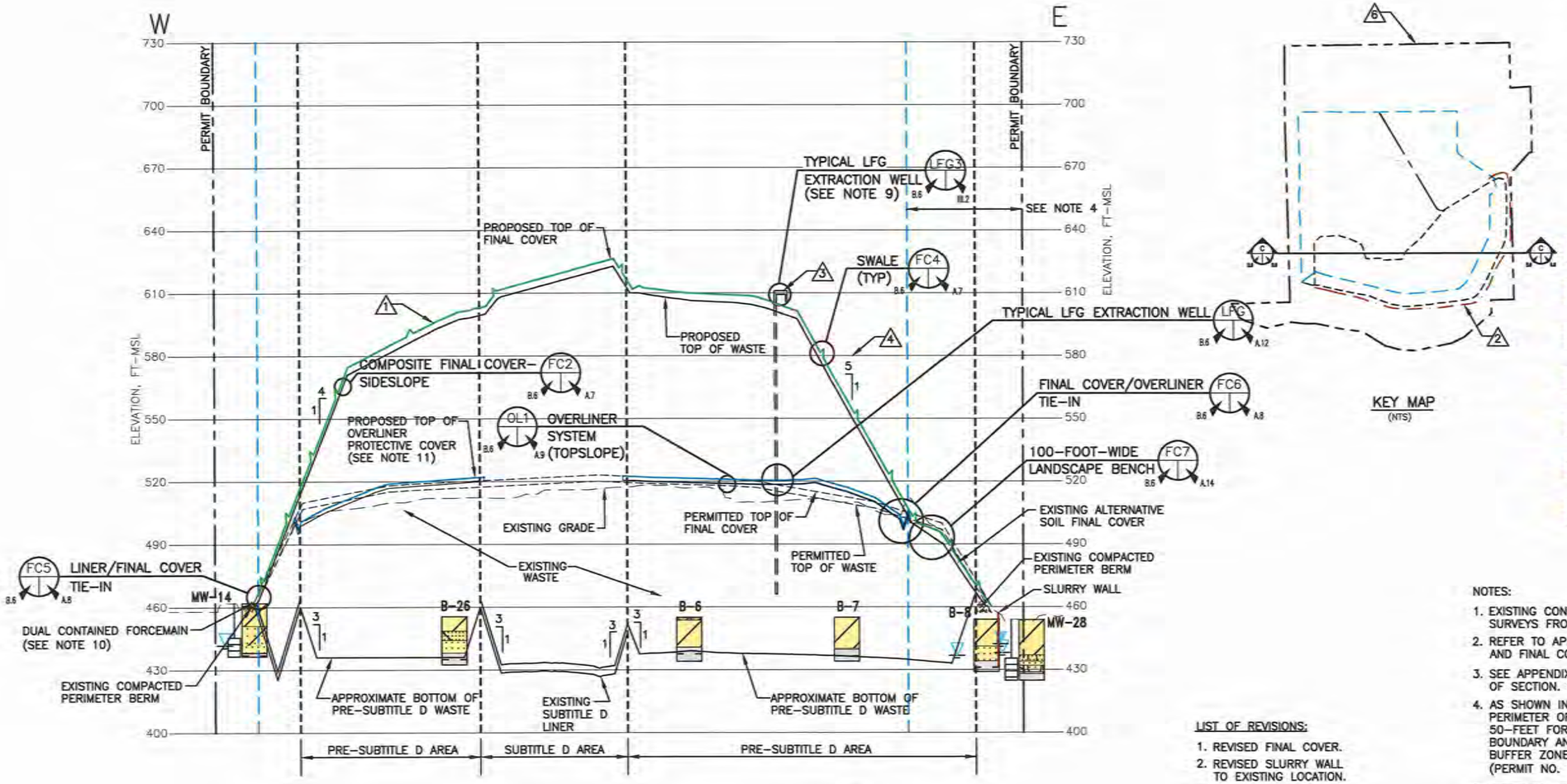

LEGEND

- PERMIT BOUNDARY
- EXISTING PERMITTED PRE-SUBTITLE D LIMIT OF WASTE
- EXISTING PERMITTED SUBTITLE D LIMIT OF WASTE
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- EXISTING GRADE
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- EXISTING PERMITTED FINAL COVER
- EXISTING SLURRY WALL
- INDICATES REVISION (SEE LIST OF REVISIONS)
- CLAY AND SILTY CLAY
- EARTHEN FILL
- GRAVELLY SANDY CLAY
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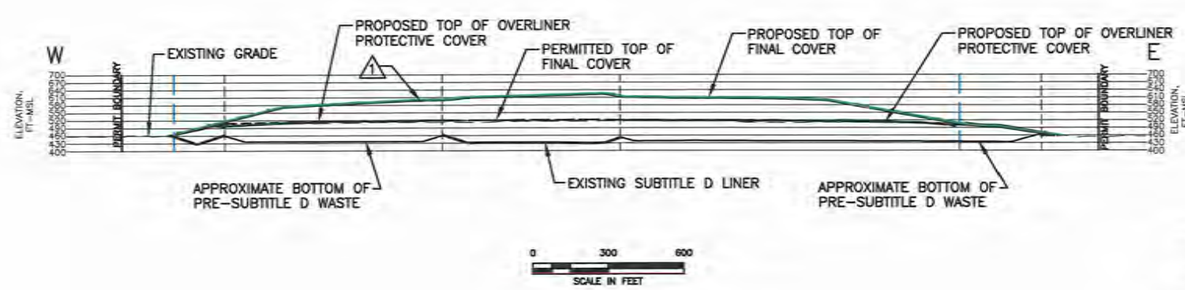
LIST OF REVISIONS:

1. REVISED FINAL COVER.
2. REVISED SLURRY WALL TO EXISTING LOCATION.
3. LOWERED ELEVATION OF LFG EXTRACTION WELL.
4. REVISED SLOPE TO 5H:1V.
5. REVISED NOTE 7.
6. UPDATED PERMIT BOUNDARY.



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DATE: 03/2012
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DRAWN BY: JDW
DESIGN BY: MGM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SECTION C

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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SHEET IIIA-B.6

DRAWING B.6

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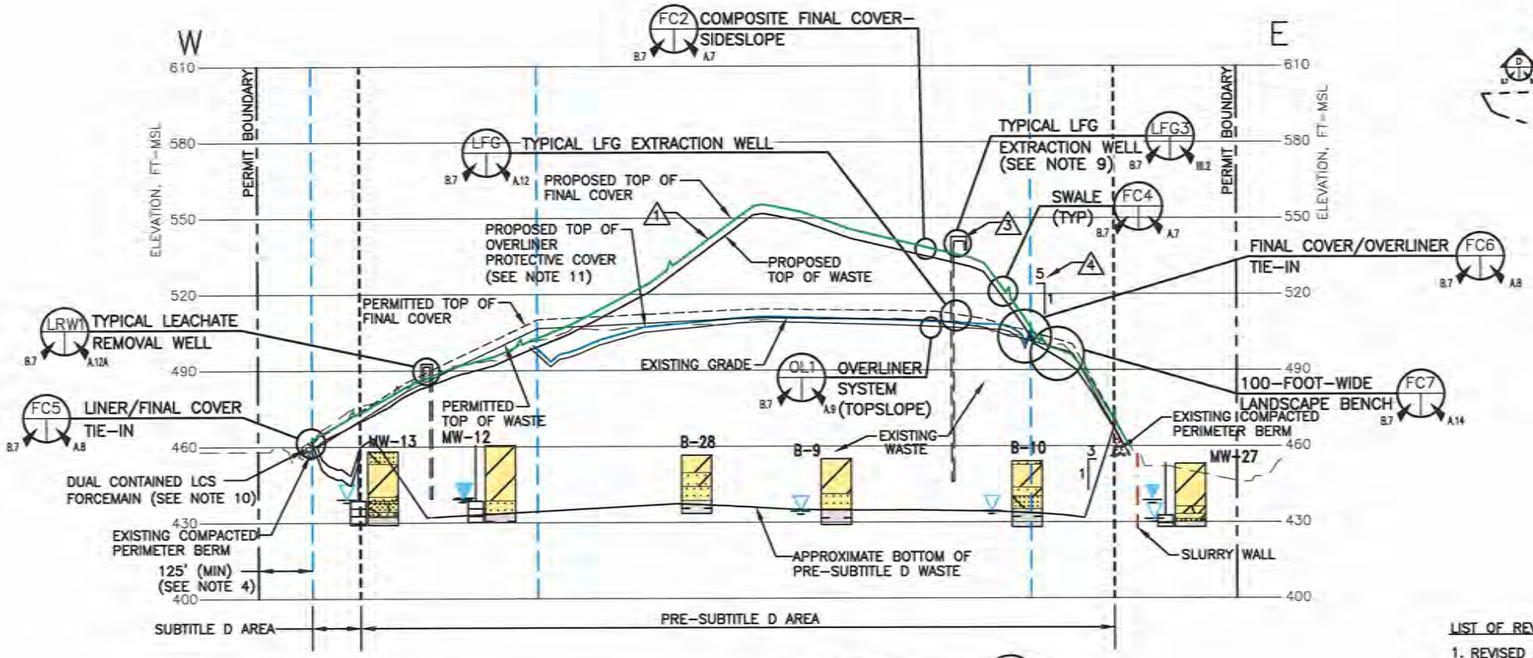
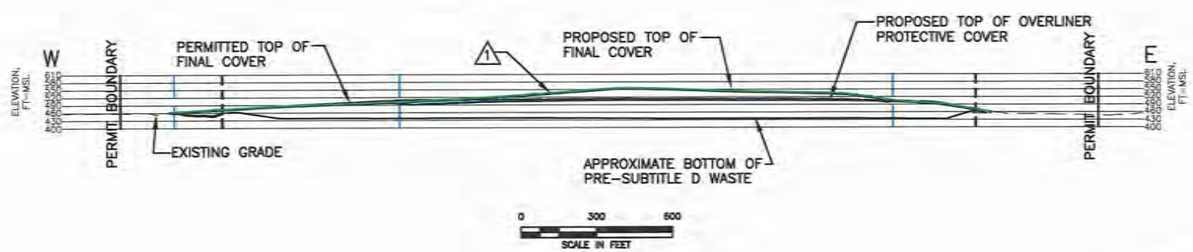


0 300 600 SCALE IN FEET HORIZONTAL

0 30 60 SCALE IN FEET VERTICAL

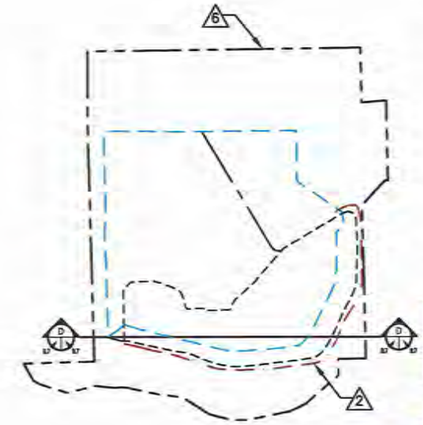
SECTION D
(EXAGGERATED VERTICAL SCALE)
B.1,B.2,B.3 B.7



0 300 600 SCALE IN FEET

LIST OF REVISIONS:

1. ADDED TYPICAL LEACHATE REMOVAL WELL.



KEY MAP
(NTS)

LEGEND

- PERMIT BOUNDARY
- EXISTING PERMITTED PRE-SUBTITLE D LIMIT OF WASTE
- EXISTING PERMITTED SUBTITLE D LIMIT OF WASTE
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- EXISTING GRADE
- TOP OF WASTE
- TOP OF FINAL COVER
- EXISTING PERMITTED FINAL COVER
- EXISTING SLURRY WALL
- INDICATES REVISION (SEE LIST OF REVISIONS)

CLAY AND SILTY CLAY
EARTHEN FILL
GRAVELLY SANDY CLAY
SAND
SANDY CLAY
CLAYEY GRAVEL
GRAVEL
GRAVELLY SAND
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LIST OF REVISIONS:

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3. LOWERED ELEVATION OF LFG EXTRACTION WELL.
4. REVISED SLOPE TO 5H:1V.
5. REVISED NOTE 7.
6. UPDATED PERMIT BOUNDARY.

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: B.4-B-11-SECTIONS.DWG

DRAWN BY: JDW
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT TYPICAL SECTION D

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIA-B.7

DRAWING B.7

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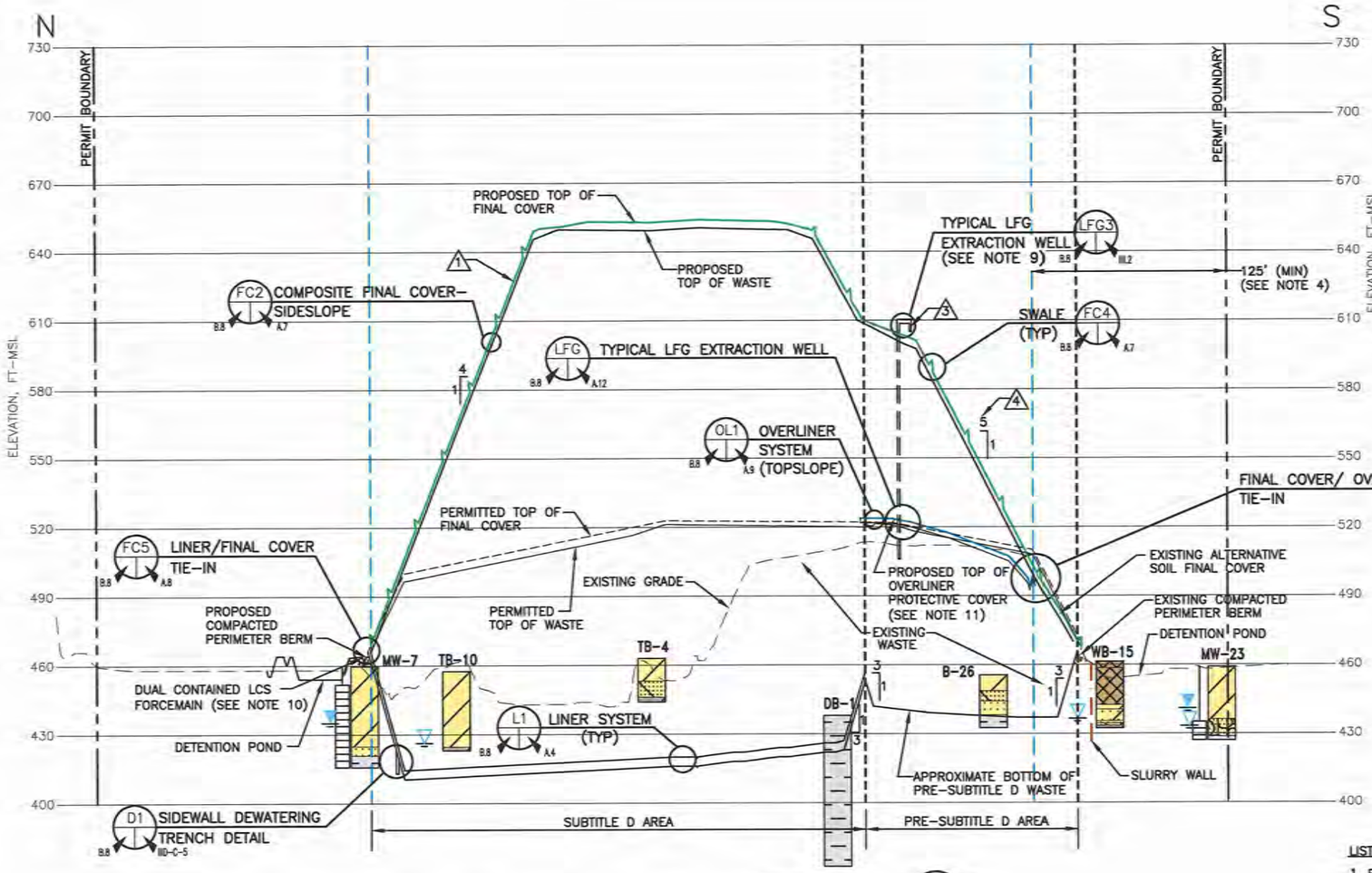
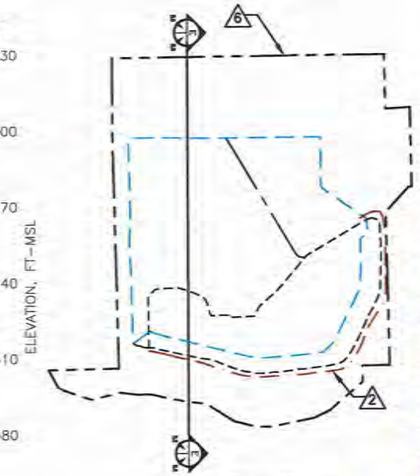


SECTION (EXAGGERATED VERTICAL SCALE) E



LEGEND

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- INDICATES REVISION (SEE LIST OF REVISIONS)
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LIST OF REVISIONS:

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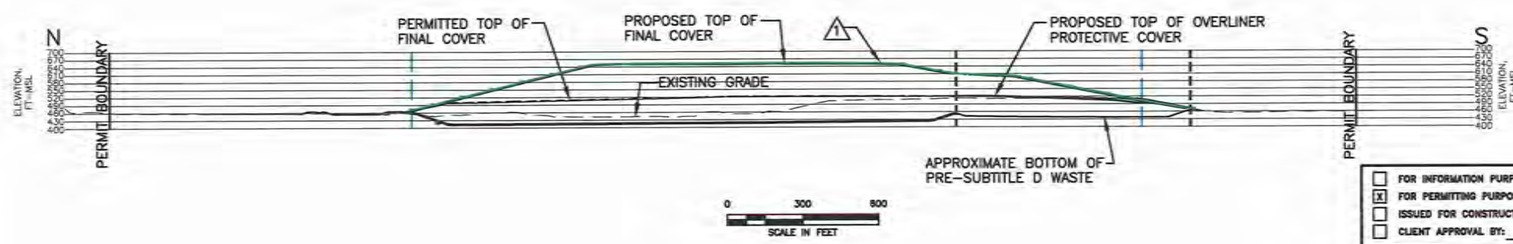

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DRAWN BY: JDW
DESIGN BY: NDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SECTION E

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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DRAWING B.8

SHEET IIIA-B.8

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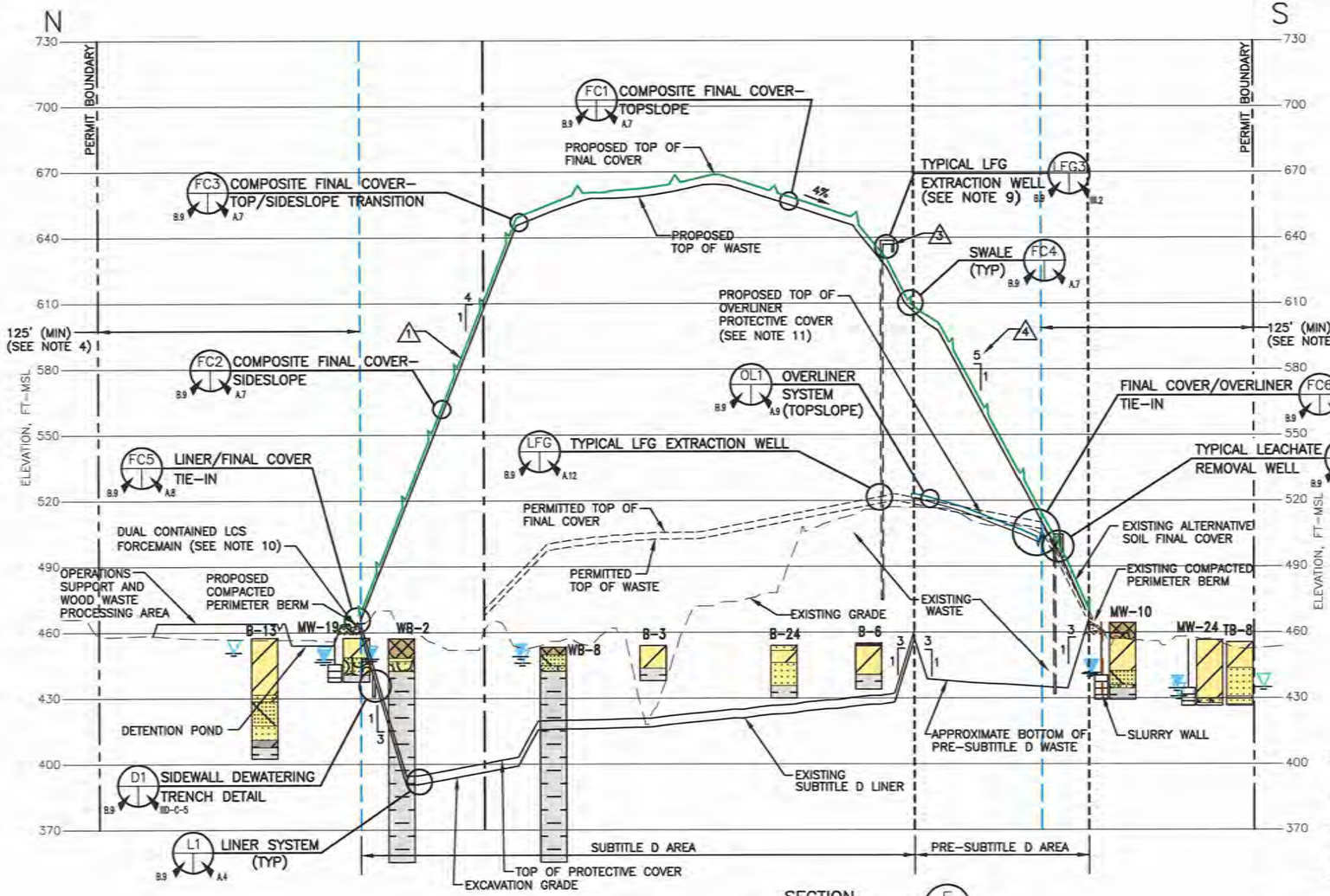
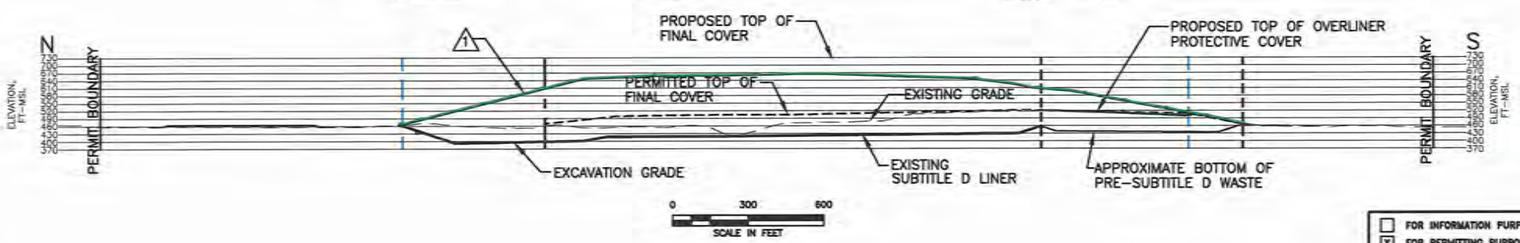
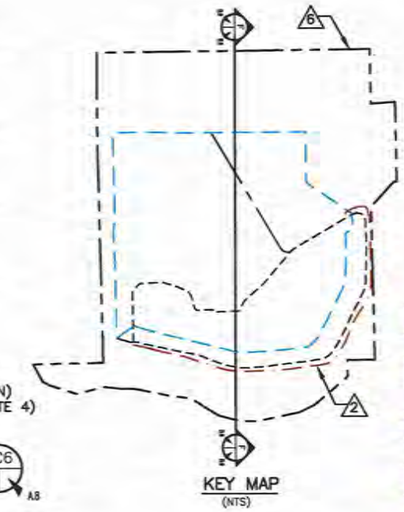


SECTION F
(EXAGGERATED VERTICAL SCALE)
B.1,B.2,B.3 B.9





LEGEND

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4. AS SHOWN IN APPENDIX I/IIC, THE BUFFER ZONES VARY AROUND THE PERIMETER OF THE SITE, BUT IN NO CASE ARE THEY LESS THAN 50–FEET FOR EXISTING WASTE. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND THE LATERAL EXPANSION IS AT LEAST 125–FEET. THE BUFFER ZONE BETWEEN THE PERMIT BOUNDARY AND NEWLY PERMITTED (PERMIT NO. 1312B) WASTE DISPOSAL AIRSPACE IS AT LEAST 125–FEET.
5. REFER TO APPENDIX IIII, FOR DETAILS OF THE LANDFILL GAS MANAGEMENT PLAN.
6. DRAINAGE DESIGN INFORMATION IS PROVIDED IN APPENDIX IIIF–SURFACE WATER DRAINAGE PLAN.
7. MINIMUM EXCAVATION ELEVATION AT LCS SUMPS IS 387 FT–MSL. MAXIMUM TOP OF FINAL COVER ELEVATION IS 675 FT–MSL.
8. STATIC GROUNDWATER ELEVATIONS AND GROUNDWATER AT TIME OF DRILLING NOT REPORTED IN ALL BOREHOLES.
9. LOCATIONS OF TYPICAL LFG EXTRACTION WELLS CAN BE FOUND IN APPENDIX IIII.
10. REFER TO APPENDIX IIIC FOR LEACHATE COLLECTION SYSTEM (LCS) FORCEMAIN INFORMATION.
11. REFER TO APPENDIX IIIA–A FOR THE OVERLINER DESIGN THAT WILL BE INSTALLED OVER THE PRE–SUBTITLE D AREA.

LIST OF REVISIONS:

1. REVISED FINAL COVER.
2. REVISED SLURRY WALL TO EXISTING LOCATION.
3. LOWERED ELEVATION OF LFG EXTRACTION WELL.
4. REVISED SLOPE TO 5H:1V.
5. REVISED NOTE 7.
6. UPDATED PERMIT BOUNDARY.

DRAFT

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- ☐ CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: B.4-9-11-SECTIONS.DWG

DRAWN BY: JDW
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2019	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SECTION F

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING B.9

SHEET IIIA-B.9

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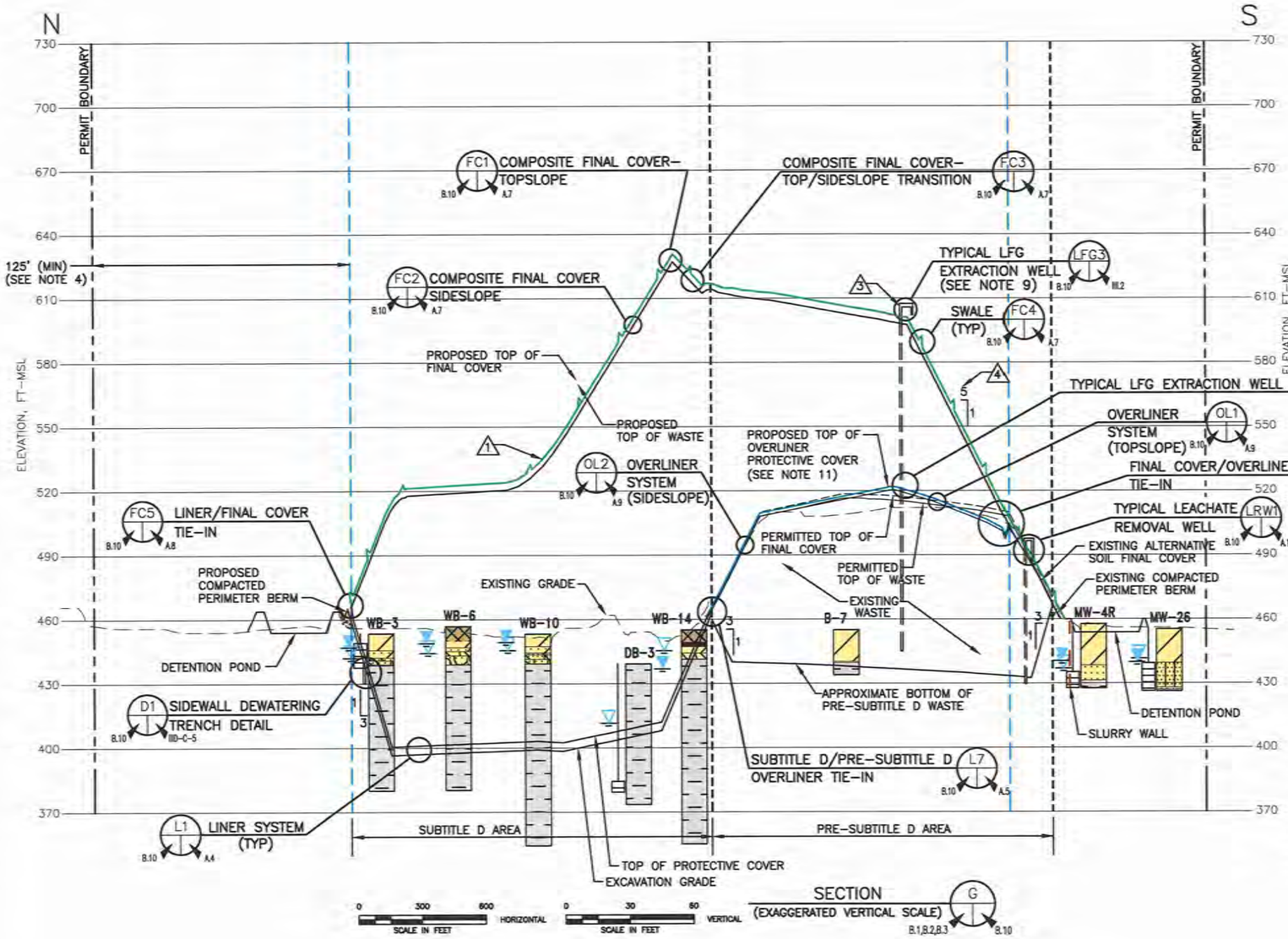

LEGEND

- PERMIT BOUNDARY
- EXISTING PERMITTED PRE-SUBTITLE D LIMIT OF WASTE
- EXISTING PERMITTED SUBTITLE D LIMIT OF WASTE
- NEWLY PERMITTED AIRSPACE LIMIT OF WASTE
- EXISTING GRADE
- TOP OF WASTE
- TOP OF FINAL COVER
- EXISTING PERMITTED FINAL COVER
- EXISTING SLURRY WALL
- INDICATES REVISION (SEE LIST OF REVISIONS)
- CLAY AND SILTY CLAY
- EARTHEN FILL
- GRAVELLY SANDY CLAY
- SAND
- SANDY CLAY
- CLAYEY GRAVEL
- GRAVEL
- GRAVELLY SAND
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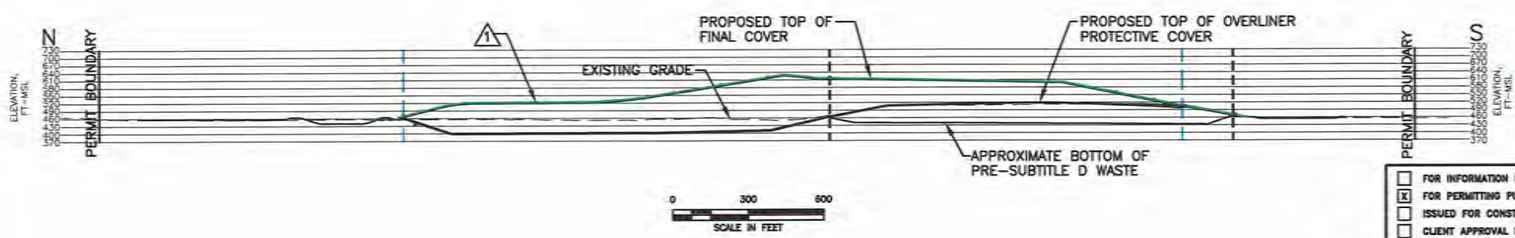

NOTES:

1. EXISTING CONTOURS AND ELEVATIONS PREPARED BY METROPOLITAN AERIAL SURVEYS FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010.
2. REFER TO APPENDIX IIIA-A FOR LINER, OVERLINER, LEACHATE COLLECTION, AND FINAL COVER SYSTEM DETAILS.
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LIST OF REVISIONS:

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2. REVISED SLURRY WALL TO EXISTING LOCATION.
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DATE: 03/2012
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DRAWN BY: JDW
DESIGN BY: MDM
REVIEWED BY: JPY

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SHEET IIIA-B.10

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT TYPICAL SECTION G

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DENTON COUNTY, TEXAS

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DRAWING B.10

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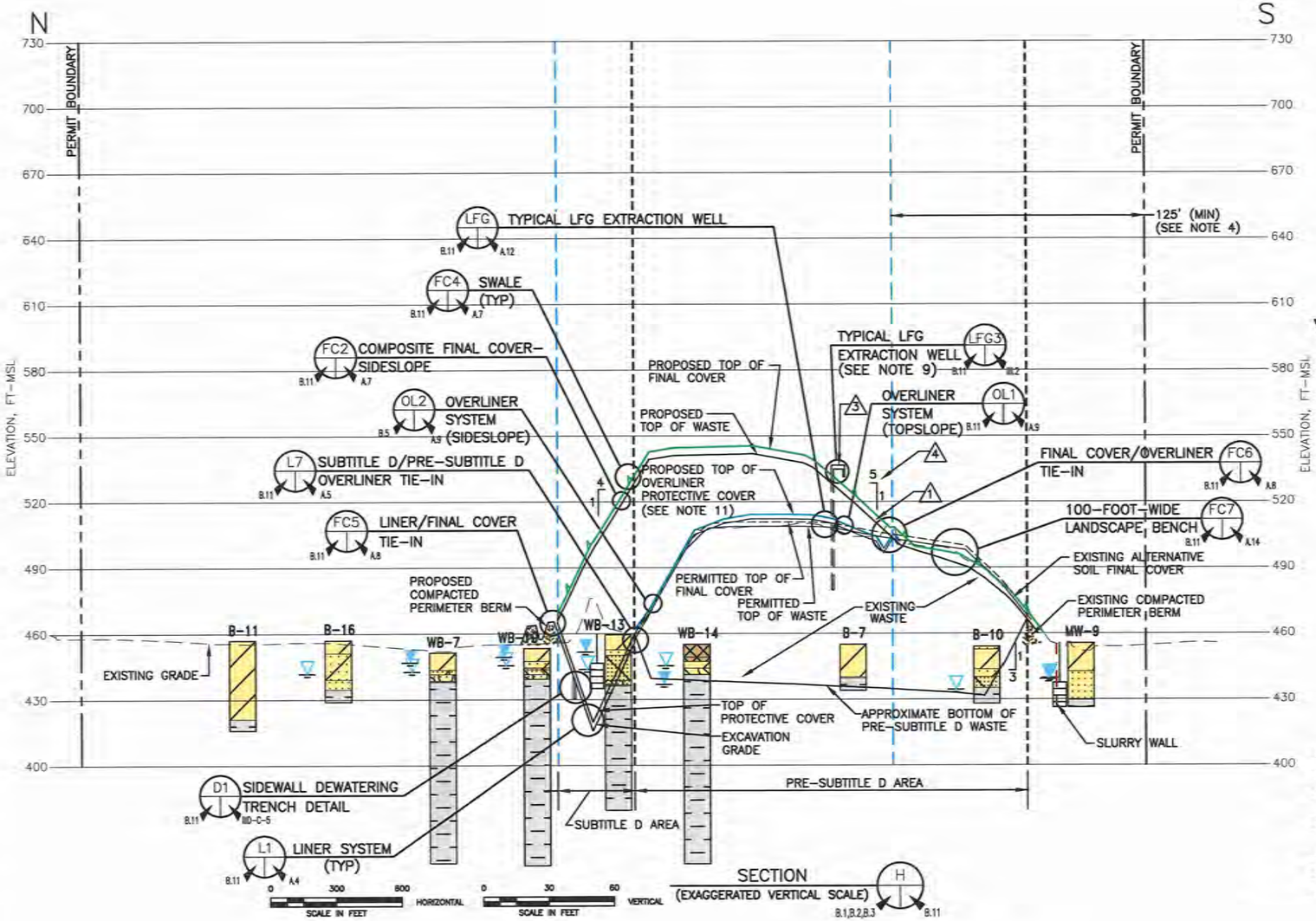

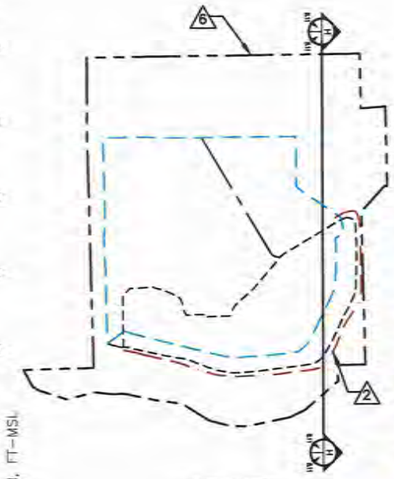

LEGEND

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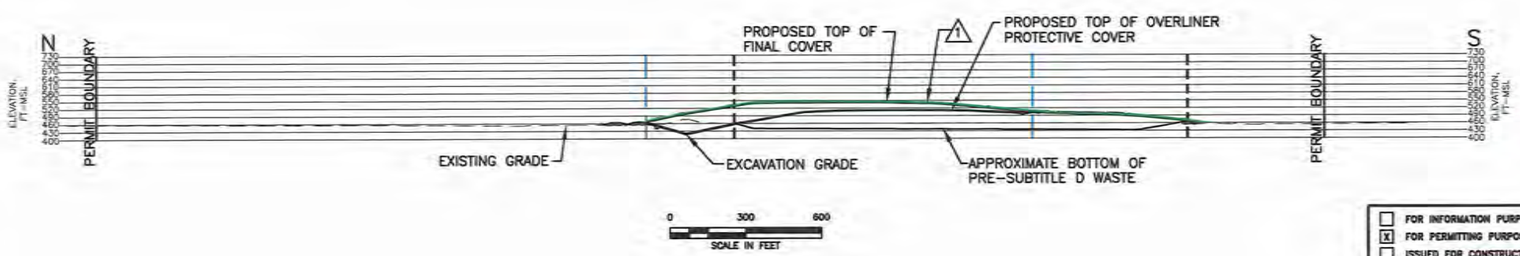

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- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
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DRAWN BY: JCW
DESIGN BY: MCM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SECTION H

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIA-B.11

DRAWING B.11

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APPENDIX IIIA-C HAS BEEN REMOVED BECAUSE THE SLURRY WALL CONSTRUCTION WAS COMPLETED UNDER TCEQ PERMIT NO. 1312A. LOCATION OF "AS-BUILT SLURRY WALL" HAS BEEN INCORPORATED INTO APPROPRIATE DRAWINGS.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

VOLUME 2 OF 6

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014
Revised October 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B

This document is intended for permitting purposes only.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIB
WASTE CONTAINMENT SYSTEM DESIGN
POINT OF COMPLIANCE DEMONSTRATION

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised April 2014
Revised June 2014

Revised August 2016

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TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B.2

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1 INTRODUCTION

1.1 Purpose

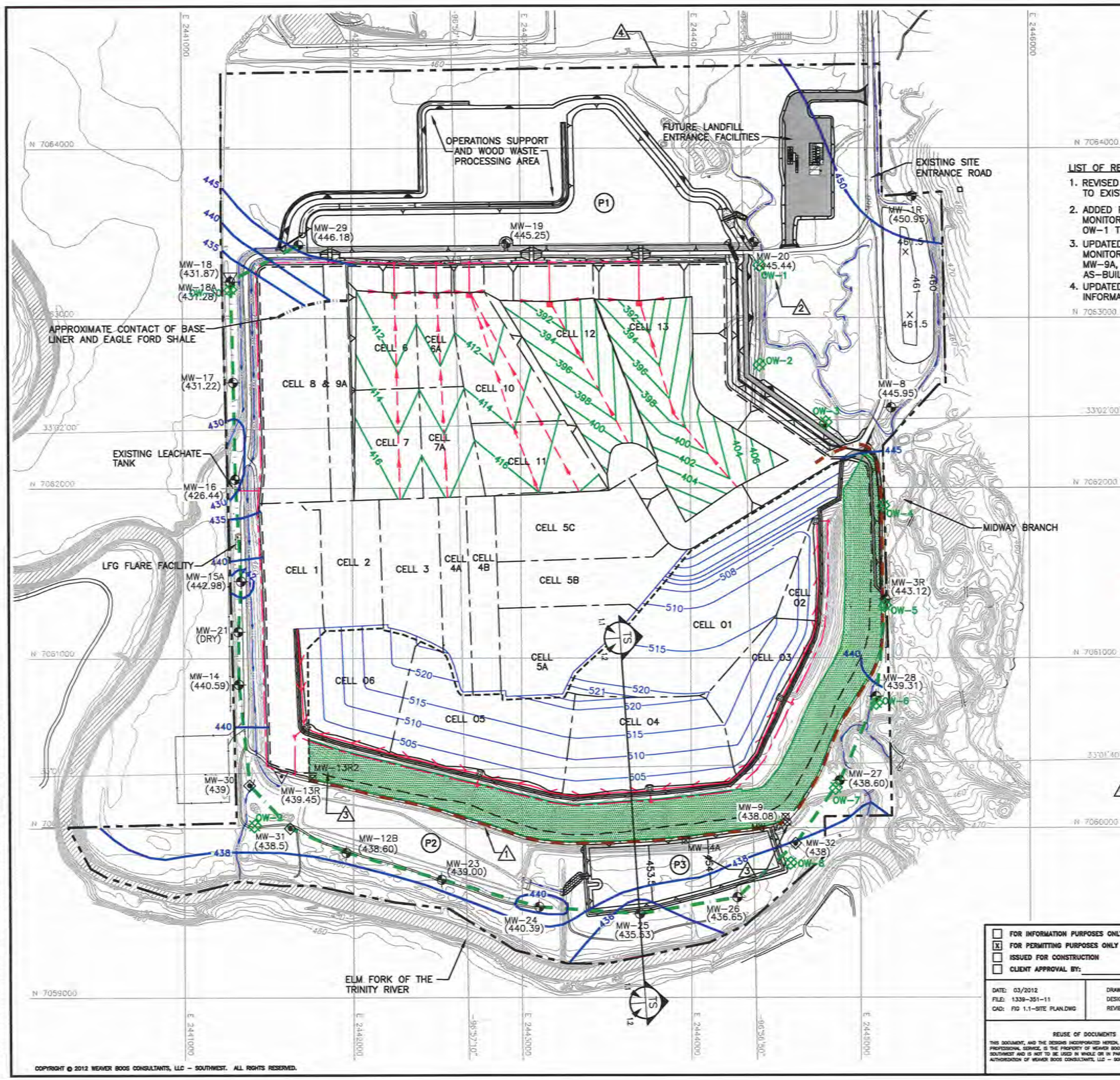
The proposed continued development of the Camelot Landfill includes a vertical expansion over the pre-Subtitle D portion of the landfill. The purpose of this appendix is to demonstrate that the proposed containment system design for the pre-Subtitle D area meets the point of compliance (POC) requirements set forth in Title 30 TAC §330.331(a). This is achieved by demonstrating that the predicted concentrations of selected leachate chemical constituents do not exceed maximum contaminant levels listed in Table 1 in §330.331(a)(1) in the uppermost aquifer at the POC.

Section 1.2 provides a description of the containment system design and Section 1.3 presents an overview of the POC demonstration.

1.2 Containment System Design

The locations of the pre-Subtitle D area, the overliner area, and the point of compliance are shown on Figure 1.1. The overliner area will consist of Cells O1 through O6, which comprises approximately 61.7 acres of the total 236.8-acre solid waste disposal area footprint. The waste containment system design is shown on Figure 1.2. Each component of the design is described below.

- I – In-situ Bottom Liner. This relatively thick geologic layer prevents the downward migration of leachate. The thickness of the unweathered Shale Strata below the pre-Subtitle D area varies from approximately 55 feet to approximately 90 feet (refer to Figure IIIG-C-4 in Appendix IIIG-C).
- II and III – 3-foot-thick Compacted Clay Sidewall Liner and Slurry Wall. These two components of the containment system form a dual barrier to prevent the lateral migration of leachate from the landfill. The extent of the slurry wall, or soil bentonite cutoff wall, is shown on Figure 1.1. As shown, the slurry wall surrounds the southern and eastern perimeter of the pre-Subtitle D area. The slurry wall ~~will be~~ is keyed into the unweathered Shale Strata and will provide an additional hydraulic barrier between the pre-Subtitle D area and groundwater. The slurry wall backfill ~~will have~~ has a permeability of no more than $1x10^{-7}$ cm/s. The slurry wall ~~is scheduled to be~~ was installed ~~after~~ per a ~~pending~~ permit modification (submitted under TCEQ Permit No. MSW-1312A) ~~is approved~~ (refer to Appendix IIIA, Section 5 for more information).
- IV – Overliner System. The overliner consists of a composite liner system that is designed to prevent the percolation of leachate from the vertical expansion area to the existing waste in the pre-Subtitle D area. The overliner system will convey



0:\1339\351\EXPANSION 2009\PART III-SDP\IIB\FIG 1.1-SITE PLAN.dwg, jwilson, 12

N

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
4. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — EXCAVATION CONTOUR
- 461 — REGRADED BUFFER ZONE AREA
- 430 — GROUNDWATER ELEVATION CONTOUR (FT-MSL) (SEE NOTE 3)
- LEACHATE LINE
- LEACHATE COLLECTION SUMP
- LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D GEOMEMBRANE LINER (SEE NOTE 5)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 3H:1V SLOPE (TYPICAL)
- 515 — TOP OF OVERLINER CONTOUR
- OVERLINER LEACHATE LINE
- OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- POINT OF COMPLIANCE
- EXISTING SLURRY WALL (SEE NOTE 7)
- MW-3R (443.12) — EXISTING MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-30 (439) — PROPOSED MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-13R (439.45) — EXISTING MONITORING WELL PROPOSED FOR REMOVAL AFTER REPLACEMENT WELL BACKGROUND CONCENTRATIONS ESTABLISHED (WITH GROUNDWATER ELEVATION POSTED IN FT-MSL)
- MW-9 (438.08) — EXISTING MONITORING WELL PROPOSED TO CONVERTED TO AN OBSERVATION/MONITORING WELL AFTER REPLACEMENT WELL BACKGROUND CONCENTRATIONS ESTABLISHED (WITH GROUNDWATER ELEVATIONS POSTED IN FT-MSL)
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- CONSTRUCTED FINAL COVER
- INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON DECEMBER 5, 2010. POTENTIOMETRIC CONTOURS INTERPOLATED BY WBC.
4. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).
5. AS-BUILT TOP OF GEOMEMBRANE LINER CONTOURS WERE DEVELOPED FROM HISTORICAL SLERS MAINTAINED IN THE SITE OPERATING RECORD.
6. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
7. REFER TO APPENDIX IIIA-A FOR OVERLINER SYSTEM, LINER SYSTEM AND SLURRY WALL DETAILS.

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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: FIG 1.1-SITE PLAN.DWG

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SITE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
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FIGURE 1.1

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For example, if there were a constituent release from the landfill, leachate would have to flow from the pre-Subtitle D area through the 3-foot-thick clay liner. It would then travel through the subsurface soils before encountering the slurry wall. The leachate constituents would have to travel through the slurry wall and also travel through additional subsurface soils before reaching the POC.

With a two-dimensional analysis, the travel distance between the landfill and the POC occurs via a direct route straight to the POC. However, the actual travel route is more circuitous due to the varying flow gradient between the landfill and the POC (as shown in Appendices IIIG-D and IIIG-F of Appendix IIIG) and this area could be modeled using a three-dimensional analysis. However, if a three-dimensional analysis was performed to model the varying flow patterns, the DAF would be higher (and less conservative) than the two-dimensional analysis which models a direct travel path between the landfill and the POC.

3.2 Sequence of Site Development and Percolation Estimates

Figure 3.3 provides a summary of how the site development will occur. The various stages of development were reproduced from the sector development drawings provided in Parts I/II, Appendix I/IIA. As discussed in Appendix III~~M~~N – Site Life, the site is projected to close in ~~2039~~ 2035. However, the original design that was declared technically complete on March 19, 2015 included an estimated closure date of 2039. Due to the reduction in proposed capacity, the site life projection has been reduced to 2035. However, the modeling for the POC demonstration reflects the original closure date as it provides for a conservative analysis because the estimated percolation rate is higher during the active life of the site under this scenario. Therefore, the 30-year postclosure period for the model will be between 2039 and 2069.

As noted on Figure 3.3, the slurry wall ~~will be~~ has been constructed ~~after~~ per a ~~pending~~ permit modification (submitted under TCEQ Permit No. MSW-1312A) ~~is approved~~ (refer to Appendix IIIA, Section 5). In addition, the site will develop the overliner area toward the end of the active site life. The majority of the Subtitle D area (northern portion of the site) will be developed as much as possible prior to the initial construction event for the overliner system, which is projected to occur in 2028. Construction of overliner cells O1 through O6 should be complete by 2034 for modeling purposes.

Figure 3.4 shows how the percolation rate in each zone varies over the life of the site and the postclosure period. As shown, the percolation rate into the existing waste disposal area below the overliner decreases significantly after the overliner is constructed. As discussed in Appendix IIIA, the overliner system includes a leachate collection system that will remove leachate that is generated from the waste placed in the vertical expansion area, virtually eliminating percolation into the existing waste fill area.

The HELP model was used to estimate each of the percolation rates shown on Figure 3.4, except for the existing alternative soil final cover areas. The percolation rate for this area was assumed to be 4 mm/year. As noted in the permit modification titled, "Alternative Soil Final Cover System Design and Certification Report," the average percolation rate for this area is actually less than 1 mm/year.

The HELP model results are included in Appendix IIIB-A. A detailed discussion of the HELP model and some of the key parameters are provided in Appendix IIIC – Leachate and Contaminated Water Management Plan. A summary of the key assumptions used to develop the percolation rates specific to the POC demonstration in this appendix are listed below.

- As noted in Section 3.1, the percolation through the intermediate cover, overliner, and final cover was assumed to flow directly to the bottom of the landfill. This is a conservative assumption because the travel time, absorption, and consumption of water that enters the landfill is not accounted for with this assumption. There has been a substantial amount of research completed over the last two decades that shows that municipal solid waste (MSW) landfills have the capacity to absorb and consume a tremendous quantity of water in the waste decomposition process. The decomposition process proceeds relatively slowly until the moisture content of the waste material within the landfill reaches 35 percent or more. Typically, the moisture content of waste when it is first disposed of in the landfill is approximately 25 percent. The water loss is due to (1) the waste biodegradation process, which involves microorganisms breaking down the organic portion of the waste material into carbon dioxide and methane, and (2) the removal of landfill gas (LFG) from the landfill.
- The MODFLOW analysis assumes that in 2011, the bottom 4 feet of the waste disposal area contains saturated waste. The MODFLOW analysis then uses the percolation rate calculated by the HELP model as additional flow that is added to the assumed initial condition of 4 feet of saturated waste. This estimated additional flow of leachate expands the saturated zone from 4 feet thick to 10 feet thick between 2011 and when the overliner is projected to begin construction (2028).

  However, this is a very conservative assumption given that the analysis ignores two separate leachate removal systems that will be used to prevent the buildup of leachate in the pre-Subtitle D area.

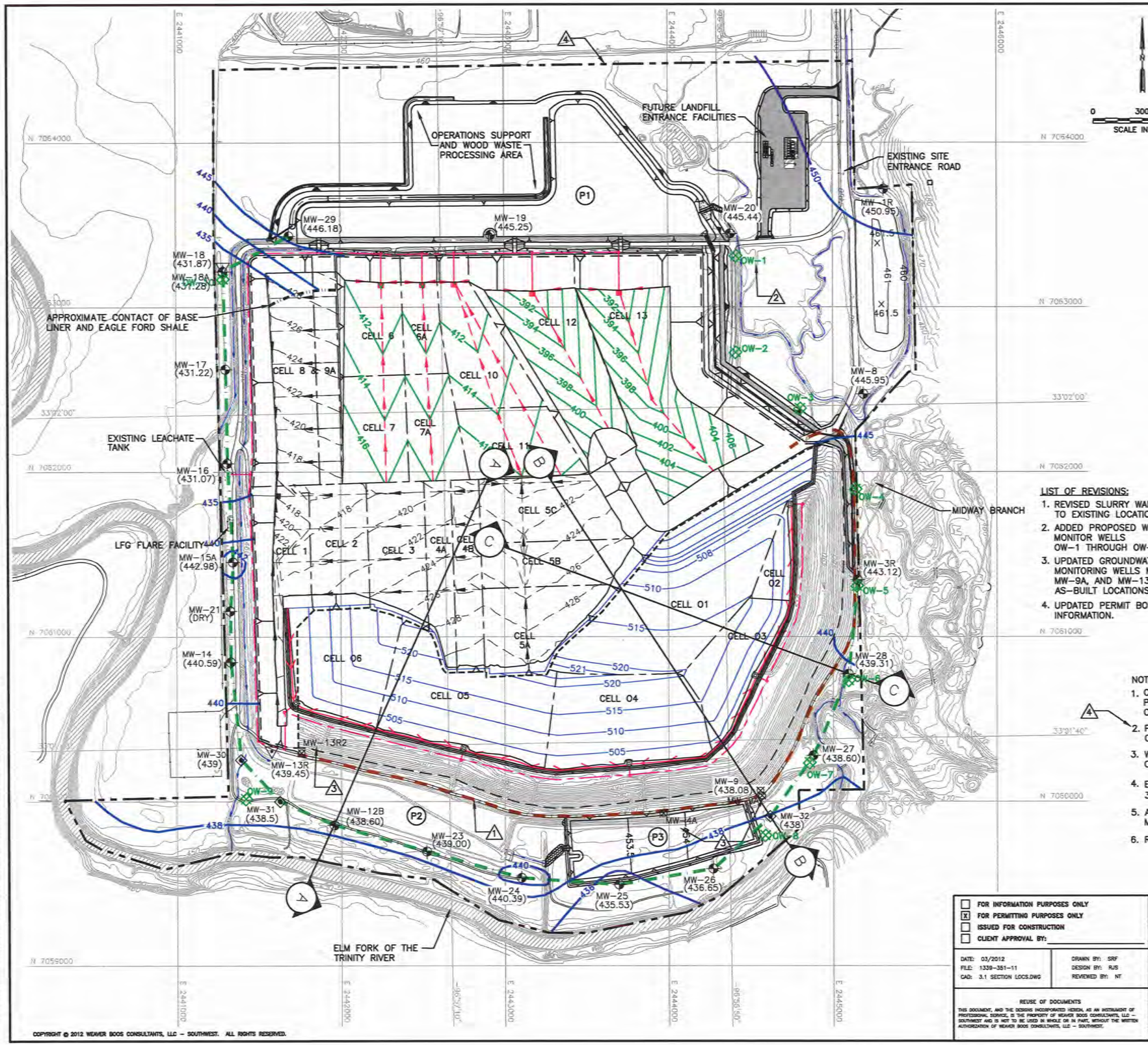
  Between 2005 and 2011, 77 LFG extraction wells were installed in the pre-Subtitle D area. A review of the construction reports for each event show that the existing waste fill area is relatively dry. Section 4.2 in Appendix IIIA also includes a plan to remove collected condensate/leachate from the LFG extraction wells in the pre-Subtitle D area. In addition, a detailed pre-Subtitle D area leachate removal system ~~is also planned for installation~~ has been installed under TCEQ Permit No. MSW-1312A. This leachate removal system includes the installation of 10 leachate extraction wells that will be located on the floor of the pre-Subtitle D area, near the toe of the 3H:1V compacted clay liner sideslope.
- To estimate the percolation through the overliner system, it was assumed that during the filling of overliner cells O1 through O6, this area only

has 10 feet of solid waste on the overliner system. This extended period of 10-foot-waste fill condition simulated in the HELP model is intended to conservatively estimate the amount of leachate that will percolate from this area between 2028 and 2039. To verify this assumption, the HELP model was run for various waste thicknesses to demonstrate that this percolation value is conservative. The HELP model simulations for various waste thicknesses are presented in Appendix IIIB-C.

3.3 MODFLOW Model Domain Development

Figure 3.5 – MODFLOW Model Domain Development shows a general setup of the model (Section B is used for the illustration). The upper portion of Figure 3.5 shows Section B across the site to depict the general site condition for the section. As shown on Figure 3.5, the model domain (or the horizontal extension of the MODFLOW grid) is set up for the pre-Subtitle D area. The MODFLOW grid is set up to cover the entire overliner area. The figure shows the overliner area, the distance between the pre-Subtitle D limits of waste and the POC, location of the slurry wall, and permit boundary. The lower portion of Figure 3.5 shows the MODFLOW grid development scheme. Critical points of the MODFLOW grid are shown on the figure. The grid is set up with 5 feet of column width except where a narrower column width was necessary (i.e., pre-Subtitle D liner on 3H:1V vertical slope). The two barriers located between the bottom of waste for the pre-Subtitle D area and the POC are the slurry wall and the compacted clay sidewall liner. Each of these barrier layers is shown on Figure 3.5 and discussed further below.

- Slurry Wall. The slurry wall ~~will be~~ is located adjacent to the existing pre-Subtitle D area as shown on Figure 3.1. The slurry wall ~~will be~~ was installed in accordance with the Construction Quality Assurance Plan for the Slurry Wall included in ~~Appendix IIIA-C~~ a permit modification submitted under TCEQ Permit No. MSW-1312A ~~to ensure the slurry wall is installed as designed~~. The slurry wall thickness ~~will be~~ is 3 feet and the maximum allowable hydraulic conductivity ~~will be~~ is $1x10^{-7}$ cm/s. As demonstrated in the Slurry Wall CQA Report submitted to TCEQ in March 2016, the as-built hydraulic conductivity of the slurry wall ranged from $1.48x10^{-8}$ cm/s to $7.10x10^{-8}$ cm/s. ~~It is expected that slurry wall hydraulic conductivities of more than one order of magnitude of less than $1x10^{-7}$ cm/s will be achieved during the installation. Additionally, during the installation a bentonite seal that establishes on the walls of the excavated trench creates a layer of significantly lower hydraulic conductivity (typically less than 10^{-8} cm/s).~~
- Pre-Subtitle D Liner. The existing pre-Subtitle D liner system was installed under the TCEQ-required construction quality assurance procedures, and SLERs were approved by the TCEQ for each construction event. The available SLERs indicate that the installed soil liner system has hydraulic conductivity values between 10^{-8} to 10^{-9} cm/s. However, a hydraulic conductivity value of $1x10^{-7}$ cm/s was used for modeling purposes.



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — EXCAVATION CONTOUR
- 461 — REGRADED BUFFER ZONE AREA
- 430 — GROUNDWATER ELEVATION CONTOUR (FT-MSL) (SEE NOTE 3)
- LEACHATE LINE
- LEACHATE COLLECTION SUMP
- LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D GEOMEMBRANE LINER (SEE NOTE 5)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 3H:1V SLOPE (TYPICAL)
- 515 — TOP OF OVERLINER CONTOUR
- OVERLINER LEACHATE LINE
- OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- POINT OF COMPLIANCE
- 1 — EXISTING SLURRY WALL
- MW-3R (443.12) — EXISTING MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-30 (439) — PROPOSED MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-13R (439.45) — EXISTING MONITORING WELL PROPOSED FOR REMOVAL AFTER REPLACEMENT WELL BACKGROUND CONCENTRATIONS ESTABLISHED (WITH GROUNDWATER ELEVATION POSTED IN FT-MSL)
- MW-9 (438.08) — EXISTING MONITORING WELL PROPOSED TO CONVERTED TO AN OBSERVATION/MONITORING WELL AFTER REPLACEMENT WELL BACKGROUND CONCENTRATIONS ESTABLISHED (WITH GROUNDWATER ELEVATIONS POSTED IN FT-MSL)
- 2 — OW-1 — PROPOSED WOODBINE MONITOR WELL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
4. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON DECEMBER 5, 2010. POTENTIOMETRIC CONTOURS INTERPOLATED BY WBC.
4. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).
5. AS-BUILT TOP OF GEOMEMBRANE LINER CONTOURS WERE DEVELOPED FROM HISTORICAL SLERS MAINTAINED IN THE SITE OPERATING RECORD.
6. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: 3.1 SECTION LOCS.DWG

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
3	12/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SECTION LOCATIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 3.1

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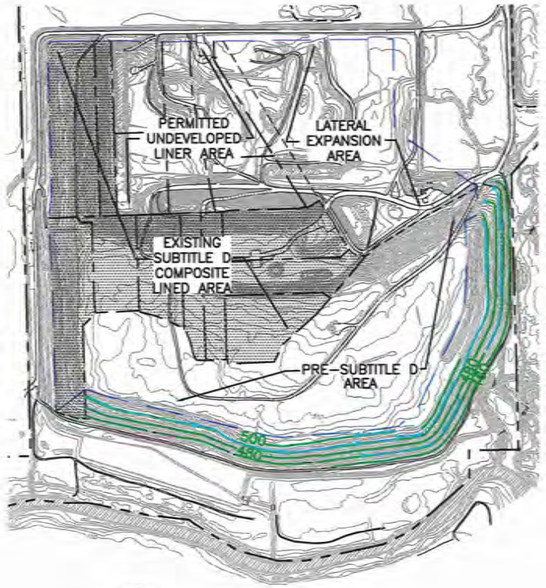
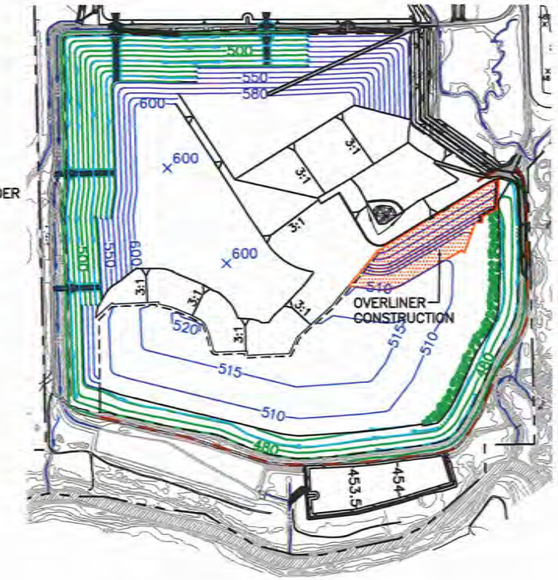
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIG 3.1 SEC LOCS.dwg, jwilson, 1:2



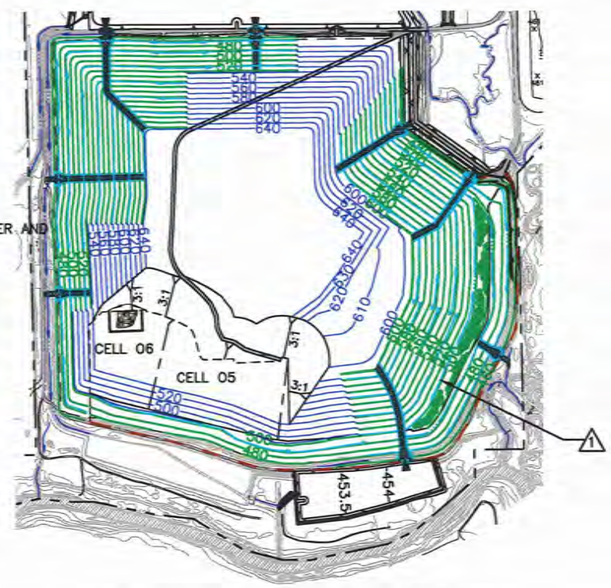
(I) EXISTING CONDITION 2011

SLURRY WALL WAS CONSTRUCTED IN 2015 UNDER PERMIT NO. MSW-1312A.

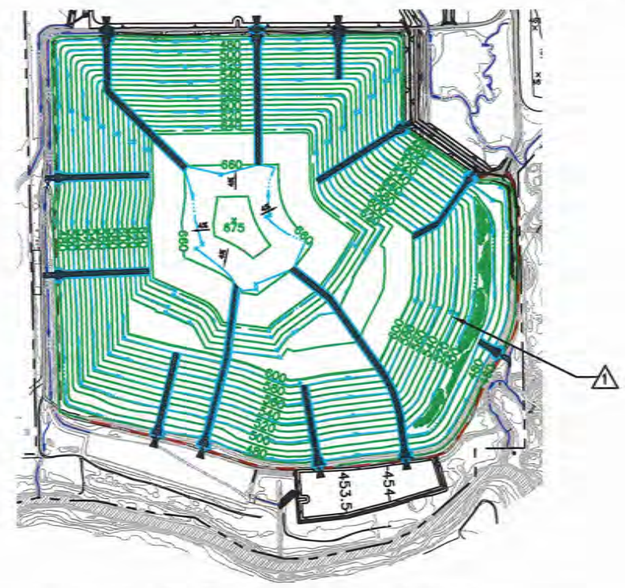
(II) BETWEEN 2011 AND 2028 THE SITE WILL CONTINUE TO DEVELOP NON-OVERLINER AREAS



(III) FIRST OVERLINER AREA IS PROJECTED TO BE CONSTRUCTED IN 2028



(IV) BETWEEN 2028 AND 2039 THE SITE WILL CONTINUE TO DEVELOP CELLS 01 THROUGH 06 AND FILL IN ALL DEVELOPED AREAS (SEE NOTE 1) 2



(V) BETWEEN 2039 AND 2069 THE SITE WILL BE CLOSED FOR A 30-YEAR POST CLOSURE PERIOD (SEE NOTE 1) 2

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED FINAL COVER AND INTERMEDIATES.
2. ADDED NOTE 1.
3. REVISED NOTE.

NOTE:

2 1. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

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- ☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: 3.3 SEQ. OF DEVELOPMENT.DWG

DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1ST TCEQ COMMENT RESPONSE
2	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SEQUENCE OF DEVELOPMENT

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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FIGURE 3.3

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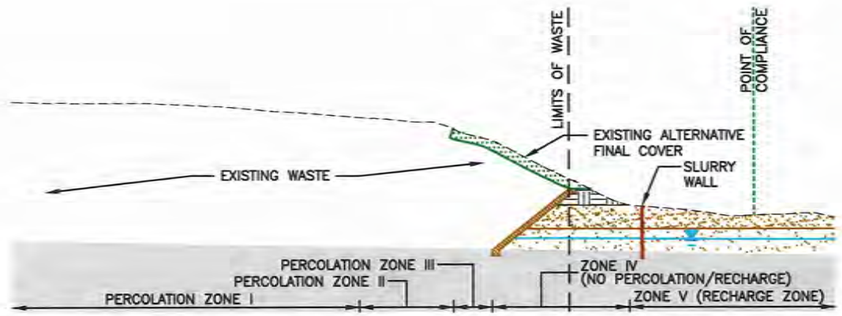
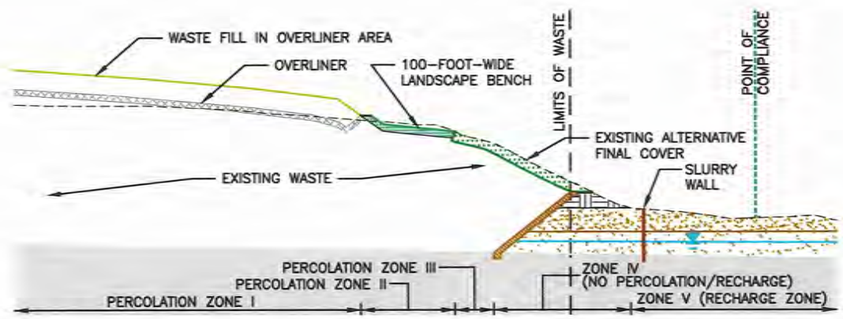
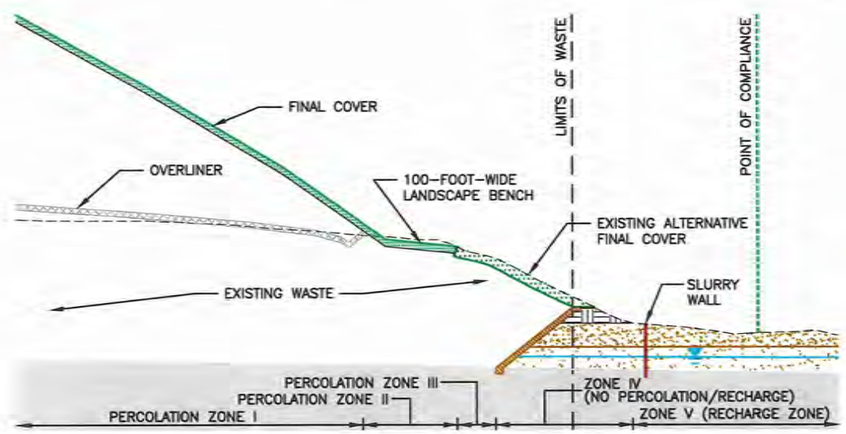
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIG 3.3 SEQUENCE OF DEVELOPMENT.dwg, jwilson, 1:2



BETWEEN 2011 AND 2028 THE SITE WILL CONTINUE TO DEVELOP IN NON–OVERLINER AREAS



BETWEEN 2028 AND 2039 THE SITE WILL DEVELOP CELLS 01 THROUGH 06 AND FILL IN OVERLINER AREAS (SEE NOTE 1) 1



BETWEEN 2039 AND 2069 THE SITE WILL BE CLOSED FOR A 30–YEAR POSTCLOSURE PERIOD (SEE NOTE 1) 1

YEAR 2011–2028 (EXISTING SITE CONDITIONS TO OVERLINER CONSTRUCTION)		
ZONE #	DESCRIPTION	PERCOLATION
PERCOLATION ZONE I	INTERMEDIATE COVER	130 MM/YR
PERCOLATION ZONE II	INTERMEDIATE COVER	130 MM/YR
PERCOLATION ZONE III	ALTERNATIVE FINAL COVER	4 MM/YR
ZONE IV (NO RECHARGE/ PERCOLATION)	LINER SIDESLOPE/ PERIMETER BERM	0 MM/YR
ZONE V (RECHARGE ZONE)	OUTSIDE LANDFILL	7.4 MM/YR

YEAR 2028–2039 (OVERLINER CONSTRUCTION TO CLOSURE)		
ZONE #	DESCRIPTION	PERCOLATION
PERCOLATION ZONE I	OVERLINER	2.5×10^{-4} MM/YR
PERCOLATION ZONE II	FINAL COVER	6.5 MM/YR
PERCOLATION ZONE III	ALTERNATIVE FINAL COVER	4 MM/YR
ZONE IV (NO RECHARGE/ PERCOLATION)	LINER SIDESLOPE/ PERIMETER BERM	0 MM/YR
ZONE V (RECHARGE ZONE)	OUTSIDE LANDFILL	7.4 MM/YR

YEAR 2039–2069 (CLOSURE TO END OF POSTCLOSURE)		
ZONE #	DESCRIPTION	PERCOLATION
PERCOLATION ZONE I	OVERLINER/ FINAL COVER	5.1×10^{-4} MM/YR
PERCOLATION ZONE II	FINAL COVER	6.5 MM/YR
PERCOLATION ZONE III	ALTERNATIVE FINAL COVER	4 MM/YR
ZONE IV (NO RECHARGE/ PERCOLATION)	LINER SIDESLOPE/ PERIMETER BERM	0 MM/YR
ZONE V (RECHARGE ZONE)	OUTSIDE LANDFILL	7.4 MM/YR

DRAFT

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. ADDED NOTE 1.

NOTE:

1 1. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30–YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

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☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339–351–11
CAD: 3.4 TYP. SEC. SEQUENCE.DWG

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SECTION SEQUENCE

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DENTON COUNTY, TEXAS

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FIGURE 3.4

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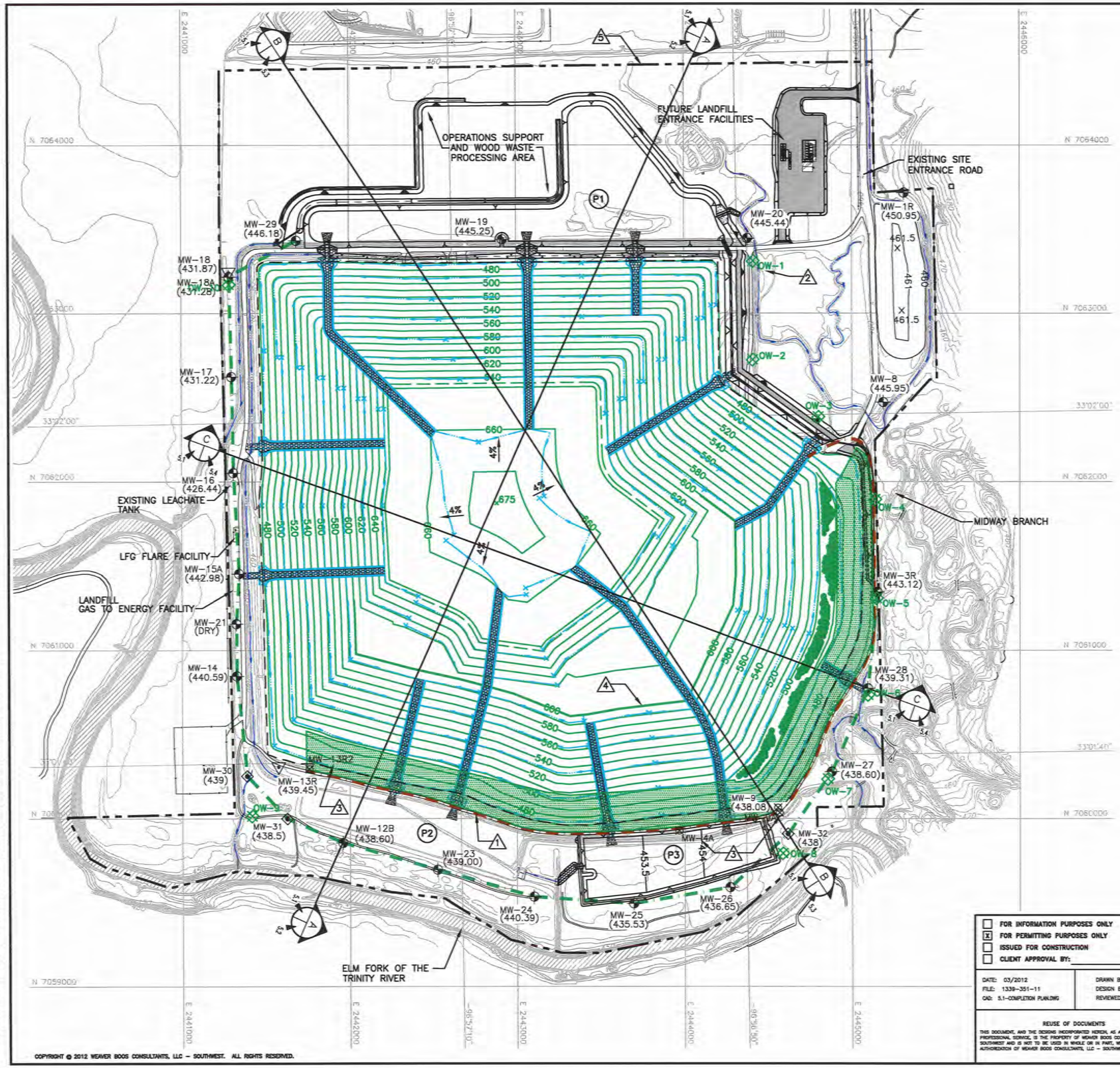
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIG 3.4 TYP SEC. SEQUENCE.dwg, jwilson, 1:2



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- (4) FINAL COVER CONTOUR
- REGRADED BUFFER ZONE AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- POINT OF COMPLIANCE
- (1) EXISTING SLURRY WALL
- MW-3R (443.12) — EXISTING MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-30 (439) — PROPOSED MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-13R (439.45) — EXISTING MONITORING WELL PROPOSED FOR REMOVAL AFTER REPLACEMENT WELL BACKGROUND CONCENTRATIONS ESTABLISHED (WITH GROUNDWATER ELEVATION POSTED IN FT-MSL)
- MW-9 (438.08) — EXISTING MONITORING WELL PROPOSED TO CONVERTED TO AN OBSERVATION/MONITORING WELL AFTER REPLACEMENT WELL BACKGROUND CONCENTRATIONS ESTABLISHED (WITH GROUNDWATER ELEVATIONS POSTED IN FT-MSL)
- LANDSCAPE BENCH
- (2) OW-1 — PROPOSED WOODBINE MONITOR WELL
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. (5) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
4. REVISED FINAL COVER CONTOURS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

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DATE: 03/2012
FILE: 1339-351-11
CAD: 5.1-COMPLETION PLANLING

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT LANDFILL COMPLETION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

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FIGURE 5.1

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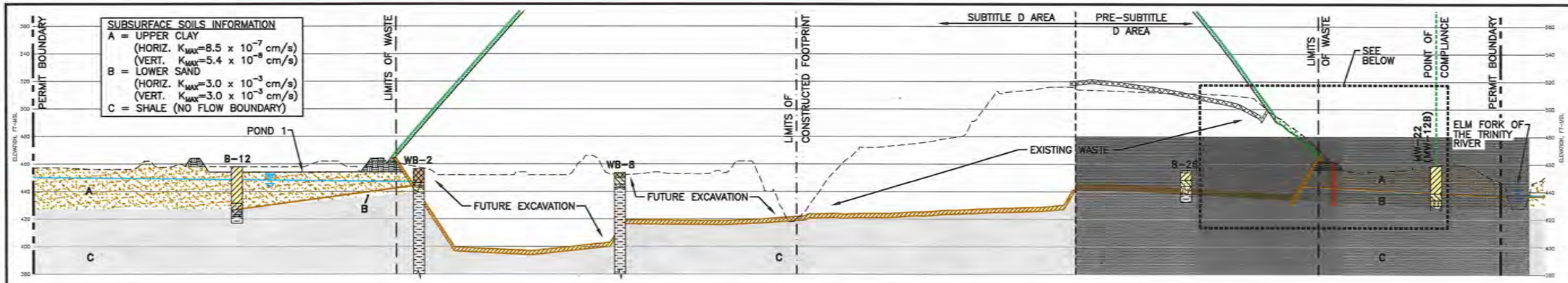
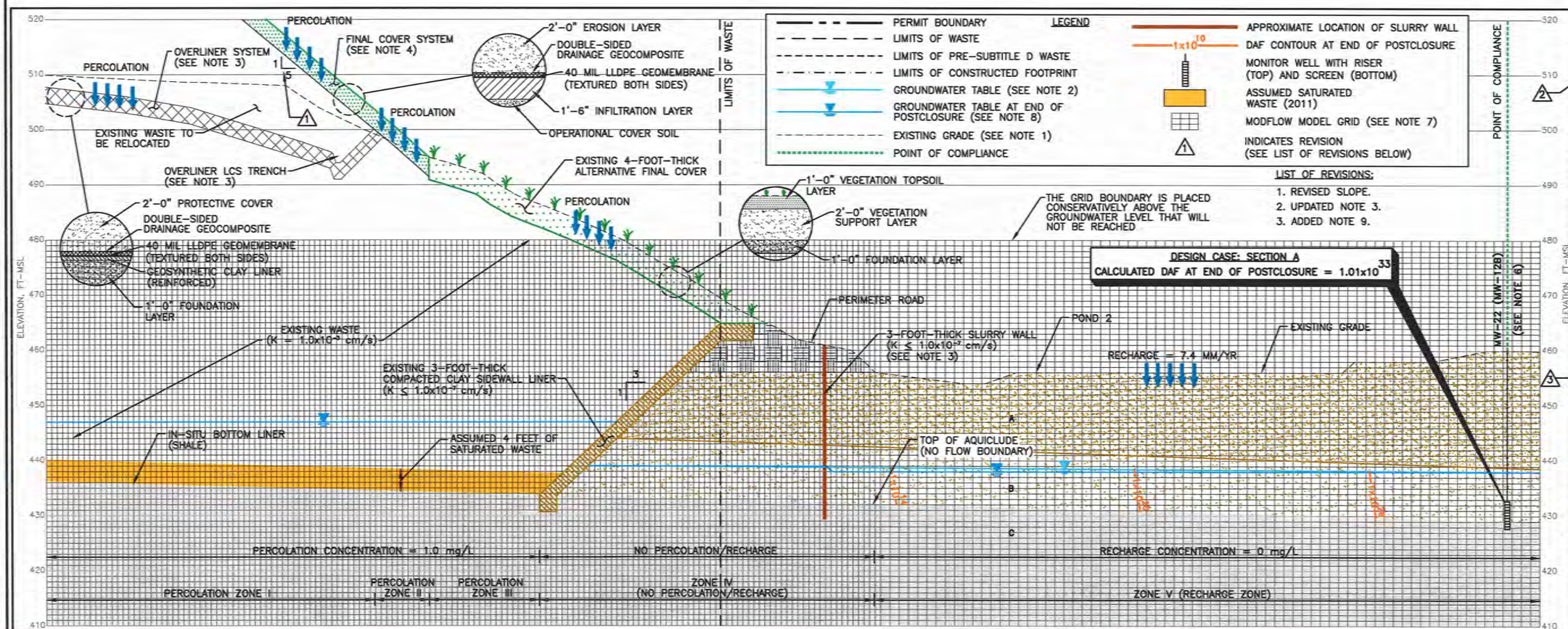
G:\1339\351\EXPANSION 2009\PART III-SDP\IIB\FIG 5.1-COMPLETION PLAN.dwg, jwilson, 1:2



SECTION A



YEAR 2011–2069
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60 HORIZONTAL SCALE IN FEET
0 10 20 VERTICAL SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- LIMITS OF CONSTRUCTED FOOTPRINT
- GROUNDWATER TABLE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 8)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- ASSUMED SATURATED WASTE (2011)
- MODFLOW MODEL GRID (SEE NOTE 7)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 9.

LITHOLOGY LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SANDY GRAVEL
    - SILTY SANDY GRAVEL
    - GRAVELLY CLAY
    - CLAYEY GRAVEL
  - EARTHEN FILL
- SHALE STRATA
  - WEATHERED SHALE
  - UNWEATHERED SHALE

NOTES:

1. EXISTING GRADE ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON DECEMBER 5, 2010.
3. OVERLINER SYSTEM COMPONENTS, FINAL COVER SYSTEM COMPONENTS, AND SLURRY WALL INFORMATION IS PROVIDED IN APPENDIX IIIA.
4. POINT OF COMPLIANCE AND MONITORING WELL LOCATIONS ARE PROVIDED IN APPENDIX IIIH. REFER TO APPENDIX IIIH FOR GROUNDWATER MONITORING, SAMPLING, AND ANALYSIS PLAN.
5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 22 IS SCREENED BETWEEN THE DEPTHS OF 432.7 FT-MSL AND 427.7 FT-MSL.
7. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
8. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
9. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

DRAFT

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2039	OVERLINER CONSTRUCTION	CLOSURE	OVERLINER	$2.5x10^{-4}$ MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2039	12/31/2069	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	OVERLINER/FINAL COVER	$5.1x10^{-4}$ MM/YR				

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DATE: 03/2012
FILE: 1339-351-11
CAD: FIGURE 5.2.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POC DEMONSTRATION DESIGN CASE–SECTION A

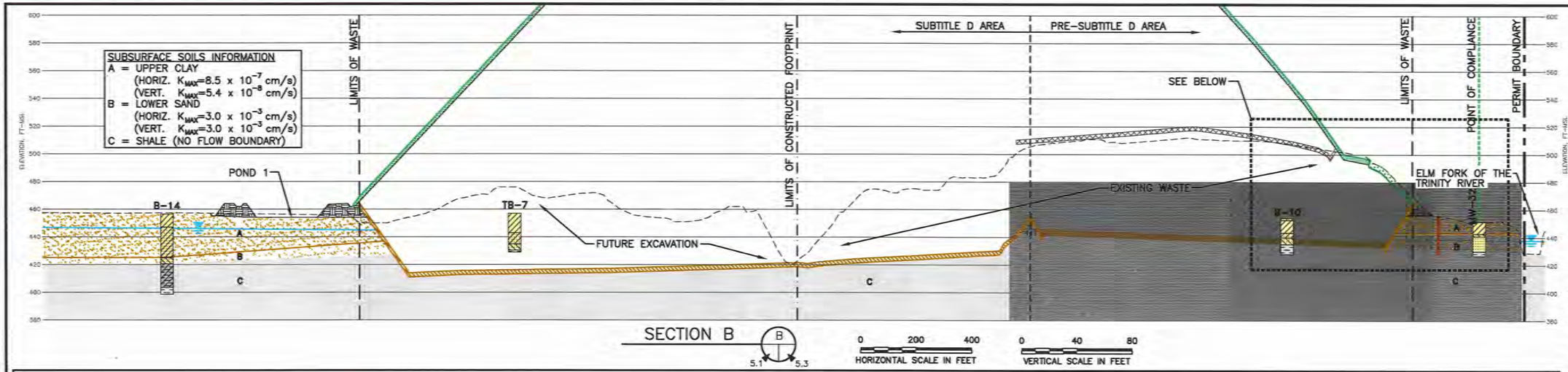
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 5.2

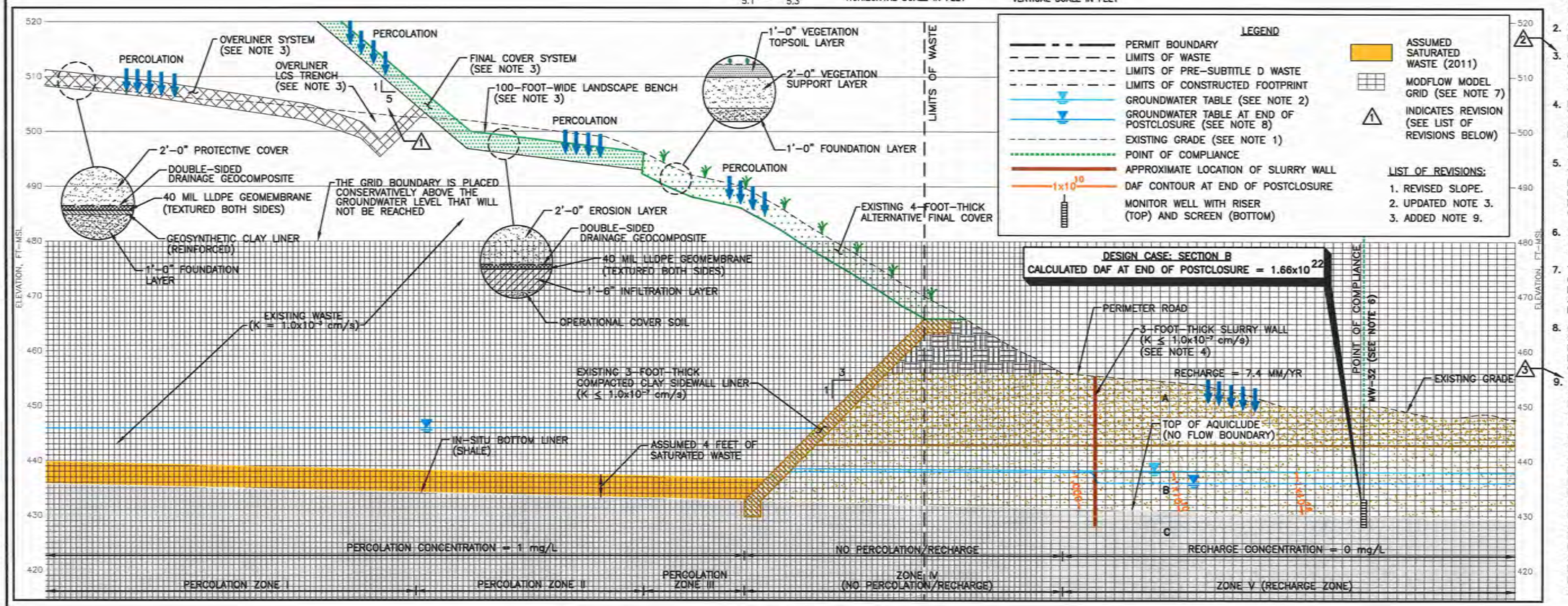
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 5.2 - SECTION A - DESIGN CASE.dwg, jwilson, 1:2



SECTION B

0 200 400 HORIZONTAL SCALE IN FEET

0 40 80 VERTICAL SCALE IN FEET



YEAR 2011–2069
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- LIMITS OF CONSTRUCTED FOOTPRINT
- GROUNDWATER TABLE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 8)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- ASSUMED SATURATED WASTE (2011)
- MODFLOW MODEL GRID (SEE NOTE 7)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 9.

LITHOLOGY LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SANDY GRAVEL
    - SILTY SANDY GRAVEL
    - GRAVELLY CLAY
    - CLAYEY GRAVEL
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NOTES:

1. EXISTING GRADE ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
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3. OVERLINER SYSTEM COMPONENTS, FINAL COVER SYSTEM COMPONENTS, AND SLURRY WALL INFORMATION IS PROVIDED IN APPENDIX IIIA.
4. POINT OF COMPLIANCE AND MONITORING WELL LOCATIONS ARE PROVIDED IN APPENDIX IIIH. REFER TO APPENDIX IIIH FOR GROUNDWATER MONITORING, SAMPLING, AND ANALYSIS PLAN.
5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 32 IS SCREENED BETWEEN THE DEPTHS OF 433.0 FT-MSL AND 428.0 FT-MSL.
7. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
8. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
9. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

DRAFT

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2039	OVERLINER CONSTRUCTION	CLOSURE	OVERLINER	2.5x10^{-4} MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2039	12/31/2069	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	OVERLINER/FINAL COVER	5.1x10^{-4} MM/YR				

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DATE: 03/2012
FILE: 1339-351-11
CAD: FIGURE 5.3.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POC DEMONSTRATION DESIGN CASE–SECTION B

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

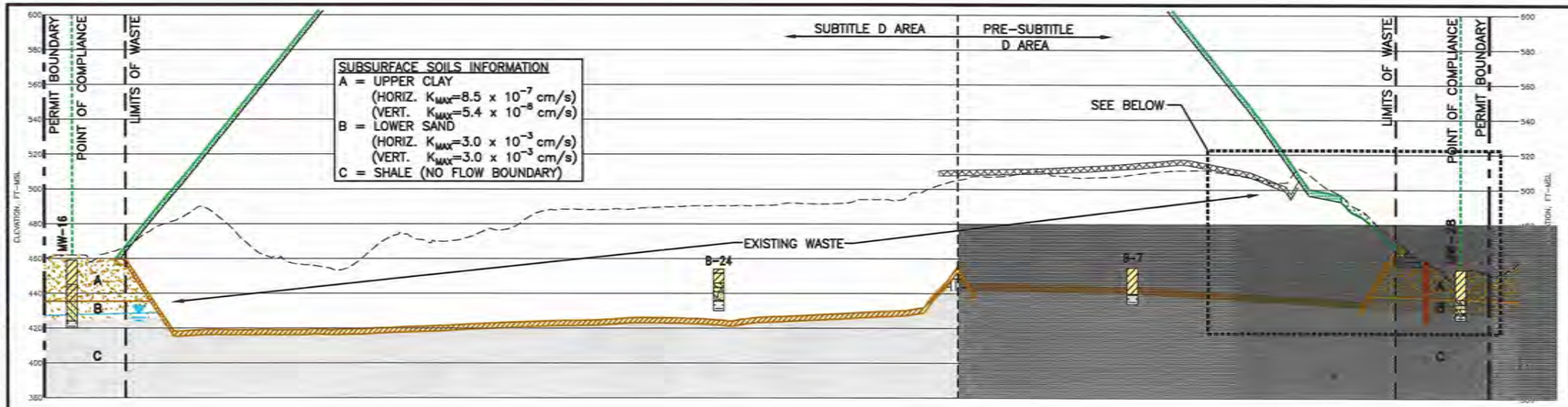
Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

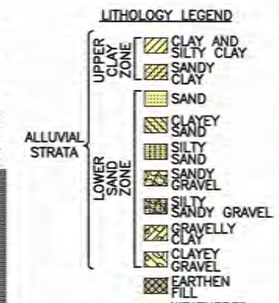
CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO | FORT WORTH, TX (817) 735-9770 | GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 5.3

O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 5.3 - SECTION B - DESIGN CASE.dwg, jwilson, 1:2

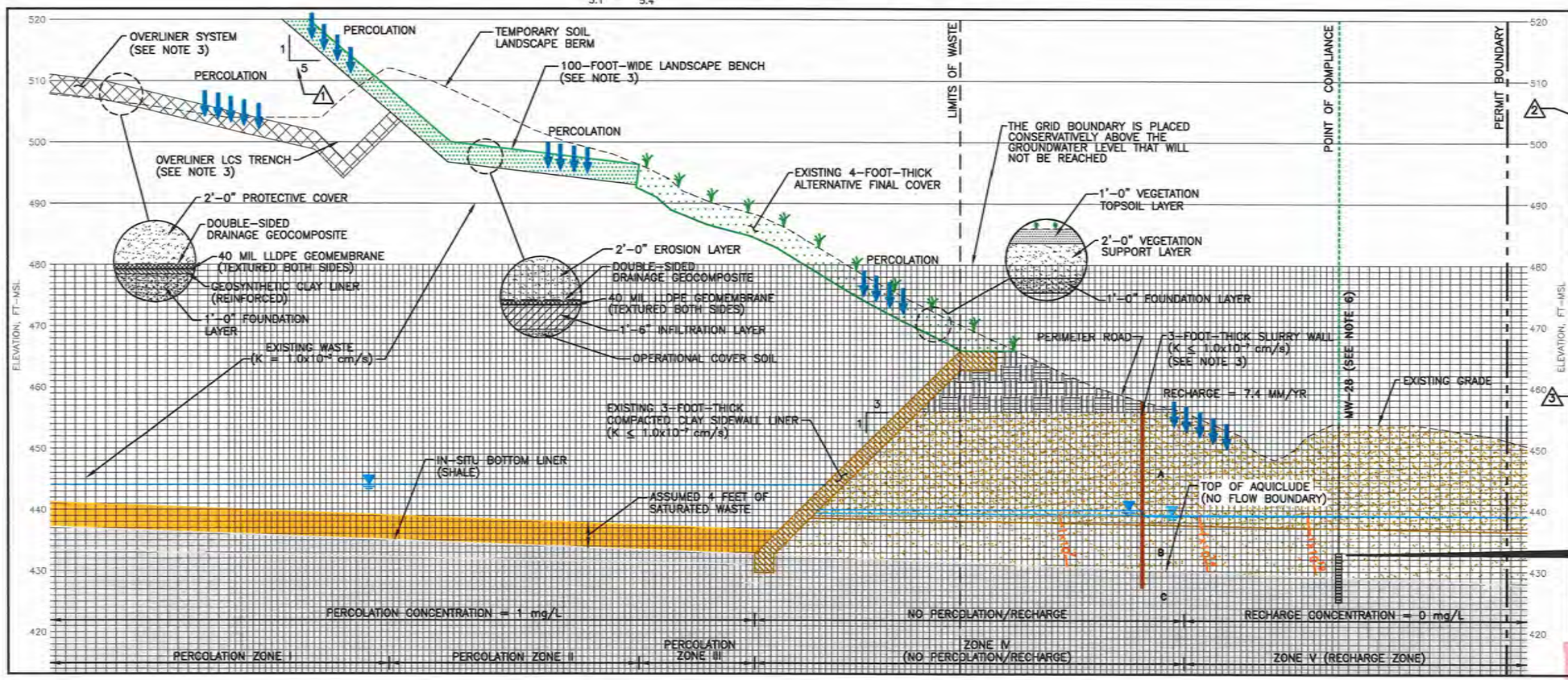


SECTION C



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- GROUNDWATER TABLE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 8)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- $1x10^{-7}$ DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- ASSUMED SATURATED WASTE (2011)
- MODFLOW MODEL GRID (SEE NOTE 7)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)



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6. MONITORING WELL 28 IS SCREENED BETWEEN THE DEPTHS OF 433.3 FT-MSL AND 425.8 FT-MSL.
7. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
8. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
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DESIGN CASE: SECTION C

CALCULATED DAF AT END OF POSTCLOSURE = $2.80x10^{20}$

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 9.

DRAFT

YEAR 2011-2069
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60 HORIZONTAL SCALE IN FEET
0 10 20 VERTICAL SCALE IN FEET

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2039	OVERLINER CONSTRUCTION	CLOSURE	OVERLINER	$2.5x10^{-1}$ MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2039	12/31/2069	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	OVERLINER/FINAL COVER	$5.1x10^{-1}$ MM/YR				

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FILE: 1339-351-11
CAD: FIGURE 5.4.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POC DEMONSTRATION DESIGN CASE-SECTION C

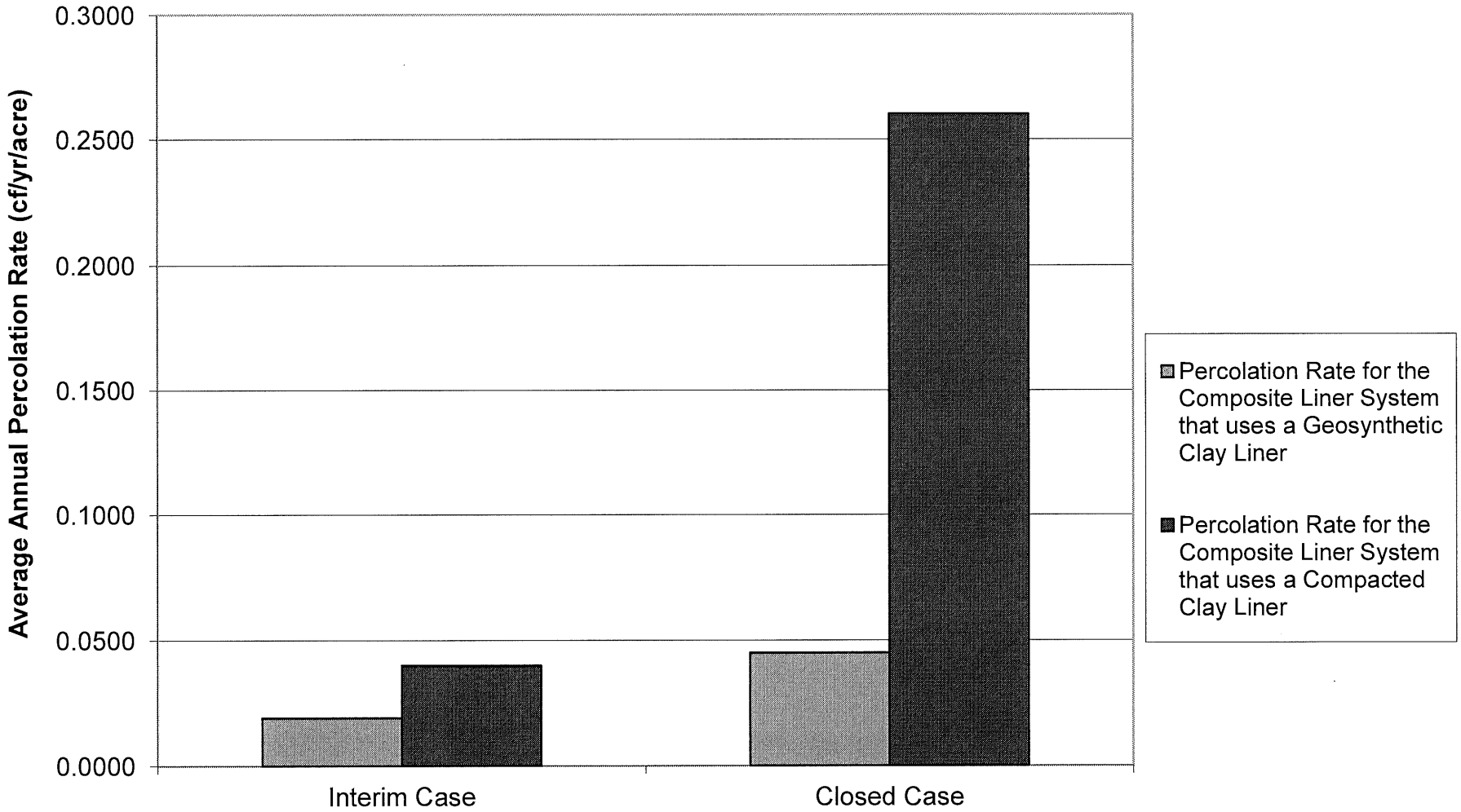
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

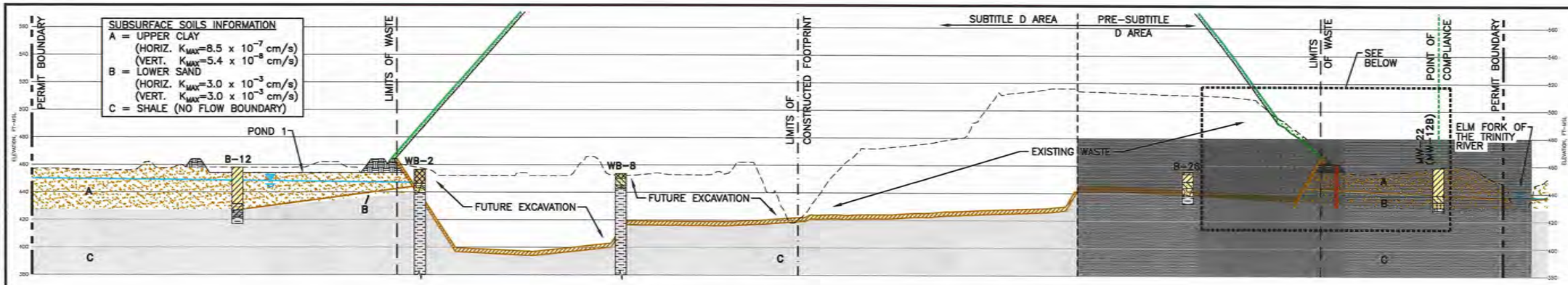
Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 5.4

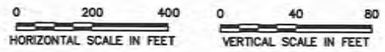
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 5.4 - SECTION C - DESIGN CASE.dwg, jwilson, 1:2

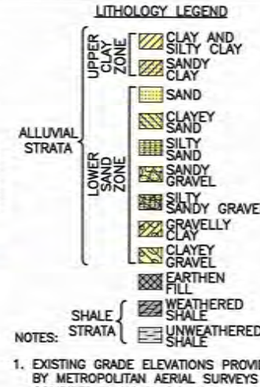
Figure 6.1
Comparison of Percolation Rates for Two Liner Systems





SECTION A
(SEE NOTE 7)





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5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 22 IS SCREENED BETWEEN THE DEPTHS OF 432.7 FT-MSL AND 427.7 FT-MSL.
7. REFER TO FIGURE 5.1 FOR SECTION LOCATION.
8. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
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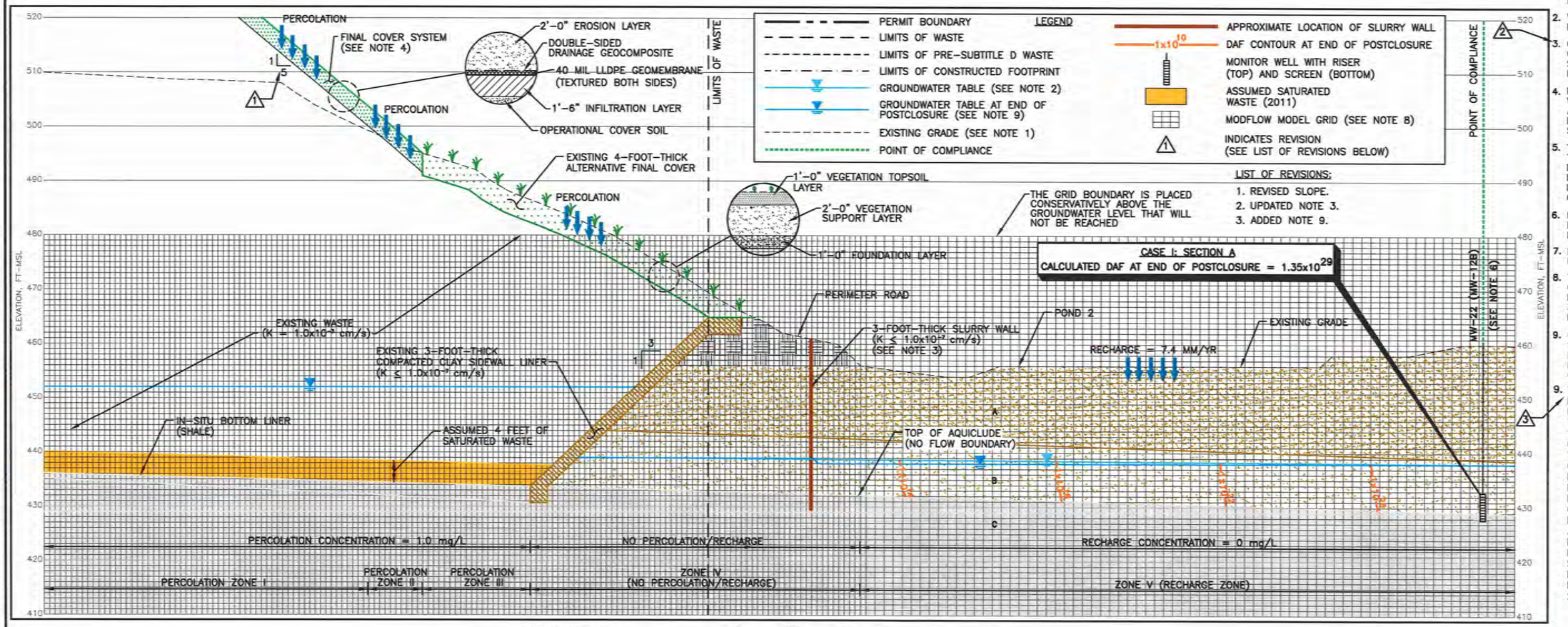

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 9.

YEAR 2011-2069
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2039	OVERLINER CONSTRUCTION	CLOSURE	INTERMEDIATE COVER	130 MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2039	12/31/2069	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	FINAL COVER	6.5 MM/YR				

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DATE: 03/2012
FILE: 1339-351-11
CAD: FIGURE 7.1.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POC DEMONSTRATION CASE I-SECTION A

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

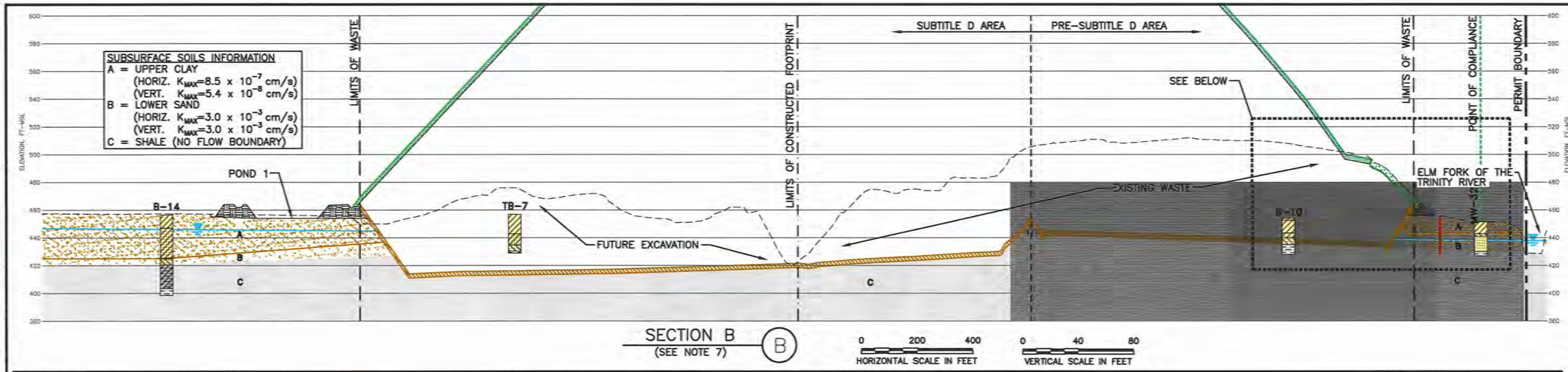
Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 7.1

DRAFT

G:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 7.1 - SECTION A - Case I.dwg, jwilson, 1:2



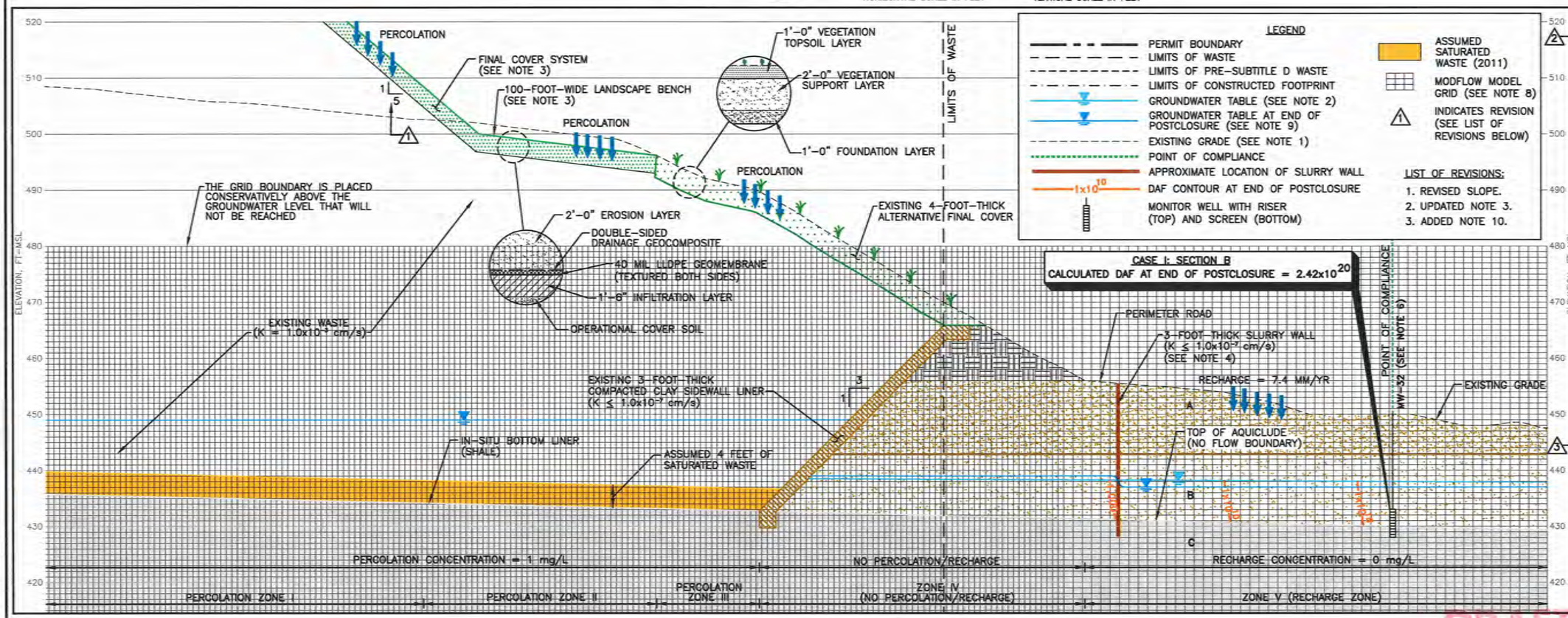
SECTION B (SEE NOTE 7) B

0 200 400 HORIZONTAL SCALE IN FEET

0 40 80 VERTICAL SCALE IN FEET

LITHOLOGY LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SANDY GRAVEL
    - SILTY SANDY GRAVEL
    - GRAVELLY CLAY
    - CLAYEY GRAVEL
  - EARTHEN FILL
- SHALE STRATA
  - WEATHERED SHALE
  - UNWEATHERED SHALE



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- LIMITS OF CONSTRUCTED FOOTPRINT
- GROUNDWATER TABLE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 9)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- ASSUMED SATURATED WASTE (2011)
- MODFLOW MODEL GRID (SEE NOTE 8)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 10.

YEAR 2011–2069
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTES:

1. EXISTING GRADE ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON DECEMBER 5, 2010.
3. OVERLINER SYSTEM COMPONENTS, FINAL COVER SYSTEM COMPONENTS, AND SLURRY WALL INFORMATION IS PROVIDED IN APPENDIX IIIA.
4. POINT OF COMPLIANCE AND MONITORING WELL LOCATIONS ARE PROVIDED IN APPENDIX IIIH. REFER TO APPENDIX IIIH FOR GROUNDWATER MONITORING, SAMPLING, AND ANALYSIS PLAN.
5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 32 IS SCREENED BETWEEN THE DEPTHS OF 433.0 FT-MSL AND 428.0 FT-MSL.
7. REFER TO FIGURE 5.1 FOR SECTION LOCATION.
8. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
9. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
10. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2039	OVERLINER CONSTRUCTION	CLOSURE	INTERMEDIATE COVER	130 MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2039	12/31/2069	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	FINAL COVER	6.5 MM/YR				

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☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: FIGURE 7.2.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POC DEMONSTRATION CASE I–SECTION B

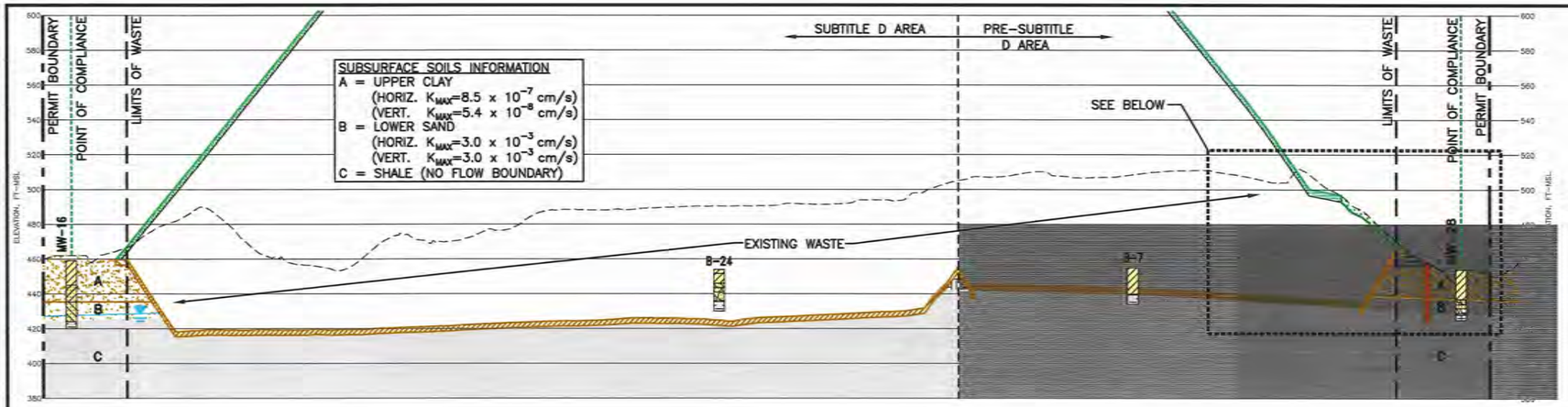
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL · NAPERVILLE, IL · COLUMBUS, OH · DENVER, CO · FORT WORTH, TX (817) 735-9770 · GRIFFITH, IN · SOUTH BEND, IN · SPRINGFIELD, IL · ST. LOUIS, MO

FIGURE 7.2

G:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 7.2 - SECTION B - CASE I.dwg, jwilson, 1:2



SECTION C
(SEE NOTE 7)

0 200 400
HORIZONTAL SCALE IN FEET

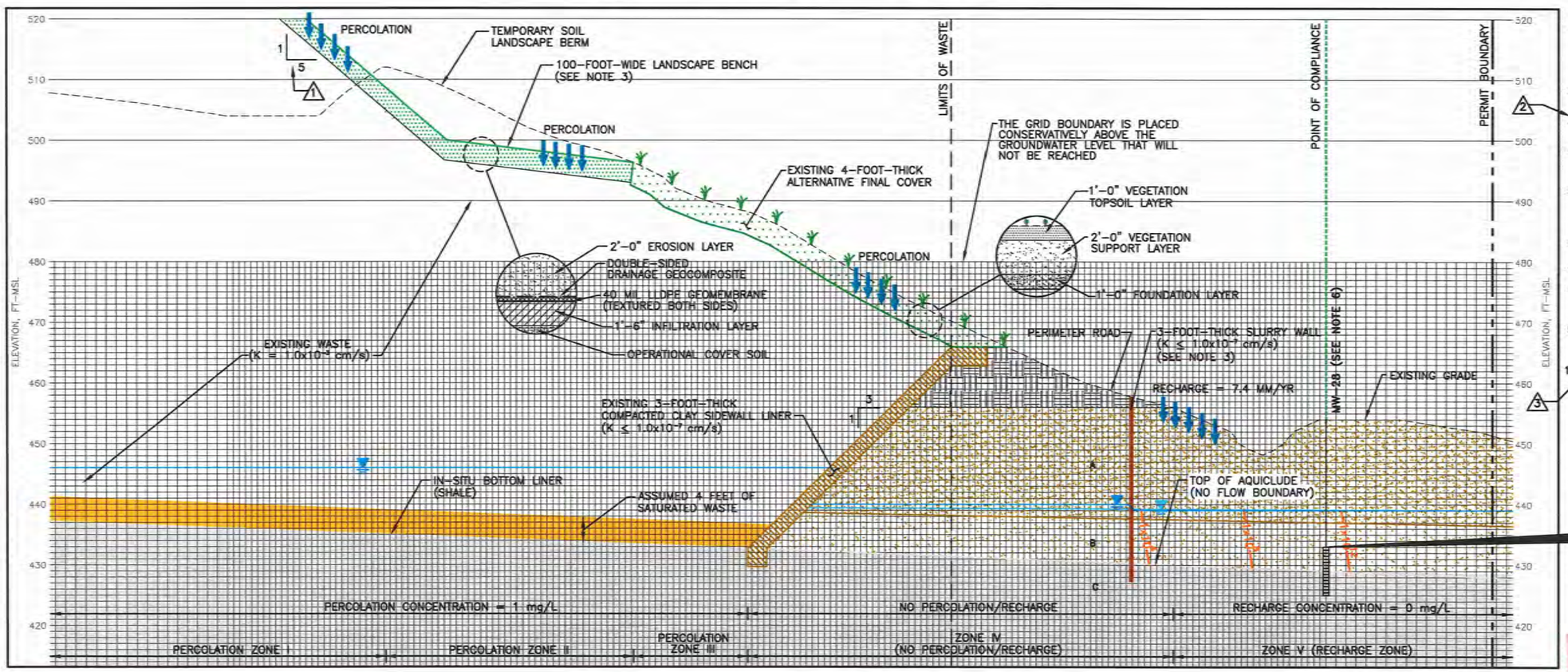
0 40 80
VERTICAL SCALE IN FEET

LITHOLOGY LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SANDY GRAVEL
    - SILTY SANDY GRAVEL
    - GRAVELLY CLAY
    - CLAYEY GRAVEL
  - EARTHEN FILL
- SHALE STRATA
  - WEATHERED SHALE
  - UNWEATHERED SHALE

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- GROUNDWATER TABLE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 9)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- $1x10^{-7}$ DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- ASSUMED SATURATED WASTE (2011)
- MODFLOW MODEL GRID (SEE NOTE 8)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)



YEAR 2011–2069
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2039	OVERLINER CONSTRUCTION	CLOSURE	INTERMEDIATE COVER	130 MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2039	12/31/2069	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	FINAL COVER	6.5 MM/YR				

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NOTES:

1. EXISTING GRADE ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON DECEMBER 5, 2010.
3. OVERLINER SYSTEM COMPONENTS, FINAL COVER SYSTEM COMPONENTS, AND SLURRY WALL INFORMATION IS PROVIDED IN APPENDIX IIIA.
4. POINT OF COMPLIANCE AND MONITORING WELL LOCATIONS ARE PROVIDED IN APPENDIX IIIH. REFER TO APPENDIX IIIH FOR GROUNDWATER MONITORING, SAMPLING, AND ANALYSIS PLAN.
5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 28 IS SCREENED BETWEEN THE DEPTHS OF 433.3 FT–MSL AND 425.8 FT–MSL.
7. REFER TO FIGURE 5.1 FOR SECTION LOCATION.
8. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
9. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
10. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30–YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

CASE I: SECTION C
CALCULATED DAF AT END OF POSTCLOSURE = $2.91x10^{11}$

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 10.

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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339–351–11
CAD: FIGURE 7.3.DWG

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OVERLINER POC DEMONSTRATION
CASE I–SECTION C

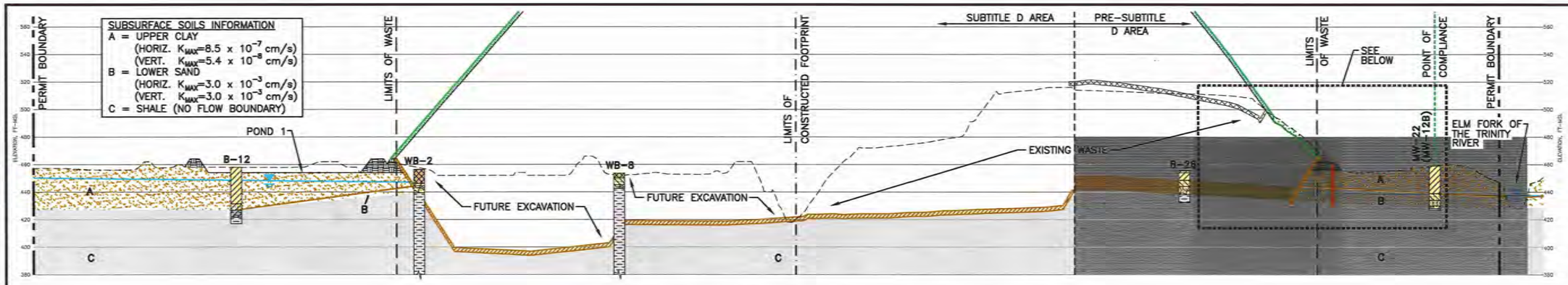
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F–3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735–9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 7.3

O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 7.3 - SECTION C - CASE I.dwg, jwilson, 1:2



SECTION A
(SEE NOTE 7)

0 200 400 HORIZONTAL SCALE IN FEET
0 40 80 VERTICAL SCALE IN FEET

LITHOLOGY LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SANDY GRAVEL
    - SILTY SANDY GRAVEL
    - GRAVELLY CLAY
    - CLAYEY GRAVEL
- EARTHEN FILL
- SHALE STRATA
  - WEATHERED SHALE
  - UNWEATHERED SHALE

NOTES:

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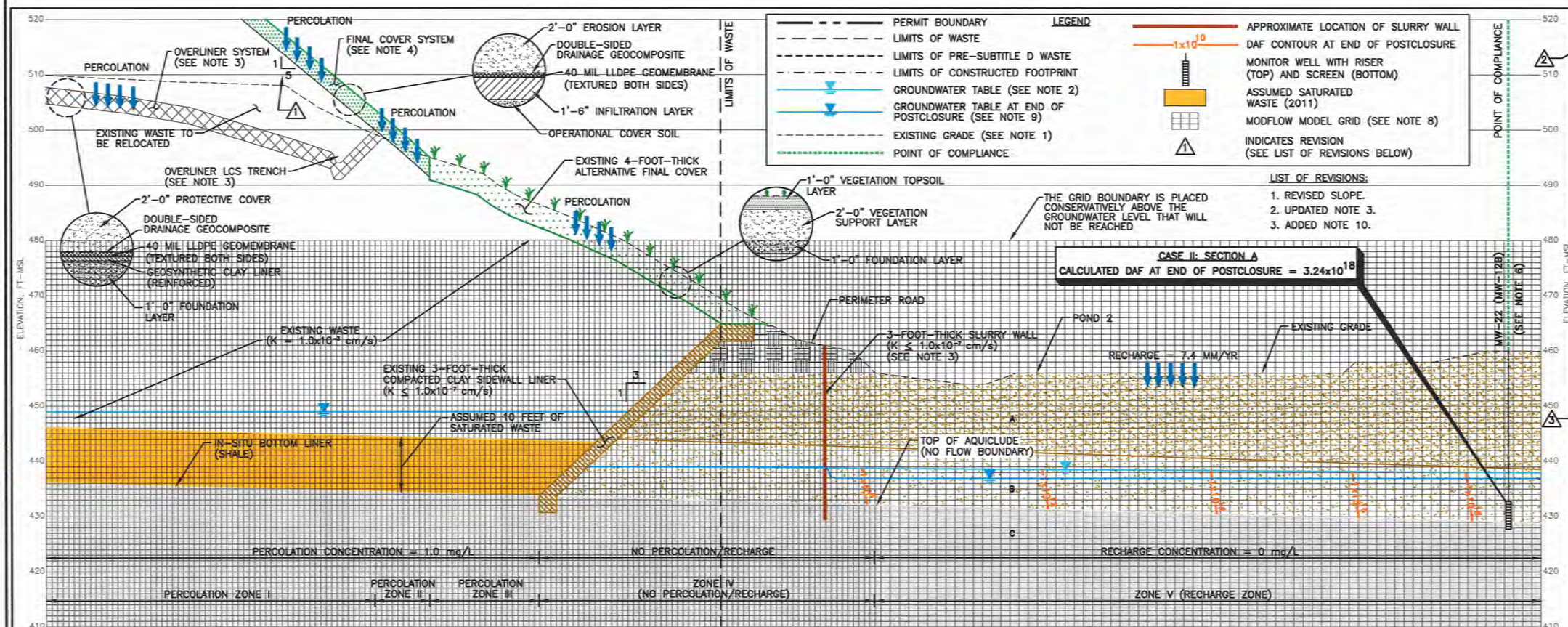
4. POINT OF COMPLIANCE AND MONITORING WELL LOCATIONS ARE PROVIDED IN APPENDIX IIIH. REFER TO APPENDIX IIIH FOR GROUNDWATER MONITORING, SAMPLING, AND ANALYSIS PLAN.
5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 22 IS SCREENED BETWEEN THE DEPTHS OF 432.7 FT-MSL AND 427.7 FT-MSL.
7. REFER TO FIGURE 5.1 FOR SECTION LOCATION.
8. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
9. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
10. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- LIMITS OF CONSTRUCTED FOOTPRINT
- GROUNDWATER TABLE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 9)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- ASSUMED SATURATED WASTE (2011)
- MODFLOW MODEL GRID (SEE NOTE 8)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 10.

YEAR 2011-2093
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60 HORIZONTAL SCALE IN FEET
0 10 20 VERTICAL SCALE IN FEET

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2063	OVERLINER CONSTRUCTION	CLOSURE	OVERLINER	6.5 MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2063	12/31/2093	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	OVERLINER/FINAL COVER	6.5 MM/YR				

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CAD: FIGURE 7.4.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OVERLINER POC DEMONSTRATION
CASE II-SECTION A

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 7.4

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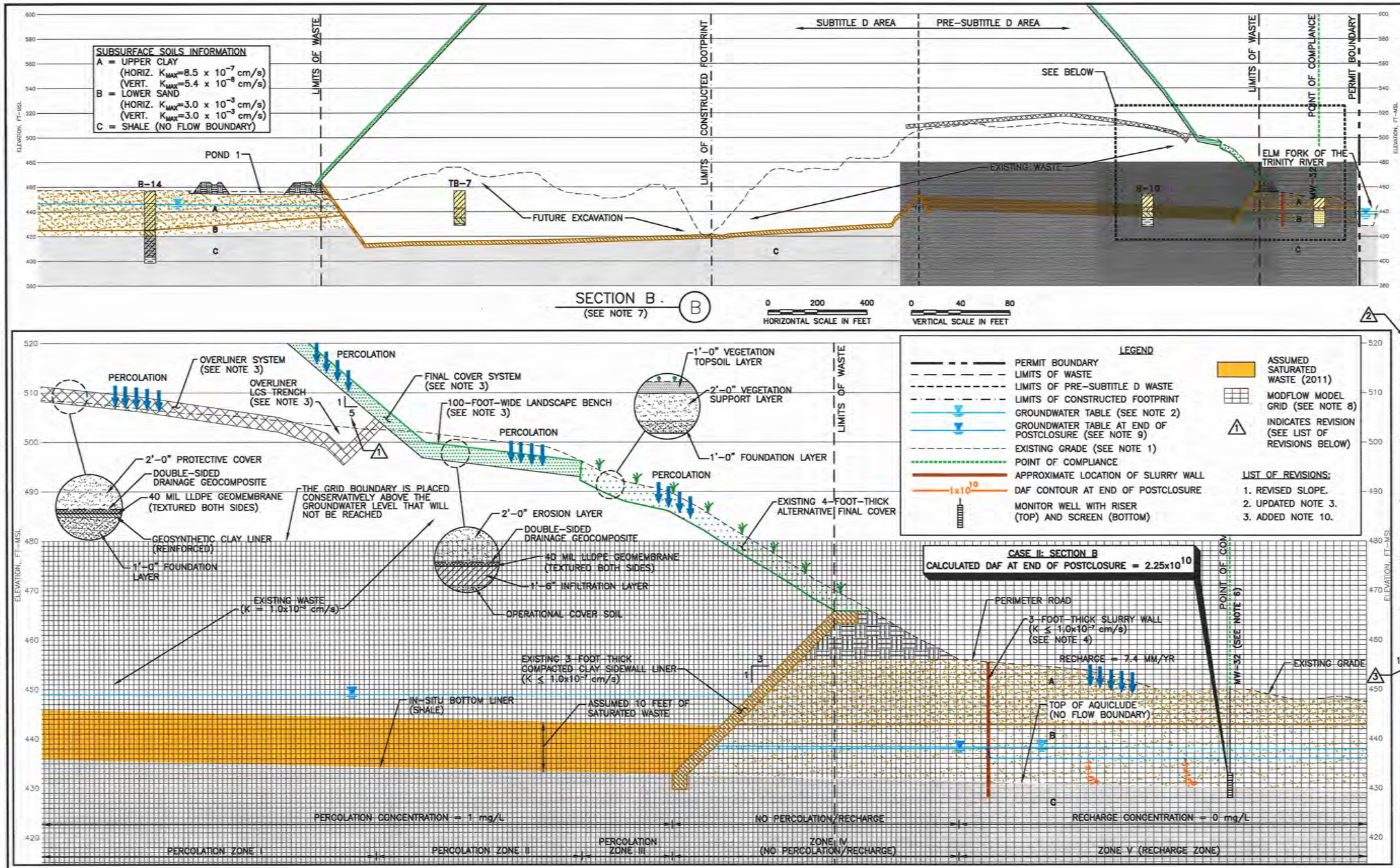
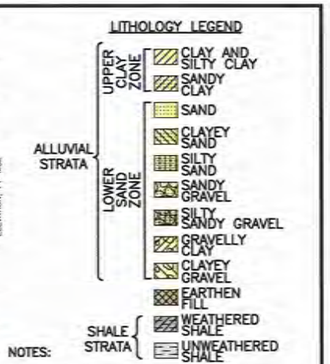
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 7.4 - SECTION A - CASE II.dwg, jwilson, 1:2





NOTES:

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5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 32 IS SCREENED BETWEEN THE DEPTHS OF 433.0 FT-MSL AND 428.0 FT-MSL.
7. REFER TO FIGURE 5.1 FOR SECTION LOCATION.
8. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
9. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
10. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

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LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2063	OVERLINER CONSTRUCTION	CLOSURE	OVERLINER	6.5 MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2063	12/31/2093	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	OVERLINER/FINAL COVER	6.5 MM/YR				

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- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: FIGURE 7.5.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POC DEMONSTRATION CASE II–SECTION B

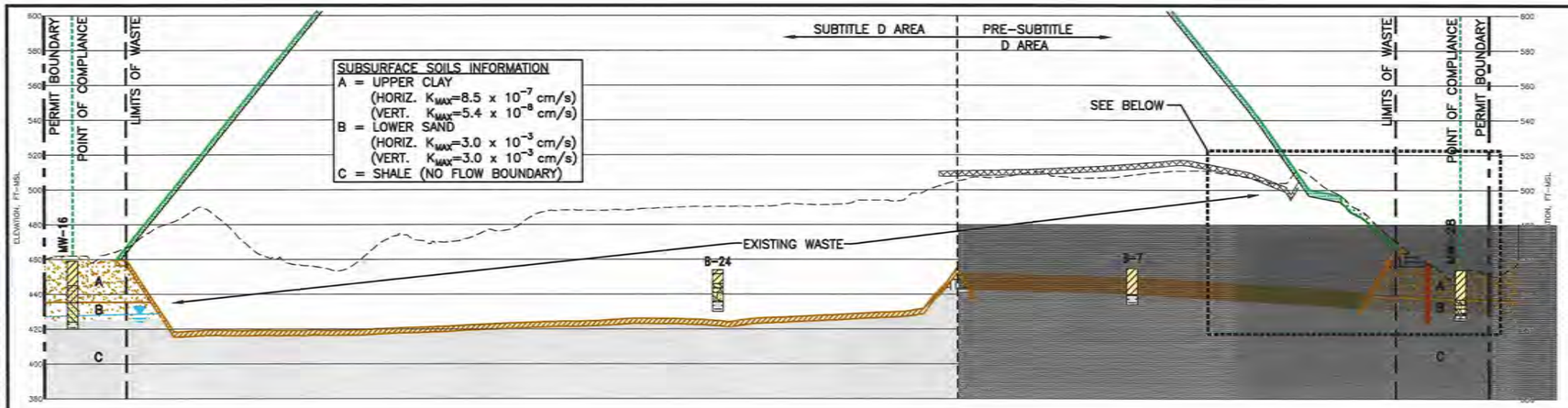
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 7.5

O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 7.5 – SECTION B – CASE II.dwg, jwilson, 1:2



SECTION C
(SEE NOTE 7)

0 200 400
HORIZONTAL SCALE IN FEET

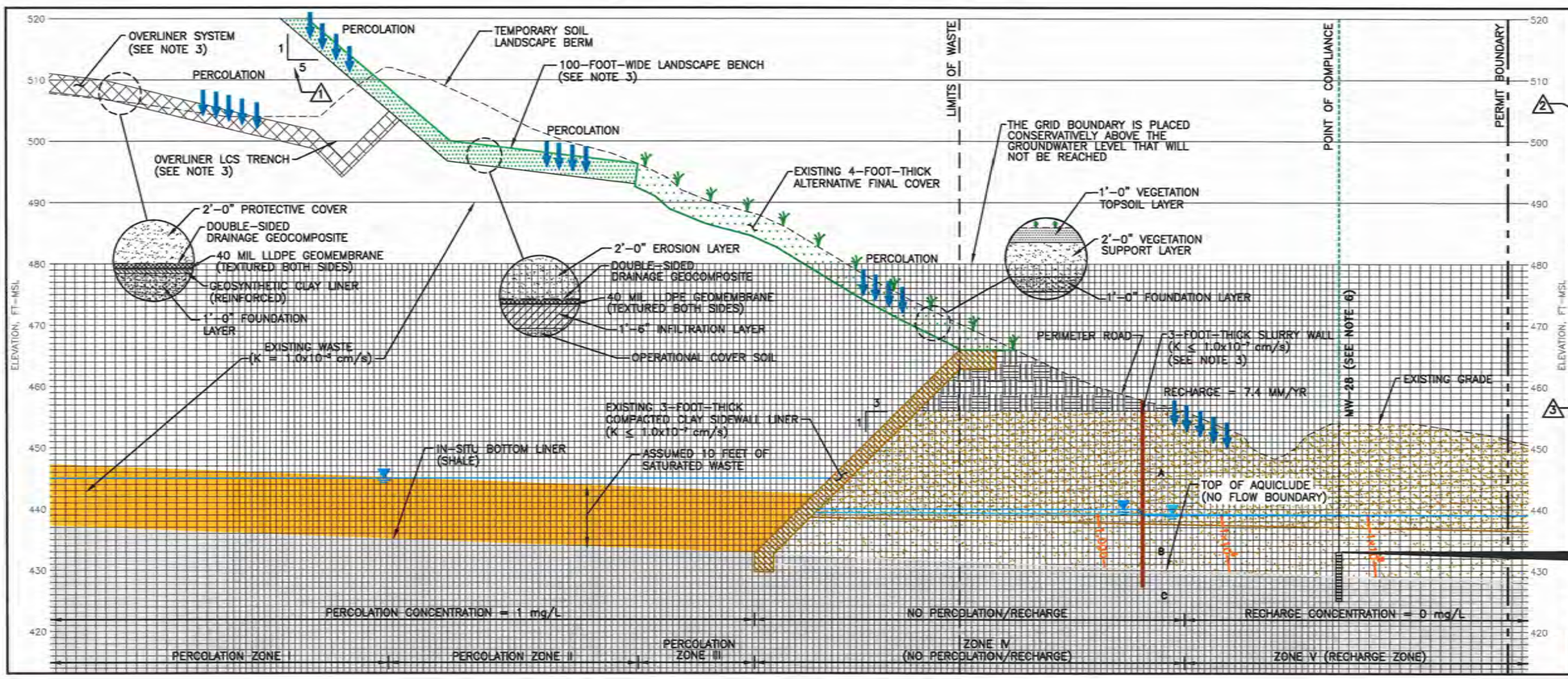
0 40 80
VERTICAL SCALE IN FEET

LITHOLOGY LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SANDY GRAVEL
    - SILTY SANDY GRAVEL
    - GRAVELLY CLAY
    - CLAYEY GRAVEL
  - EARTHEN FILL
- SHALE STRATA
  - WEATHERED SHALE
  - UNWEATHERED SHALE

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- GROUNDWATER TABLE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 9)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- $1x10^7$ DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- ASSUMED SATURATED WASTE (2011)
- MODFLOW MODEL GRID (SEE NOTE 8)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)



YEAR 2011-2093
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

NOTES:

1. EXISTING GRADE ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON DECEMBER 5, 2010.
3. OVERLINER SYSTEM COMPONENTS, FINAL COVER SYSTEM COMPONENTS, AND SLURRY WALL INFORAMTION IS PROVIDED IN APPENDIX IIIA.
4. POINT OF COMPLIANCE AND MONITORING WELL LOCATIONS ARE PROVIDED IN APPENDIX IIIH. REFER TO APPENDIX IIIH FOR GROUNDWATER MONITORING, SAMPLING, AND ANALYSIS PLAN.
5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 28 IS SCREENED BETWEEN THE DEPTHS OF 433.3 FT-MSL AND 425.8 FT-MSL.
7. REFER TO FIGURE 5.1 FOR SECTION LOCATION.
8. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
9. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
10. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

CASE II: SECTION C
CALCULATED DAF AT END OF POSTCLOSURE = $4.21x10^7$

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 10.

DRAFT

LEACHATE PERCOLATION VALUES FOR VARIOUS STAGES OF LANDFILL DEVELOPMENT

TIME PERIOD				PERCOLATION ZONE I		PERCOLATION ZONE II		PERCOLATION ZONE III	
START DATE	END DATE	START DESCRIPTION	END DESCRIPTION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION	DESCRIPTION	PERCOLATION
01/01/2011	01/01/2028	EXISTING SITE CONDITION	OVERLINER CONSTRUCTION	INTERMEDIATE COVER	130 MM/YR	INTERMEDIATE COVER	130 MM/YR	ALTERNATIVE FINAL COVER	4 MM/YR
01/01/2028	12/31/2063	OVERLINER CONSTRUCTION	CLOSURE	OVERLINER	6.5 MM/YR	FINAL COVER	6.5 MM/YR		
12/31/2063	12/31/2093	CLOSURE (SEE NOTE 9)	END OF POSTCLOSURE	OVERLINER/FINAL COVER	6.5 MM/YR				

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- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: FIGURE 7.6.DWG
DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POC DEMONSTRATION CASE II-SECTION C

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 7.6

O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIGURE 7.6 - SECTION C - CASE II.dwg, jwilson, 1:2

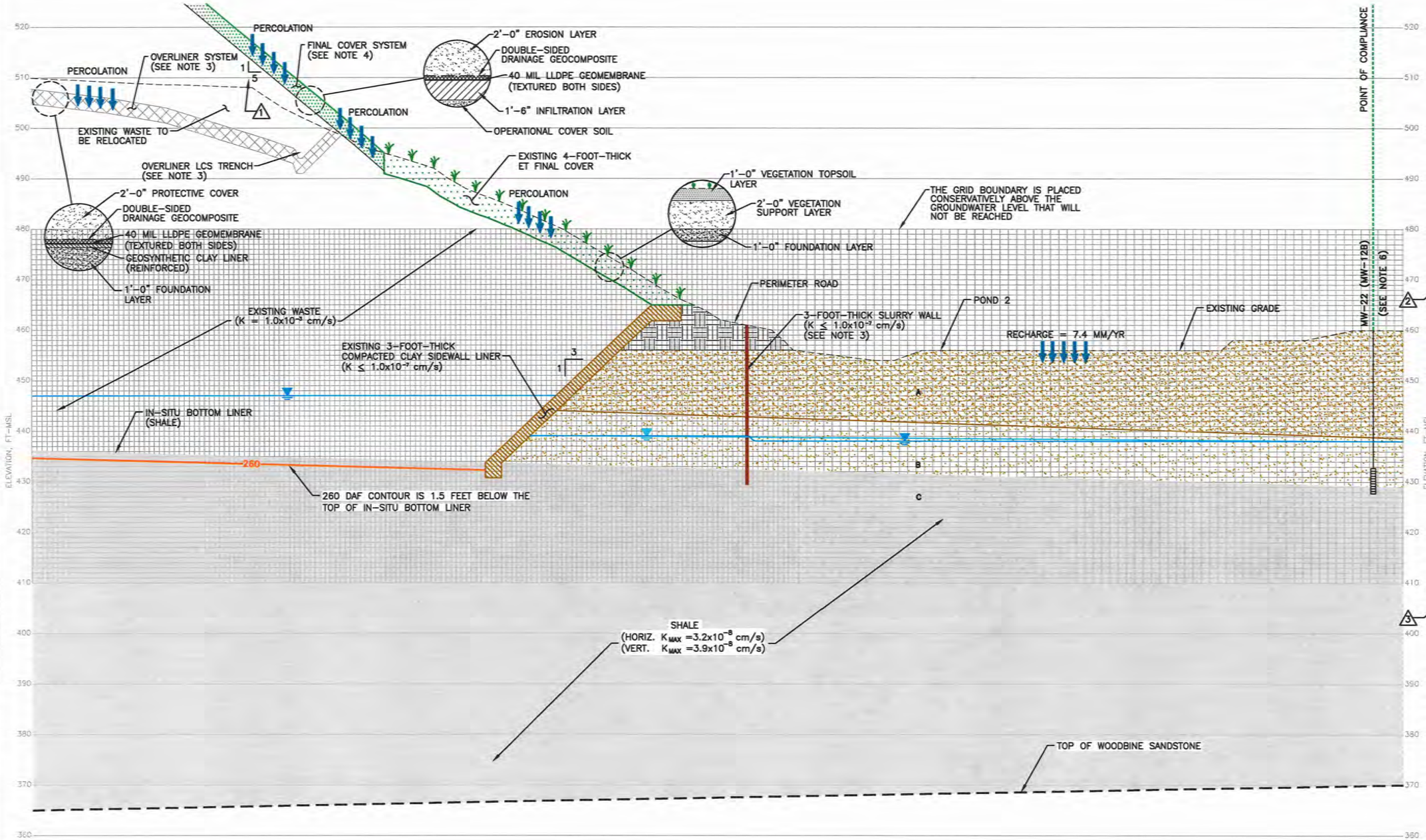

FIGURE 1: YEAR 2011–2069
(EXISTING SITE CONDITION TO END OF POSTCLOSURE)

0 30 60 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

SUBSURFACE SOILS INFORMATION

A = UPPER CLAY
(HORIZ. K_{MAX}=8.5 x 10^{-7} cm/s)
(VERT. K_{MAX}=5.4 x 10^{-8} cm/s)

B = LOWER SAND
(HORIZ. K_{MAX}=3.0 x 10^{-3} cm/s)
(VERT. K_{MAX}=3.0 x 10^{-3} cm/s)

C = SHALE
(HORIZ. K_{MAX}=3.2 x 10^{-8} cm/s)
(VERT. K_{MAX}=3.9 x 10^{-8} cm/s)

NOTES:

1. EXISTING GRADE ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. POTENTIOMETRIC SURFACE SHOWN WAS REPRODUCED FROM FIGURE 3.1 OF APPENDIX IIIB.
3. OVERLINER SYSTEM COMPONENTS, FINAL COVER SYSTEM COMPONENTS, AND SLURRY WALL INFORMATION IS PROVIDED IN APPENDIX IIIA.
4. POINT OF COMPLIANCE AND MONITORING WELL LOCATIONS ARE PROVIDED IN APPENDIX IIIH. REFER TO APPENDIX IIIH FOR GROUNDWATER MONITORING, SAMPLING, AND ANALYSIS PLAN.
5. TOP OF SHALE ELEVATION, LOWER SAND THICKNESS, AND UPPER CLAY THICKNESS DATA FROM RONE, REED, AND WBC BOREHOLE LOGS. REFER TO APPENDIX IIIG FOR BORING INFORMATION AND SITE GEOLOGY REPORT.
6. MONITORING WELL 22 IS SCREENED BETWEEN THE DEPTHS OF 432.7 FT-MSL AND 427.7 FT-MSL.
7. REFER TO SECTION 8 FOR ADDITIONAL INFORMATION.
8. THE MODFLOW MODEL GRID IS OVERLAIN ON THE SECTION FOR ILLUSTRATION PURPOSES ONLY. REFER TO FIGURE 3.5 FOR MODFLOW MODEL DOMAIN DEVELOPMENT.
9. GROUNDWATER POTENTIOMETRIC SURFACE WAS REPRODUCED FROM THE MODFLOW MODEL GROUNDWATER POTENTIOMETRIC SURFACE AT THE END OF POSTCLOSURE.
10. THE SITE IS PROJECTED TO CLOSE IN 2035. HOWEVER, THE ORIGINAL DESIGN THAT WAS DECLARED TECHNICALLY COMPLETE ON MARCH 19, 2015 INCLUDED AN ESTIMATED CLOSURE DATE OF 2039. DUE TO THE REDUCTION IN PROPOSED CAPACITY, THE SITE LIFE PROJECTION HAS BEEN REDUCED TO 2035. HOWEVER, THE MODELING FOR THE POC DEMONSTRATION REFLECTS THE ORIGINAL CLOSURE DATE AS IT PROVIDES FOR A CONSERVATIVE ANALYSIS BECAUSE THE ESTIMATED PERCOLATION RATE IS HIGHER DURING THE ACTIVE LIFE OF THE SITE. THEREFORE, THE 30-YEAR POSTCLOSURE PERIOD FOR THE MODEL WILL BE BETWEEN 2039 AND 2069.

DRAFT

LEGEND

- POTENTIMETERIC SURFACE (SEE NOTE 2)
- GROUNDWATER TABLE AT END OF POSTCLOSURE (SEE NOTE 9)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SLURRY WALL
- 260 DAF CONTOUR AT END OF POSTCLOSURE
- MONITOR WELL WITH RISER (TOP) AND SCREEN (BOTTOM)
- THE PERCOLATION CONDITIONS FOR THIS ANALYSIS ARE THE SAME AS PERCOLATION VALUES DESCRIBED IN SECTION 3
- MODFLOW MODEL GRID (SEE NOTE 7)
- INDICATES REVISION (SEE LIST OF REVISIONS ON THIS DRAWING)

LIST OF REVISIONS:

1. REVISED SLOPE.
2. UPDATED NOTE 3.
3. ADDED NOTE 10.

☐ FOR INFORMATION PURPOSES ONLY
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: 8.1 BARRIER LAYER.DWG

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: NT

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1ST TCEQ COMMENT RESPONSE
2	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT BARRIER LAYER DEMONSTRATION

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 8.1

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIB\FIG 8.1-BARRIER LAYER DEMONSTRATION.dwg, jwilson, 1:2

APPENDIX IIIB-A

HELP MODEL OUTPUT – POC DEMONSTRATION

THIS DOCUMENT IS RELEASED FOR
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UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-16

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Includes Pages IIIB-A-1 through IIIB-A-36

Prep By: NT
Date: 2/26/2016

Chkd By: RS
Date: 2/26/2016

CAMELOT LANDFILL
1339-351-11-02-6B.2
HELP VERSION 3.07 SUMMARY SHEET
POINT OF COMPLIANCE DEMONSTRATION

			ACTIVE EXISTING SITE CONDITION	INTERIM OVERLINER WITH 10 FEET OF WASTE	CLOSED OVERLINER/ FINAL COVER		CLOSED EXISTING ALTERNATIVE FINAL COVER[1]	OFFSITE AREAS (RECHARGE)
GENERAL INFORMATION		No. of Years	29	12	30		30	30
		Ground Cover	BARE	FAIR	GOOD		EXCELLENT	EXCELLENT
		SCS Runoff Curve No.	-	87.1	80.1		98.7	86.7
		Model Area (acre)	1	1	1		1	1
		Runoff Area (%)	95	70	100		100	95
		Maximum Leaf Area Index	3.5	3.0	4.5		5.0	5.0
		Evaporative Zone Depth (inch)	6	12	18		12	24
Final Cover	TOPSOIL LAYER (Texture = 10)	Thickness (in)	6		12		12	Upper Layer of Offsite Areas (see below)
		Porosity (vol/vol)	0.4640		0.3980		0.4253	
		Field Capacity (vol/vol)	0.3100		0.2440		-	
		Wilting Point (vol/vol)	0.1870		0.1360		0.2170	
		Init. Moisture Content (vol/vol)	0.3100		0.2440		-	
		Hyd. Conductivity (cm/s)	6.4E-05		1.2E-04		1.3E-05	
	EROSION LAYER (Texture = 10)	Thickness (in)			12		36	48
		Porosity (vol/vol)			0.3980		0.4253	0.4640
		Field Capacity (vol/vol)			0.2440		-	0.3100
		Wilting Point (vol/vol)			0.1360		0.2170	0.1870
		Init. Moisture Content (vol/vol)			0.2440		-	0.3100
		Hyd. Conductivity (cm/s)			1.2E-04		1.3E-05	1.8E-08
	FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)			0.04		See Note 1 For Referenced Information	Lower Layer of Offsite Areas Upper Clay Soil (see below)
		Hyd. Conductivity (cm/s)			4.0E-13			
		Pinhole Density (holes/acre)			1			
		Install. Defects (holes/acre)			4			
		Placement Quality			GOOD			
	INFILTRATION LAYER (Texture = 0)	Thickness (in)			18			72
		Porosity (vol/vol)			0.4270			0.4750
		Field Capacity (vol/vol)			0.4180			0.3780
		Wilting Point (vol/vol)			0.3670			0.2650
		Init. Moisture Content (vol/vol)			0.4270			0.4750
		Hyd. Conductivity (cm/s)			1.0E-05			1.8E-08
Intermediate Cover	INTERMEDIATE COVER (Texture = 11)	Thickness (in)	6	12	12			
		Porosity (vol/vol)	0.4750	0.4640	0.4640			
		Field Capacity (vol/vol)	0.3780	0.3100	0.3100			
		Wilting Point (vol/vol)	0.2650	0.1870	0.1870			
		Init. Moisture Content (vol/vol)	0.4750	0.3100	0.3100			
		Hyd. Conductivity (cm/s)	1.7E-05	6.4E-05	6.4E-05			
Waste	WASTE TOP[2] (Texture = 0)	Thickness (in)	600		~~1500~~ **1464**			
		Porosity (vol/vol)	0.6376		~~0.6148~~ **0.6159**			
		Field Capacity (vol/vol)	0.5185		~~0.5114~~ **0.5118**			
		Wilting Point (vol/vol)	0.0770		0.0770			
		Init. Moisture Content (vol/vol)	0.2500		0.3800			
		Hyd. Conductivity (cm/s)	1.0E-03		1.0E-03			
	WASTE BOTTOM[2] (Texture = 0)	Thickness (in)		120	~~756~~			
		Porosity (vol/vol)		0.6376	~~0.5387~~			
		Field Capacity (vol/vol)		0.5185	~~0.4900~~			
		Wilting Point (vol/vol)		0.0770	~~0.0770~~			
		Init. Moisture Content (vol/vol)		0.2500	~~0.3800~~			
		Hyd. Conductivity (cm/s)		1.0E-03	~~1.0E-04~~			
Overliner	PROTECTIVE COVER (Texture = 10)	Thickness (in)		24	24			
		Porosity (vol/vol)		0.3980	0.3980			
		Field Capacity (vol/vol)		0.2440	0.2440			
		Wilting Point (vol/vol)		0.1360	0.1360			
		Init. Moisture Content (vol/vol)		0.2440	0.2440			
		Hyd. Conductivity (cm/s)		1.2E-04	1.2E-04			
	LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)		0.30	~~0.25~~ **0.27**			
		Porosity (vol/vol)		0.8500	0.8500			
		Field Capacity (vol/vol)		0.0100	0.0100			
		Wilting Point (vol/vol)		0.0050	0.0050			
		Init. Moisture Content (vol/vol)		0.0100	0.0100			
		Hyd. Conductivity (cm/s)		40.42	~~7.77~~ **12.08**			
		Slope (%)		1	1			
		Slope Length (ft)		700	700			
	FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)		0.04	0.04			
		Hyd. Conductivity (cm/s)		4.0E-13	4.0E-13			
		Pinhole Density (holes/acre)		1	1			
		Install. Defects (holes/acre)		4	20			
		Placement Quality		GOOD	GOOD			
	GEOSYNTHETIC CLAY LINER (Texture = 0)	Thickness (in)		0.25	0.25			
		Porosity (vol/vol)		0.7500	0.7500			
		Field Capacity (vol/vol)		0.7470	0.7470			
		Wilting Point (vol/vol)		0.4000	0.4000			
		Init. Moisture Content (vol/vol)		0.7500	0.7500			
		Hyd. Conductivity (cm/s)		5.0E-09	5.0E-09			
Pre D Liner		Thickness (in)	36					
		Porosity (vol/vol)	0.4270					
		Field Capacity (vol/vol)	0.4180					
		Wilting Point (vol/vol)	0.3670					
		Init. Moisture Content (vol/vol)	0.4270					
		Hyd. Conductivity (cm/s)	1.0E-07					
PRECIPITATION		Average Annual (in)	34.25	36.16	34.26		34.26	34.26
PERCOLATION		Through Layer	Int. Cover	Overliner	Overliner	Final Cover	Alt. Final Cover[1]	Upper Clay
		Average Annual (in/year)	5.07635	0.00001	~~0.00002~~ **0.00001**	0.2564	0.0106	0.2917
		Average Annual (mm/year)	130	0.00025	~~0.00051~~ **0.00025**	6.5	0.3	7.4

[1] Existing alternative final cover information was reproduced from the Alternative Soil Final Cover System approved by TCEQ on August 5, 2011. This demonstration was completed using the UNSAT-H model and estimated a 0.3 mm/yr percolation rate for the existing alternative final cover. However, a percolation value of 4 mm/yr was used in lieu of 0.3 mm/yr for the existing alternative final cover in MODFLOW simulations for a more conservative approach.

HELP MODEL OUTPUT FOR OVERLINER WITH FINAL COVER (CLOSED)

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP 307\CAM\IIIB\CLOSD\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\IIIB\CLOSD\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\IIIB\CLOSD\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\IIIB\CLOSD\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\IIIB\CLOSD\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\IIIB\CLOSD\CLOSED.OUT


TIME:   9:41     DATE:   2/22/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-OVERLINER CLOSED

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
           THICKNESS                   =     12.00   INCHES
           POROSITY                    =      0.3980 VOL/VOL
           FIELD CAPACITY              =      0.2440 VOL/VOL
           WILTING POINT               =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

```
                    LAYER  2
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC


                    LAYER  3
                    --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                    LAYER  4
                    --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                    LAYER  5
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  11
THICKNESS                    =     12.00   INCHES
```

```
POROSITY                    =      0.4640 VOL/VOL
FIELD CAPACITY              =      0.3100 VOL/VOL
WILTING POINT               =      0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.639999998000E-04 CM/SEC


                       LAYER  6
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =   1464.00   INCHES
POROSITY                    =      0.6159 VOL/VOL
FIELD CAPACITY              =      0.5118 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                       LAYER  7
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                       LAYER  8
                       --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.27   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   12.0799999000     CM/SEC
SLOPE                       =      1.00   PERCENT
DRAINAGE LENGTH             =    700.0    FEET


                       LAYER  9
```

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	20.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 10

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999997000E-08	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.392	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.164	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.448	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	579.628	INCHES
TOTAL INITIAL WATER	=	579.628	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85 DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50
START OF GROWING SEASON (JULIAN DATE)	=	63
END OF GROWING SEASON (JULIAN DATE)	=	329
EVAPORATIVE ZONE DEPTH	=	18.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION						
TOTALS	1.49	2.20	2.80	3.08	4.59	3.29
	2.94	1.93	2.75	4.15	2.36	2.71
STD. DEVIATIONS	1.02	1.27	1.67	1.89	2.17	2.13
	2.33	1.43	1.52	3.45	1.80	1.93
RUNOFF						
TOTALS	0.231	0.154	0.318	0.189	0.352	0.106
	0.124	0.016	0.022	0.847	0.537	0.879
STD. DEVIATIONS	0.410	0.410	0.709	0.443	0.820	0.204
	0.289	0.039	0.049	1.590	1.034	1.518
EVAPOTRANSPIRATION						
TOTALS	1.673	1.770	2.669	4.424	4.729	3.465
	2.959	1.935	2.408	1.751	1.035	1.400
STD. DEVIATIONS	0.408	0.585	0.943	1.005	1.869	1.948
	1.993	1.548	1.397	0.866	0.367	0.421
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0314	0.0274	0.0306	0.0241	0.0158	0.0134
	0.0135	0.0123	0.0119	0.0195	0.0255	0.0309
STD. DEVIATIONS	0.0126	0.0096	0.0093	0.0081	0.0061	0.0034
	0.0036	0.0024	0.0025	0.0103	0.0141	0.0142
LATERAL DRAINAGE COLLECTED FROM LAYER 8						
TOTALS	0.3024	0.2800	0.2990	0.2934	0.2983	0.2860
	0.3082	0.2962	0.2911	0.2957	0.2858	0.2898
STD. DEVIATIONS	0.1091	0.1128	0.1156	0.1179	0.1063	0.1101
	0.1217	0.1057	0.1132	0.1146	0.1065	0.0998
PERCOLATION/LEAKAGE THROUGH LAYER 10						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	15.3998	14.7275	15.0076	12.1243	7.5029	6.5148
	6.3332	5.7299	5.7205	9.3725	12.8499	15.1297
STD. DEVIATIONS	6.3262	5.3059	4.6271	4.1758	3.0544	1.7389
	1.7835	1.1462	1.2067	5.1851	7.3282	7.1434

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0100	0.0101	0.0099	0.0100	0.0098	0.0097
	0.0102	0.0098	0.0099	0.0098	0.0097	0.0096
STD. DEVIATIONS	0.0036	0.0041	0.0038	0.0040	0.0035	0.0038
	0.0040	0.0035	0.0039	0.0038	0.0036	0.0033

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.26	(6.276)	124371.1	100.00
RUNOFF	3.774	(2.9347)	13698.63	11.014
EVAPOTRANSPIRATION	30.216	(4.2443)	109684.16	88.191
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.25638	(0.06252)	930.642	0.74828
AVERAGE HEAD ON TOP OF LAYER 3	10.534	(2.625)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	3.52592	(1.29917)	12799.096	10.29105
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00001	(0.00000)	0.045	0.00004
AVERAGE HEAD ON TOP OF LAYER 9	0.010	(0.004)		
CHANGE IN WATER STORAGE	-3.254	(2.4206)	-11810.86	-9.496

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              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
  ---------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
     PRECIPITATION                               6.00         21780.000

     RUNOFF                                      3.413        12389.1777

     PERCOLATION/LEAKAGE THROUGH LAYER  4        0.001567         5.68974

     AVERAGE HEAD ON TOP OF LAYER  3            24.000

     DRAINAGE COLLECTED FROM LAYER  8            0.03801        137.98445

     PERCOLATION/LEAKAGE THROUGH LAYER 10        0.000000         0.00031

     AVERAGE HEAD ON TOP OF LAYER  9             0.039

     MAXIMUM HEAD ON TOP OF LAYER  9             0.078

     LOCATION OF MAXIMUM HEAD IN LAYER  8
           (DISTANCE FROM DRAIN)                 0.4 FEET

     SNOW WATER                                  2.40          8713.1436


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                   0.3980

     MINIMUM VEG. SOIL WATER (VOL/VOL)                   0.1360

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4409	0.2034
2	3.8913	0.3243
3	0.0000	0.0000
4	7.6860	0.4270
5	3.7200	0.3100
6	458.0822	0.3129
7	6.0023	0.2501
8	0.0075	0.0278
9	0.0000	0.0000
10	0.1875	0.7500
SNOW WATER	0.000	

****
****

APPENDIX IIIB-B

HELP MODEL OUTPUT – GCL/CCL COMPARISON

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON
8-5-16
IT IS NOT TO BE USED FOR CONSTRUCTION,
BIDDING, OR PERMIT PURPOSES.

Includes pages IIIB-B-1 through IIIB-B-21

CAMELOT LANDFILL
1339-351-11-02-6B.2
HELP VERSION 3.07 SUMMARY SHEET
POINT OF COMPLIANCE DEMONSTRATION

			INTERIM OVERLINER WITH GEOSYNTHETIC CLAY LINER[1]	INTERIM OVERLINER WITH COMPACTED CLAY LINER	CLOSED OVERLINER WITH GEOSYNTHETIC CLAY LINER[1]	CLOSED OVERLINER WITH COMPACTED CLAY LINER
GENERAL INFORMATION		No. of Years	12	12	30	30
		Ground Cover	FAIR	FAIR	GOOD	GOOD
		SCS Runoff Curve No.	87.1	87.1	80.1	80.1
		Model Area (acre)	1	1	1	1
		Runoff Area (%)	70	70	100	100
		Maximum Leaf Area Index	3.0	3.0	4.5	4.5
		Evaporative Zone Depth (inch)	12	12	18	18
Final Cover	TOPSOIL LAYER (Texture = 10)	Thickness (in)			12	12
		Porosity (vol/vol)			0.3980	0.3980
		Field Capacity (vol/vol)			0.2440	0.2440
		Wilting Point (vol/vol)			0.1360	0.1360
		Init. Moisture Content (vol/vol)			0.2440	0.2440
		Hyd. Conductivity (cm/s)			1.2E-04	1.2E-04
	EROSION LAYER (Texture = 10)	Thickness (in)			12	12
		Porosity (vol/vol)			0.3980	0.3980
		Field Capacity (vol/vol)			0.2440	0.2440
		Wilting Point (vol/vol)			0.1360	0.1360
		Init. Moisture Content (vol/vol)			0.2440	0.2440
		Hyd. Conductivity (cm/s)			1.2E-04	1.2E-04
	FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)			0.04	0.04
		Hyd. Conductivity (cm/s)			4.0E-13	4.0E-13
		Pinhole Density (holes/acre)			1	1
		Install. Defects (holes/acre)			4	4
		Placement Quality			GOOD	GOOD
	INFILTRATION LAYER (Texture = 0)	Thickness (in)			18	18
		Porosity (vol/vol)			0.4270	0.4270
		Field Capacity (vol/vol)			0.4180	0.4180
		Wilting Point (vol/vol)			0.3670	0.3670
		Init. Moisture Content (vol/vol)			0.4270	0.4270
		Hyd. Conductivity (cm/s)			1.0E-05	1.0E-05
Intermediate Cover	INTERMEDIATE COVER (Texture = 11)	Thickness (in)	12	12	12	12
		Porosity (vol/vol)	0.4640	0.4640	0.4640	0.4640
		Field Capacity (vol/vol)	0.3100	0.3100	0.3100	0.3100
		Wilting Point (vol/vol)	0.1870	0.1870	0.1870	0.1870
		Init. Moisture Content (vol/vol)	0.3100	0.3100	0.3100	0.3100
		Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	6.4E-05	6.4E-05
Waste	WASTE TOP (Texture = 0)	Thickness (in)			~~1500~~ **1464**	~~1500~~ **1464**
		Porosity (vol/vol)			~~0.6148~~ **0.6159**	~~0.6148~~ **0.6159**
		Field Capacity (vol/vol)			~~0.5114~~ **0.5118**	~~0.5114~~ **0.5118**
		Wilting Point (vol/vol)			0.0770	0.0770
		Init. Moisture Content (vol/vol)			0.3800	0.3800
		Hyd. Conductivity (cm/s)			1.0E-03	1.0E-03
	WASTE BOTTOM (Texture = 0)	Thickness (in)	120	120	~~756~~	~~756~~
		Porosity (vol/vol)	0.6376	0.6376	~~0.5387~~	~~0.5387~~
		Field Capacity (vol/vol)	0.5185	0.5185	~~0.4900~~	~~0.4900~~
		Wilting Point (vol/vol)	0.0770	0.0770	~~0.0770~~	~~0.0770~~
		Init. Moisture Content (vol/vol)	0.2500	0.2500	~~0.3800~~	~~0.3800~~
		Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	~~1.0E-04~~	~~1.0E-04~~
Pre D Cover		Thickness (in)				
		Porosity (vol/vol)				
		Field Capacity (vol/vol)				
		Wilting Point (vol/vol)				
		Init. Moisture Content (vol/vol)				
		Hyd. Conductivity (cm/s)				
Overliner	PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24	24
		Porosity (vol/vol)	0.3980	0.3980	0.3980	0.3980
		Field Capacity (vol/vol)	0.2440	0.2440	0.2440	0.2440
		Wilting Point (vol/vol)	0.1360	0.1360	0.1360	0.1360
		Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440	0.2440
		Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04	1.2E-04
	LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	0.30	0.30	~~0.25~~ **0.27**	~~0.25~~ **0.27**
		Porosity (vol/vol)	0.8500	0.8500	0.8500	0.8500
		Field Capacity (vol/vol)	0.0100	0.0100	0.0100	0.0100
		Wilting Point (vol/vol)	0.0050	0.0050	0.0050	0.0050
		Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100	0.0100
		Hyd. Conductivity (cm/s)	40.42	40.42	~~7.77~~ **12.08**	~~7.77~~ **12.08**
		Slope (%)	1	1	1	1
		Slope Length (ft)	700	700	700	700
	FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)	0.04	0.04	0.04	0.04
		Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13	4.0E-13
		Pinhole Density (holes/acre)	1	1	1	1
		Install. Defects (holes/acre)	4	4	20	20
		Placement Quality	GOOD	GOOD	GOOD	GOOD
	COMPACTED CLAY LINER (Texture = 0)	Thickness (in)		24		24
		Porosity (vol/vol)		0.4270		0.4270
		Field Capacity (vol/vol)		0.4180		0.4180
		Wilting Point (vol/vol)		0.3670		0.3670
		Init. Moisture Content (vol/vol)		0.4270		0.4270
		Hyd. Conductivity (cm/s)		1.0E-07		1.0E-07
	GEOSYNTHETIC CLAY LINER (Texture = 0)	Thickness (in)	0.25		0.25	
		Porosity (vol/vol)	0.7500		0.7500	
		Field Capacity (vol/vol)	0.7470		0.7470	
		Wilting Point (vol/vol)	0.4000		0.4000	
		Init. Moisture Content (vol/vol)	0.7500		0.7500	
		Hyd. Conductivity (cm/s)	5.0E-09		5.0E-09	
PRECIPITATION		Average Annual (in)	36.16	36.16	34.26	34.26
PERCOLATION		Through Layer	Overliner	Overliner	Overliner	Overliner
		Average Annual (in/year)	0.00001	0.00001	~~0.00002~~ **0.00001**	~~0.00011~~ **0.00007**
		Average Annual (mm/year)	0.00025	0.00025	~~0.00051~~ **0.00025**	~~0.00279~~ **0.00178**
		Average Annual (cf/year)	0.019	0.040	~~0.062~~ **0.045**	~~0.416~~ **0.260**

[1] HELP summary reproduced from Appendix IIIB-A.

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******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP 307\CAM\IIIB\CLOSD\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\IIIB\CLOSD\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\IIIB\CLOSD\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\IIIB\CLOSD\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\IIIB\CLOSD\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\IIIB\CLOSD\CLOSED.OUT


TIME:  10:30     DATE:   2/22/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-OVERLINER CLOSED

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
          THICKNESS                  =     12.00   INCHES
          POROSITY                   =      0.3980 VOL/VOL
          FIELD CAPACITY             =      0.2440 VOL/VOL
          WILTING POINT              =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.2440 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

```
                    LAYER  2
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC


                    LAYER  3
                    --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                    LAYER  4
                    --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                    LAYER  5
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  11
THICKNESS                    =     12.00   INCHES
```

```
POROSITY                      =      0.4640 VOL/VOL
FIELD CAPACITY                =      0.3100 VOL/VOL
WILTING POINT                 =      0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =  0.639999998000E-04 CM/SEC


                        LAYER  6
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                     =   1464.00   INCHES
POROSITY                      =      0.6159 VOL/VOL
FIELD CAPACITY                =      0.5118 VOL/VOL
WILTING POINT                 =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =  0.100000005000E-02 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                     =     24.00   INCHES
POROSITY                      =      0.3980 VOL/VOL
FIELD CAPACITY                =      0.2440 VOL/VOL
WILTING POINT                 =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =  0.119999997000E-03 CM/SEC


                        LAYER  8
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                     =      0.27   INCHES
POROSITY                      =      0.8500 VOL/VOL
FIELD CAPACITY                =      0.0100 VOL/VOL
WILTING POINT                 =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =   12.0799999000     CM/SEC
SLOPE                         =      1.00   PERCENT
DRAINAGE LENGTH               =    700.0    FEET


                        LAYER  9
```

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	20.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 10

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.392	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.164	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.448	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	589.689	INCHES
TOTAL INITIAL WATER	=	589.689	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85 DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50
START OF GROWING SEASON (JULIAN DATE)	=	63
END OF GROWING SEASON (JULIAN DATE)	=	329
EVAPORATIVE ZONE DEPTH	=	18.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION						
TOTALS	1.49	2.20	2.80	3.08	4.59	3.29
	2.94	1.93	2.75	4.15	2.36	2.71
STD. DEVIATIONS	1.02	1.27	1.67	1.89	2.17	2.13
	2.33	1.43	1.52	3.45	1.80	1.93
RUNOFF						
TOTALS	0.231	0.154	0.318	0.189	0.352	0.106
	0.124	0.016	0.022	0.847	0.537	0.879
STD. DEVIATIONS	0.410	0.410	0.709	0.443	0.820	0.204
	0.289	0.039	0.049	1.590	1.034	1.518
EVAPOTRANSPIRATION						
TOTALS	1.673	1.770	2.669	4.424	4.729	3.465
	2.959	1.935	2.408	1.751	1.035	1.400
STD. DEVIATIONS	0.408	0.585	0.943	1.005	1.869	1.948
	1.993	1.548	1.397	0.866	0.367	0.421
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0314	0.0274	0.0306	0.0241	0.0158	0.0134
	0.0135	0.0123	0.0119	0.0195	0.0255	0.0309
STD. DEVIATIONS	0.0126	0.0096	0.0093	0.0081	0.0061	0.0034
	0.0036	0.0024	0.0025	0.0103	0.0141	0.0142
LATERAL DRAINAGE COLLECTED FROM LAYER 8						
TOTALS	0.3024	0.2800	0.2990	0.2934	0.2983	0.2859
	0.3082	0.2962	0.2911	0.2957	0.2858	0.2898
STD. DEVIATIONS	0.1091	0.1128	0.1156	0.1179	0.1063	0.1101
	0.1217	0.1057	0.1132	0.1146	0.1065	0.0998
PERCOLATION/LEAKAGE THROUGH LAYER 10						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	15.3998	14.7275	15.0076	12.1243	7.5029	6.5148
	6.3332	5.7299	5.7205	9.3725	12.8499	15.1297
STD. DEVIATIONS	6.3262	5.3059	4.6271	4.1758	3.0544	1.7389
	1.7835	1.1462	1.2067	5.1851	7.3282	7.1434

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0100	0.0101	0.0099	0.0100	0.0098	0.0097
	0.0102	0.0098	0.0099	0.0098	0.0097	0.0096
STD. DEVIATIONS	0.0036	0.0041	0.0038	0.0040	0.0035	0.0038
	0.0040	0.0035	0.0039	0.0038	0.0036	0.0033

****

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.26	(6.276)	124371.1	100.00
RUNOFF	3.774	(2.9347)	13698.63	11.014
EVAPOTRANSPIRATION	30.216	(4.2443)	109684.16	88.191
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.25638	(0.06252)	930.642	0.74828
AVERAGE HEAD ON TOP OF LAYER 3	10.534	(2.625)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	3.52586	(1.29915)	12798.881	10.29088
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00007	(0.00002)	0.260	0.00021
AVERAGE HEAD ON TOP OF LAYER 9	0.010	(0.004)		
CHANGE IN WATER STORAGE	-3.254	(2.4206)	-11810.86	-9.496

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	6.00	21780.000
RUNOFF	3.413	12389.1777
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.001567	5.68974
AVERAGE HEAD ON TOP OF LAYER 3	24.000	
DRAINAGE COLLECTED FROM LAYER 8	0.03801	137.98257
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000001	0.00235
AVERAGE HEAD ON TOP OF LAYER 9	0.039	
MAXIMUM HEAD ON TOP OF LAYER 9	0.077	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	7.4 FEET	
SNOW WATER	2.40	8713.1436

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3980
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4409	0.2034
2	3.8913	0.3243
3	0.0000	0.0000
4	7.6860	0.4270
5	3.7200	0.3100
6	458.0822	0.3129
7	6.0023	0.2501
8	0.0075	0.0278
9	0.0000	0.0000
10	10.2480	0.4270
SNOW WATER	0.000	

****
****

APPENDIX IIIB-C

ADDITIONAL HELP MODEL INFORMATION

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

6-5-16

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Includes pages IIIB-C-1 and IIIB-C-3

ADDITIONAL HELP MODEL INFORMATION

The purpose of this appendix is to demonstrate that the percolation rate used for the design case (0.00025 mm/year) provides a conservative (i.e., higher) percolation rate for use in MODFLOW. To demonstrate this, an assessment of percolation rates using the different waste thicknesses for overliner areas included in Appendix IIIC-A was completed. As discussed in Section 3.2 in Appendix IIIB, the design case for estimating percolation through the overliner was based on a 10-foot-waste fill condition and a 12-year simulation period between 2028 and 2039.

A summary of the key assumptions used to develop the percolation rates summarized in this appendix are listed below.

- Consistent with Appendix IIIC-A, the different waste thicknesses analyzed in this appendix include the interim 50-foot, 100-foot, ~~150-foot,~~ and ~~188~~122-foot-waste fill conditions for the overliner areas. The interim 10-foot-waste fill condition and closed ~~188~~122-foot-waste fill condition were modeled in Appendix IIIB-A to estimate percolation through the overliner system.
- Consistent with the design case, the pinhole density was increased to 1 hole/acre and the installation defects were increased to 4 holes/acre for the geomembrane liner. The geomembrane liner analyzed in Appendix IIIC-A was modeled with zero pinholes and zero installation defects to minimize percolation through the overliner and maximize leachate collection for purposes of leachate collection system design.
- Consistent with the design case, the different waste thicknesses analyzed in this appendix were modeled with the 12-year simulation period between 2028 and 2039. The simulation periods analyzed in Appendix IIIC-A for the different waste thicknesses are based on anticipated site development and waste fill conditions for overliner areas.

The results are summarized in the table below.

Table 1
Additional HELP Modeling Results

Item	HELP Model Information			
Waste Column Thickness	50 ft	100 ft	~~150 ft~~	~~188~~ 122 ft
Percolation through Overliner (mm/yr)	0.000063	0.000175	~~0.000182~~	~~0.00021~~ 0.00020

Prep By: JLG
Date: 2/26/2016

Chkd By: SAB
Date: 2/26/2016

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07
SUMMARY SHEET
ADDITIONAL HELP MODEL RUNS

		INTERIM (50 FT WASTE)	INTERIM (100 FT WASTE)	~~INTERIM (150 FT WASTE)~~	INTERIM ~~(188~~ **122** FT WASTE)
GENERAL INFORMATION	Case No.	1	2	~~3~~	4
	No. of Years	12	12	~~12~~	12
	Ground Cover	FAIR	FAIR	~~FAIR~~	FAIR
	SCS Runoff Curve No.	87.1	87.1	~~87.1~~	86.7
	Model Area (acre)	1	1	~~1~~	1
	Runoff Area (%)	70	80	~~80~~	90
	Maximum Leaf Area Index	3.0	3.0	~~3.0~~	3.0
	Evaporative Zone Depth (inch)	12	12	~~12~~	12
TOPSOIL LAYER (Texture = 10)	Thickness (in)				
	Porosity (vol/vol)				
	Field Capacity (vol/vol)				
	Wilting Point (vol/vol)				
	Init. Moisture Content (vol/vol)				
	Hyd. Conductivity (cm/s)				
EROSION LAYER (Texture = 10)	Thickness (in)				
	Porosity (vol/vol)				
	Field Capacity (vol/vol)				
	Wilting Point (vol/vol)				
	Init. Moisture Content (vol/vol)				
	Hyd. Conductivity (cm/s)				
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)				
	Hyd. Conductivity (cm/s)				
	Pinhole Density (holes/acre)				
	Install. Defects (holes/acre)				
	Placement Quality				
INFILTRATION LAYER (Texture = 0)	Thickness (in)				
	Porosity (vol/vol)				
	Field Capacity (vol/vol)				
	Wilting Point (vol/vol)				
	Init. Moisture Content (vol/vol)				
	Hyd. Conductivity (cm/s)				
INTERMEDIATE COVER (Texture = 11)	Thickness (in)	12	12	~~12~~	12
	Porosity (vol/vol)	0.4640	0.4640	~~0.4640~~	0.4640
	Field Capacity (vol/vol)	0.3100	0.3100	~~0.3100~~	0.3100
	Wilting Point (vol/vol)	0.1870	0.1870	~~0.1870~~	0.1870
	Init. Moisture Content (vol/vol)	0.3100	0.3100	~~0.3100~~	0.3100
	Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	~~6.4E-05~~	6.4E-05
WASTE TOP[2] (Texture = 0)	Thickness (in)	600	1200	~~1500~~	~~1500~~ **1464**
	Porosity (vol/vol)	0.6376	0.6247	~~0.6148~~	~~0.6148~~ **0.6159**
	Field Capacity (vol/vol)	0.5185	0.5144	~~0.5114~~	~~0.5114~~ **0.5118**
	Wilting Point (vol/vol)	0.0770	0.0770	~~0.0770~~	0.0770
	Init. Moisture Content (vol/vol)	0.2500	0.3800	~~0.3800~~	0.3800
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	~~1.0E-03~~	1.0E-03
WASTE BOTTOM[2] (Texture = 0)	Thickness (in)			~~300~~	~~756~~
	Porosity (vol/vol)			~~0.5539~~	~~0.5387~~
	Field Capacity (vol/vol)			~~0.4945~~	~~0.4900~~
	Wilting Point (vol/vol)			~~0.0770~~	~~0.0770~~
	Init. Moisture Content (vol/vol)			~~0.3800~~	~~0.3800~~
	Hyd. Conductivity (cm/s)			~~1.0E-04~~	~~1.0E-04~~
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	~~24~~	24
	Porosity (vol/vol)	0.3980	0.3980	~~0.3980~~	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	~~0.2440~~	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	~~0.1360~~	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	~~0.2440~~	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	~~1.2E-04~~	1.2E-04
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	0.291	0.279	~~0.262~~	~~0.247~~ **0.272**
	Porosity (vol/vol)	0.8500	0.8500	~~0.8500~~	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	~~0.0100~~	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	~~0.0050~~	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	~~0.0100~~	0.0100
	Hyd. Conductivity (cm/s)	26.10	18.70	~~13.65~~	~~9.22~~ **13.94**
	Slope[1] (%)	1	1	~~1~~	1
	Slope Length (ft)	700	700	~~700~~	700
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)	0.04	0.04	~~0.04~~	0.04
	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	~~4.0E-13~~	4.0E-13
	Pinhole Density (holes/acre)	1	1	~~1~~	1
	Install. Defects (holes/acre)	4	4	4	4
	Placement Quality	GOOD	GOOD	~~GOOD~~	GOOD
GEOSYNTHETIC CLAY LINER (Texture = 0)	Thickness (in)	0.25	0.25	~~0.25~~	0.25
	Porosity (vol/vol)	0.7500	0.7500	~~0.7500~~	0.7500
	Field Capacity (vol/vol)	0.7470	0.7470	~~0.7470~~	0.7470
	Wilting Point (vol/vol)	0.4000	0.4000	~~0.4000~~	0.4000
	Init. Moisture Content (vol/vol)	0.7500	0.7500	~~0.7500~~	0.7500
	Hyd. Conductivity (cm/s)	5.0E-09	5.0E-09	~~5.0E-09~~	5.0E-09
PRECIPITATION	Average Annual (in)	36.16	36.16	~~36.16~~	36.16
RUNOFF	Average Annual (in)	1.93	2.19	~~2.19~~	2.31
EVAPOTRANSPIRATION	Average Annual (in)	27.50	27.48	~~27.48~~	27.51
PERCOLATION	Through Layer	Overliner	Overliner	~~Overliner~~	Overliner
	Average Annual (cf/year)	0.009	0.025	~~0.026~~	~~0.030~~ **0.028**
	Average Annual (in/year)[3]	0.0000025	0.0000069	~~0.0000072~~	~~0.0000083~~ **0.0000077**
	Average Annual (mm/year)[3]	0.000063	0.000175	~~0.000182~~	~~0.000210~~ **0.000196**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the overliner presented in Appendix IIIJ-B.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. al, *Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-594.

[3] Percolation values converted from cubic feet/year value based on modeled 1-acre area.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIC
LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN

Prepared for
City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014
Revised October 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

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Prepared by

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WBC Project No. 1339-351-11-02-6B.3

This document is intended for permitting purposes only.

3 LEACHATE COLLECTION SYSTEM

3.1 System Layout and Design Criteria

3.1.1 Introduction

The leachate collection system (LCS) for the Subtitle D area will consist of: (1) a collection layer placed over the liner system, (2) the leachate collection piping, and (3) the leachate collection sumps and pumps. An overliner leachate collection system will be placed above the overliner system geomembrane liner within the pre-Subtitle D area to collect leachate generated from the waste placed in the vertical expansion area. The plan for the overliner LCS piping and grading is also shown in Part III, Appendix IIIA-A, Drawing A.1 – Excavation Plan and Figure 3-1. LCS details are also provided in Part III, Appendix IIIA-A – Liner, Overliner, and Final Cover System Details. The existing leachate collection system has also been analyzed to show that the proposed change in site configuration will not adversely impact the existing leachate collection system. Also, to minimize buildup of leachate in the bottom of the landfill, leachate removal wells in the pre-Subtitle D area ~~will be~~ have been installed~~,~~ and are being monitored~~,~~ and pumped, as discussed in Section 3.6.

3.1.2 Design Criteria

The leachate management system is designed and operated to collect and remove leachate from each cell, maintain leachate levels below 12 inches (or 30 cm) above the liner systems, channel leachate to designated collection sumps, and effectively manage leachate through storage and disposal. The system is designed to eliminate potential migration of landfill leachate into the environment and to meet the requirements of 30 TAC §330.333, namely:

- constructed of materials that are chemically resistant to the leachate expected to be generated;
- of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by equipment used at the facility; and
- designed to function through the scheduled closure and post-closure period of the facility.

The LCS is designed to maintain the maximum leachate depth on the liner to less than 12 inches, in accordance with 30 TAC §330.331(a)(2) by the monitoring of head levels and timely recovery of leachate. This is accomplished by setting the control level for the automatic sump pumps at a level less than 12 inches above the lip of the sump. The drainage geocomposite leachate collection layer is designed to convey the estimated peak leachate flow rate without the leachate level within the geocomposite exceeding the thickness of the geocomposite. The operation of the leachate sump and the conveyance capacity of the geocomposite leachate collection layer work in tandem to maintain

Table 3-1
Subtitle D Leachate Collection System Design Summary
Maximum Depth of Leachate on Liner

Cells[3]	Location	Initial Slope	Post-Settlement Slope	Slope Used for Design	Maximum Depth of Leachate on Liner Using Peak Flow Rate Generated by HELP[1]	Maximum Depth of Leachate on Liner Using Actual Leachate Generation Information[1]	Flow Depth Less than Thickness of Drainage Geocomposite
1 and 2	Slope between cell ridgeline and leachate collection pipe	1.17%	~~1.16%~~ 1.19%	1.1%	0.009 inches	0.0029 inches	Yes
	Slope of leachate collection pipe	0.5%	~~0.36%~~ 0.35%	0.3%	Peak flow less than the capacity of the collection pipe[2]	Peak flow less than the capacity of the collection pipe[2]	
4B and 5	Slope between cell ridgeline and leachate collection pipe	1.17%	~~1.16%~~ 1.19%	1.1%	~~0.138~~ 0.160 inches	0.0674 inches	Yes
	Slope of leachate collection pipe (minimum)	0.5%	0.47%	0.3%	Peak flow less than the capacity of the collection pipe[2]	Peak flow less than the capacity of the collection pipe[2]	
6, 6A, 7, 7A, and 10 through 13	Slope between cell ridgeline and leachate collection pipe (minimum)	0.92%	0.90%	0.9%	~~0.138~~ 0.083 inches	0.0032 inches	Yes
	Slope of leachate collection pipe (minimum)	0.5%	~~0.37%~~ 0.35%	0.3%	Peak flow less than the capacity of the collection pipe[2]	Peak flow less than the capacity of the collection pipe[2]	

[1] Maximum depth of leachate on liner was determined using the design slope. Refer to Appendices IIIC-A, IIIC-B, and IIIC-E for additional information. Refer to Appendix IIIC-B (Maximum Head Calculations for Cells 3/4A/8/9A), which address Cells 3, 4A, 8, and 9A. A tire chip layer was used for the leachate collection system in these cells.
[2] The leachate collection pipe consists of a 6-inch-diameter HDPE pipe.
[3] The leachate collection layer is as follows: Cells 1 and 2 – 200-mil-thick single-sided geocomposite; Cells 4B and 5 – 200-mil-thick double-sided geocomposite; and Cells 6, 6A, 7, 7A, and 10 through 13 – 250-mil-thick single-sided geocomposite.

Figure 3-2 provides a summary of the post-settlement slopes that were estimated for each Subtitle D cells. Detailed settlement calculations are provided in Appendix IIIJ-B. As shown on Figure 3-2, the typical post-settlement slopes of the Subtitle D cells range from 0.90 percent to ~~1.16~~ 1.19 percent. A slope of 1.1 percent was conservatively selected for Cells 1 through 5, 8, and 9A, and a slope of 0.9 percent was used for Cells 6, 6A, 7, 7A, and 10 through 13 for the LCS design of the Subtitle D area cells. Table 3-1 presents a summary of the initial and post-settlement slope for each Subtitle D cell and also the maximum depth of leachate over the liner based on the HELP generated peak flow and the actual leachate generation information.

3.1.3.2 Overliner Area

As shown on Figure 3-1, the overliner that will be installed in the pre-Subtitle D area is divided into six cells. The grades of the overliner will generally match existing grade. The leachate will drain to collection pipes and be conveyed to sumps located near the overliner/final cover tie-in.

The post-settlement slopes of the overliner were used to demonstrate that the overliner leachate collection system will maintain less than 12 inches of leachate above the liner. Figure 3-3 shows the overliner post-settlement slopes at the end of the postclosure period. The settlement analyses are discussed in detail in Appendix IIIJ-B. The post-settlement slope of the overliner ranges from ~~1.9~~ 1.8 percent to ~~14.8~~ 15.3 percent. To provide for a conservative analysis, a slope of 1.0 percent was used for the overliner in the HELP analysis included in Appendix IIIC-A. Table 3-2 presents a summary of the initial and post-settlement slopes for the overliner and the maximum depth of leachate on the overliner system.

Table 3-2
Overliner Leachate Collection System Design Summary
Maximum Depth of Leachate on Liner

Item	Location	Typical Initial Slope	Post-Settlement Slope	Slope Used for Design	Maximum Depth of Leachate on Liner Using Peak Flow Rate Generated by HELP[1]	Maximum Depth of Leachate on Liner Using Actual Leachate Generation Information[1]	Flow Depth Less than Thickness of Drainage Geocomposite
Overliner	Slope of overliner	2-20%	~~1.9-14.8%~~ 1.8-15.3%	1.0%	~~0.089~~ 0.078 inches	0.0020 inches	Yes
	Slope of leachate collection pipe	0.6% (minimum)	0.5%	0.50%	Peak flow less than capacity of the collection pipe[2]	Peak flow less than capacity of the collection pipe[2]	

[1] Maximum depth of leachate on liner was determined using the design slope. Refer to Appendices IIIC-A and IIIC-E for additional information.
[2] The leachate collection pipe consists of a 6-inch-diameter HDPE pipe.

Table 3-3
Geotextile and Drainage Geocomposite Required Testing and Properties for Undeveloped Subtitle D Lined Area[1]

Responsible Party	Material	Test	Standard	Required Property[4]
Manufacturer	Geotextile	Unit Weight	ASTM D 5261	6 oz/sy
		Apparent Opening Size	ASTM D 4751	80 sieve
		Grab Strength	ASTM D 4632	157 lb
		Tear Strength	ASTM D 4533	56 lb
		Puncture Strength	ASTM D 4833	56 lb
		Permeability	ASTM D 4491	0.2 cm/s
Manufacturer	HDPE Geonet	Specific Gravity	ASTM D 1505	0.939 g/cm^3
		Thickness	ASTM D 5199	0.25 inch
		Carbon Black	ASTM D 1603	2%
		Tensile Strength	ASTM D 5035	45 lb/in (Peak)
Third Party Laboratory	Drainage Geocomposite	Transmissivity	ASTM D 4716	See Note 2
		Strength[3]	ASTM D 5321	Protective Cover/Geocomposite: Peak: C_a=100 psf, Δ=15°; Residual: C_a=60 psf, Δ=10° Single-sided Geocomposite/Smooth Geomembrane: Peak: C_a=0 psf, Δ=13°; Residual: C_a=0 psf, Δ=9° Double-sided Geocomposite/Textured Geomembrane: Peak: C_a=110 psf, Δ=23°; Residual: C_a=100 psf, Δ=10° Smooth Geomembrane/Clay Liner: Peak: C_a=100 psf, Δ=11°; Residual: C_a=0 psf, Δ=10° Textured Geomembrane/Clay Liner: Peak: C_a=200 psf, Δ=14°; Residual: C_a=100 psf, Δ=12° Clay Liner/Underdrain Geocomposite: Peak: C_a=100 psf, Δ=15°; Residual: C_a=60 psf, Δ=10° Clay Liner Internal: C_a=125 psf, Φ =13°
Manufacturer		Peel Adhesion	ASTM D 7005	1.0 lb/in

1 The minimum testing frequency will be one test sample per 100,000 square feet.

2 As noted in Appendix IIIC, Appendices IIIC-A and IIIC-B, the transmissivity of the bottom liner single-sided geocomposite will be measured at a gradient of 0.009 under normal pressures of 1,000, 15,000 and ~~23,421~~ 19,368 psf (or higher), boundary conditions consisting of soil/geocomposite/geomembrane with minimum seating time of 100 hours will be run for the first 100,000 square feet of liner construction. For each additional 100,000 square feet liner single-sided geocomposite placement area, one additional transmissivity test will be run under the minimum normal stress (i.e., ~~23,421~~ 19,368 psf) with all the other assumptions the same as the first three tests. The minimum transmissivity will be ~~9.94×10^{-4}~~ 1.28×10^{-3} m^2/s. The transmissivity of the bottom sidewall liner double-sided geocomposite shall be measured at a minimum gradient of 0.33 under a minimum normal pressure of 1,000, 10,000 and 18,748 or higher). Boundary conditions consist of soil/geocomposite/geomembrane with a minimum seating time of 100 hours. The minimum transmissivity will be 6.24×10^{-5} m^2/s. For each additional 100,000 square feet liner double-sided geocomposite placement area, one additional transmissivity test will be run under the minimum normal stress (i.e., 18,748 psf) with all the other assumptions the same as the first three tests.

3 The adhesion and interface friction angle of the geocomposite components will be determined to verify they meet the values used in the slope stability analysis of Appendix IIIJ-A. This test may be performed using stack testing (i.e., performing a single test combining all components of the liner system).

4 Minimum required property values for the geotextile and drainage geocomposite transmissivity are based on calculations provided in Appendix IIIC-A. The geonet properties are based on values specified in GRI standard GM-13. In addition, each material will be tested prior to construction to verify that it meets the minimum required properties.

Table 3-4
Geotextile and Drainage Geocomposite Requirements for the Overliner Areas[1]

Responsible Party	Material	Test	Standard	Required Property[4]
Manufacturer	Geotextile	Unit Weight Apparent Opening Size Grab Strength Tear Strength Puncture Strength Permeability	ASTM D 5261 ASTM D 4751 ASTM D 4632 ASTM D 4533 ASTM D 4833 ASTM D 4491	6 oz/sy 80 sieve 157 lb 56 lb 56 lb 0.2 cm/s
Manufacturer	HDPE Geonet	Specific Gravity Thickness Carbon Black Tensile Strength	ASTM D 1505 ASTM D 5199 ASTM D 1603 ASTM D 5035	0.939 g/cm^3 0.30 inch 2% 45 lb/in (Peak)
Third Party Laboratory	Drainage Geocomposite	Transmissivity	ASTM D 4716	See Note 2
		Strength[3]	ASTM D 5321	Protective Cover/Geocomposite: Peak: C_a=100 psf, Δ=15° Residual: C_a=60 psf, Δ=10° Geocomposite/Textured Geomembrane: Peak: C_a=110 psf, Δ=23° Residual: C_a=100 psf, Δ=10° Textured Geomembrane/Geosynthetic Clay Liner: Peak: C_a=100 psf, Δ=20° Residual: C_a=70 psf, Δ=15° Geosynthetic Clay Liner/Subgrade: Peak: C_a=80 psf, Δ=25° Residual: C_a=50 psf, Δ=16° Geosynthetic Clay Liner Internal: Peak: C_a=100 psf, Φ =24° Residual: C_a=50 psf, Φ =6°
Manufacturer		Peel Adhesion	ASTM D 7005	1.0 lb/in

[1] The minimum testing frequency will be one test sample per 100,000 square feet.

[2] As noted in Appendix IIIC, Appendices IIIC-A and IIIC-B, the transmissivity of the overliner double-sided geocomposite will be measured at a minimum gradient of 0.01 under a minimum normal pressure of 1,000, 10,000 and ~~13,720~~ 8,068 psf (or higher), boundary conditions consisting of soil/geocomposite/geomembrane with minimum seating time of 100 hours. The minimum transmissivity will be ~~2.77~~ 4.74x10^{-3} m^2/s. For each additional 100,000 square feet double-sided geocomposite placement area, one additional transmissivity test will be run under the minimum normal stress of ~~13,720~~ 8,068 psf with all the same assumptions as the first three tests.

[3] The adhesion and interface friction angle of the geocomposite components will be determined to verify they meet the values used in the slope stability analysis of Appendix IIIJ-A. This test may be performed using stack testing (i.e., performing a single test combining all components of the overliner system).

[4] Minimum required property values for the geotextile and drainage geocomposite transmissivity are based on calculations provided in Appendix IIIC-A. The geonet properties are based on values specified in GRI standard GM-13. In addition, each material will be tested prior to construction to verify that it meets the minimum required properties.

The specified pump will have the capacity to pump leachate at a rate of 25 gpm or 36,000 gpd. The maximum estimated flow to be pumped from the largest sector is ~~34,085~~ 27,527 gpd. As noted in Section 6, the leachate generation rate predicted by the HELP model is much greater than the expected leachate generation rate that is based on site specific information.

3.5 Drainage Stone (Coarse Aggregate)

Granular drainage material around the leachate collection pipes and in the LCS sumps in the pre-subtitle D and Subtitle D areas will consist of typical (e.g., unit weight of 90 to 110 pcf) or lightweight (e.g., unit weight less than 70 pcf) materials that comply with the following criteria. The aggregate will have a loss of mass due to calcium carbonate of less than 15 percent (in accordance with JLT-S-105-89 or ASTM D3042 method modified to use a solution of hydrochloric acid having a pH of 5). The drainage stone will meet the following gradation in accordance with ASTM D448, size number 467.

Sieve Size Square Opening	Percent Passing
2 inches	100
1½ inches	95 - 100
¾ inch	35 - 70
3/8 inch	10 - 30
No. 4 (3/16 inch)	0 - 5

Drainage materials not complying with the above gradations may also be approved by the POR if demonstrated to have a hydraulic conductivity of at least 1.0 cm/s and meet the gradation requirements of the filter and leachate collection pipe (in no case will the maximum rock size be greater than 2 inches). At a minimum, the drainage stone will meet the following criteria:

For circular holes in the leachate collection pipe:

$$\frac{\text{85 Percent Size of Filter Material}}{\text{Hole Diameter}} > 1.7$$

For slots in the leachate collection pipe:

$$\frac{\text{85 Percent Size of Filter Material}}{\text{Slot Width}} > 2.0$$

The drainage stone will be covered by a geotextile to maintain separation of drainage stone from the overlying layers. The geotextile will be resistant to commonly encountered chemicals, hydrocarbons and mildew, and will be rot resistant. Geotextile design calculations are presented in Appendix IIIC-B.

3.6 Leachate Removal Wells

To minimize buildup of leachate in the bottom of the landfill, the leachate removal wells (LRW) will be installed in the pre-Subtitle D area. These pre-Subtitle D area leachate removal wells were authorized by the TCEQ in September 2014 per a permit modification to TCEQ Permit No. MSW-1312A titled, "Pre-Subtitle D Area Leachate Removal Well Installation." The installation criteria included in the above referenced modification is reproduced in this section. The operating criteria discussed below is different than the criteria listed in the September 2014 permit modification. Under TCEQ Permit No. MSW-1312B, all ten of the pre-Subtitle D area leachate removal wells will be operated during the life of the site and nine of them will be operated during the postclosure period (under TCEQ Permit No. 1312A, these wells were to be decommissioned at closure).

As shown on Drawing A.22 in Appendix IIIA, 10 leachate removal wells ~~will be~~ were installed to remove leachate from the pre-Subtitle D area. Typical leachate removal well details are shown on Drawing A.12A in Appendix IIIA. As shown on Drawings A.22 and A.12A (Appendix IIIA), the following criteria ~~will be~~ was used to install the leachate removal wells.

- The leachate removal wells shall be installed at the locations shown on Drawing A.22, which are outside the areas shown as Excavated & Recompacted Zones on Attachment 25 of the August 1993 Soil and Liner Evaluation Report (SLER) prepared by Reed Engineering), and the September 1991 SLER (prepared by Reed Engineering). As long as they remain outside such areas, the locations may be adjusted up to 50 feet to facilitate installation and avoid obstacles that would make installation difficult.
- During drilling for a leachate removal well, if material identified as recompacted shale is encountered below the bottom of waste, drilling shall stop and the well shall be completed at that depth (refer to Drawing A.12A).

The well locations are all more than 80 feet from the edge of the waste in the pre-Subtitle D area, in areas where the vertical wells will not encounter constructed sidewall liners.

Leachate removal wells LRW-1 through LRW-9 (shown on Drawing A.22) ~~will be~~ were installed within the existing final cover. These wells will be operated during the life of the site and the postclosure period. Leachate removal well LRW-10 (shown on Drawing A.22) and ~~will be~~ was installed within the future overliner area and will be decommissioned prior to overliner area construction. The report covering installation of these wells was submitted to TCEQ in June 2015.

The leachate removal wells will be operated following the procedures listed below.

- The leachate level in each LRW will be monitored once per week and documented in the Site Operating Record (refer to Part IV – SOP, Section 4.23). Monitoring will include verification that the float system or transducer used to determine the leachate level is functioning and that the pump is maintaining the leachate level below the specified depth (the specified depth is a maximum of 3 feet above the bottom of the leachate removal well). If the leachate level is above the specified depth the pump will be removed and repaired/replaced, as needed.
- As shown on Drawing A.12A, a leachate removal pump will be placed in each well to remove any collected leachate. The pumps will be used to remove the collected leachate if the leachate level in the LRW is more than 3 feet above the bottom of the LRW.
- Leachate sensing floats, transducers, or an equivalent level monitoring device will be used to automatically activate the pumps. The pumps' outlet hoses will be connected to a forcemain that will convey leachate to the aboveground leachate storage tank. When the pumps are activated, leachate will be pumped to the dual-contained forcemain (either a separate forcemain or the LFG condensate forcemain), as shown on Drawings A.20 and A.22 in Appendix IIIA-A.
- The extracted leachate will be conveyed to the on-site leachate storage tank before being discharged to a POTW.

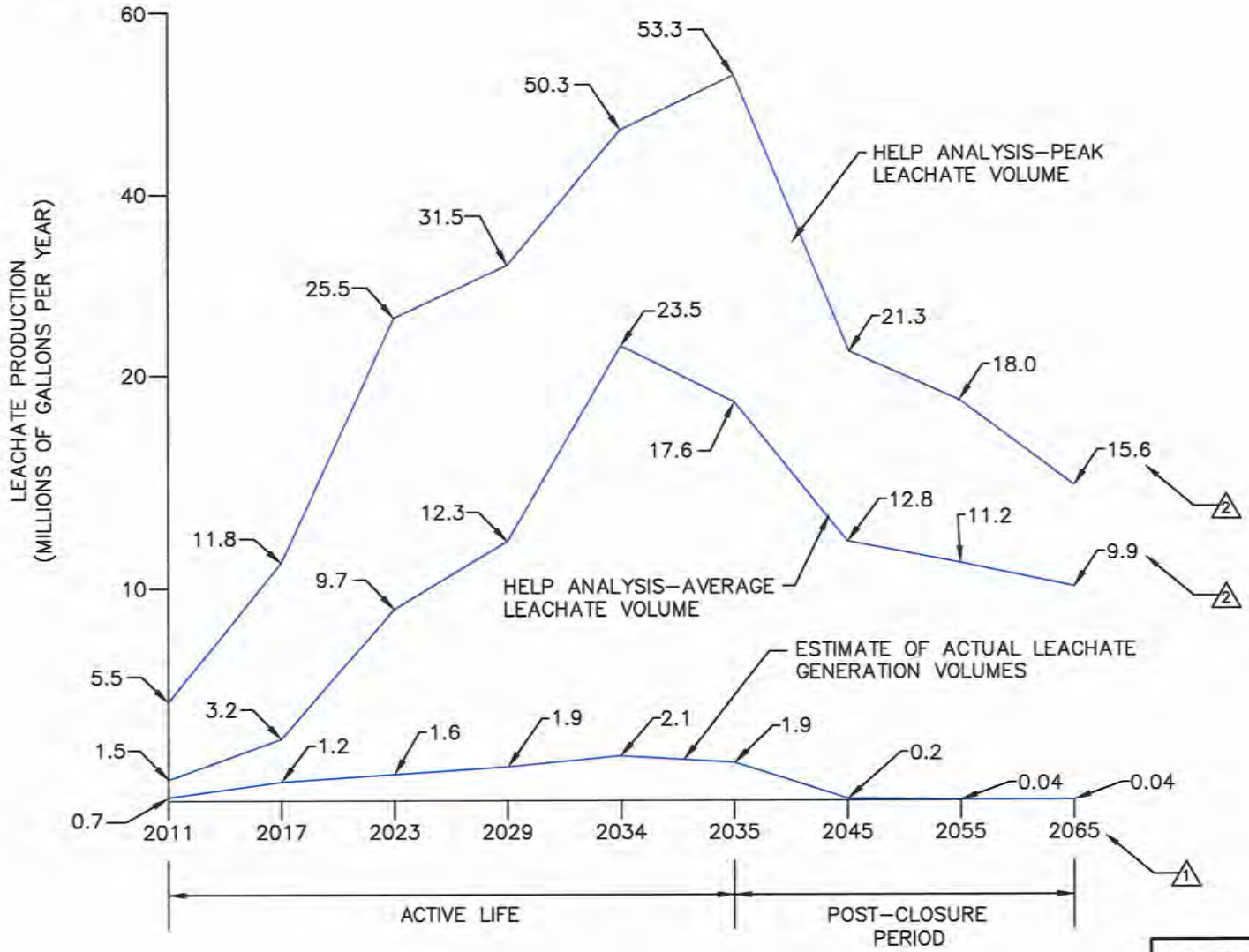
The following construction quality assurance (CQA) procedures ~~will be~~ were followed for the installation of each LRW.

- Prior to construction, the location of each well will be staked by a licensed Texas surveyor.
- A Texas licensed professional engineer will review the staked locations to verify that the location criteria set forth on Drawings A.22 and A.12A is met.
- A full-time CQA monitor will be on-site during the installation of the LRW system. The CQA monitor will log each LRW. The log or well drilling/completion report will include the depth of waste (top of Unweathered Shale or recompacted shale), the depth of the LRW, and the solid and perforate pipe configuration.
- Documentation of each LRW installation will include the following.
  - Summary of all construction activities;
  - LRW logs;
  - As-built drawing of LRW system; and
  - Statement of compliance with the permit.
- The CQA report will be signed and stamped by a Texas licensed professional engineer and the report will be maintained in the Site Operating Record.

Table 4-1
Sump Flow and Pump Operating Times

Condition	Sump Storage Summary														
	Sump for Cells 1, 2, 3, 4A, 4B, 8, and 9A[1]					Sump for Cells 5A, 5B, 5C, 10, and 11[1]					Sump for Overliner Cell O5[1]				
	Flow (gpd)		Pump Operating Time (hours/day)		Pump Capacity (gpm)	Flow (gpd)		Pump Operating Time (hours/day)		Pump Capacity (gpm)	Flow (gpd)		Pump Operating Time (hours/day)		Pump Capacity (gpm)
	Average[2]	Expected[3]	Average[2]	Expected[3]		Average[2]	Expected[3]	Average[2]	Expected[3]		Average[2]	Expected[3]	Average[2]	Expected[3]	
Active	~~2,374~~ 2,283	1,328	~~1.6~~ 1.5	0.9	25	~~21,363~~ 19,097	1,202	~~14.2~~ 12.7	0.8	25	~~4,688~~ 4,785	345	~~5.2~~ 5.3	0.4	15
Closed	~~2,023~~ 1,827	1,328	~~1.3~~ 1.2	0.9	25	~~19,441~~ 16,265	1,202	~~13.0~~ 10.8	0.8	25	~~3,669~~ 3,305	345	~~4.1~~ 3.7	0.4	15

1 Sumps for the largest drainage areas are shown. Refer to Appendix IIIC-B, Sheet IIIC-B-41 – Sump Drainage Areas for sector layout and sump drainage areas.
2 Refer to Appendix IIIC-B, pages IIIC-B-35 through IIIC-B-41 for sumps in the developed and undeveloped areas and Appendix IIIC-B, pages IIIC-B-60 through IIIC-B-64 for the sumps in the overliner area.
3 The expected flow values are based on site specific leachate generation listed in Table 6-1. The average value listed in Table 6-1 was used (i.e., 9,991 gal/ac/yr).



1 INDICATES REVISION
(SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED CLOSURE/POST–CLOSURE TIME FRAMES.
2. UPDATED VOLUMES.

NOTE:

1. REFER TO APPENDIX IIIC–E FOR SUPPORTING INFORMATION.

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REVISIONS		
NO.	DATE	DESCRIPTION
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LEACHATE GENERATION VOLUME ESTIMATION

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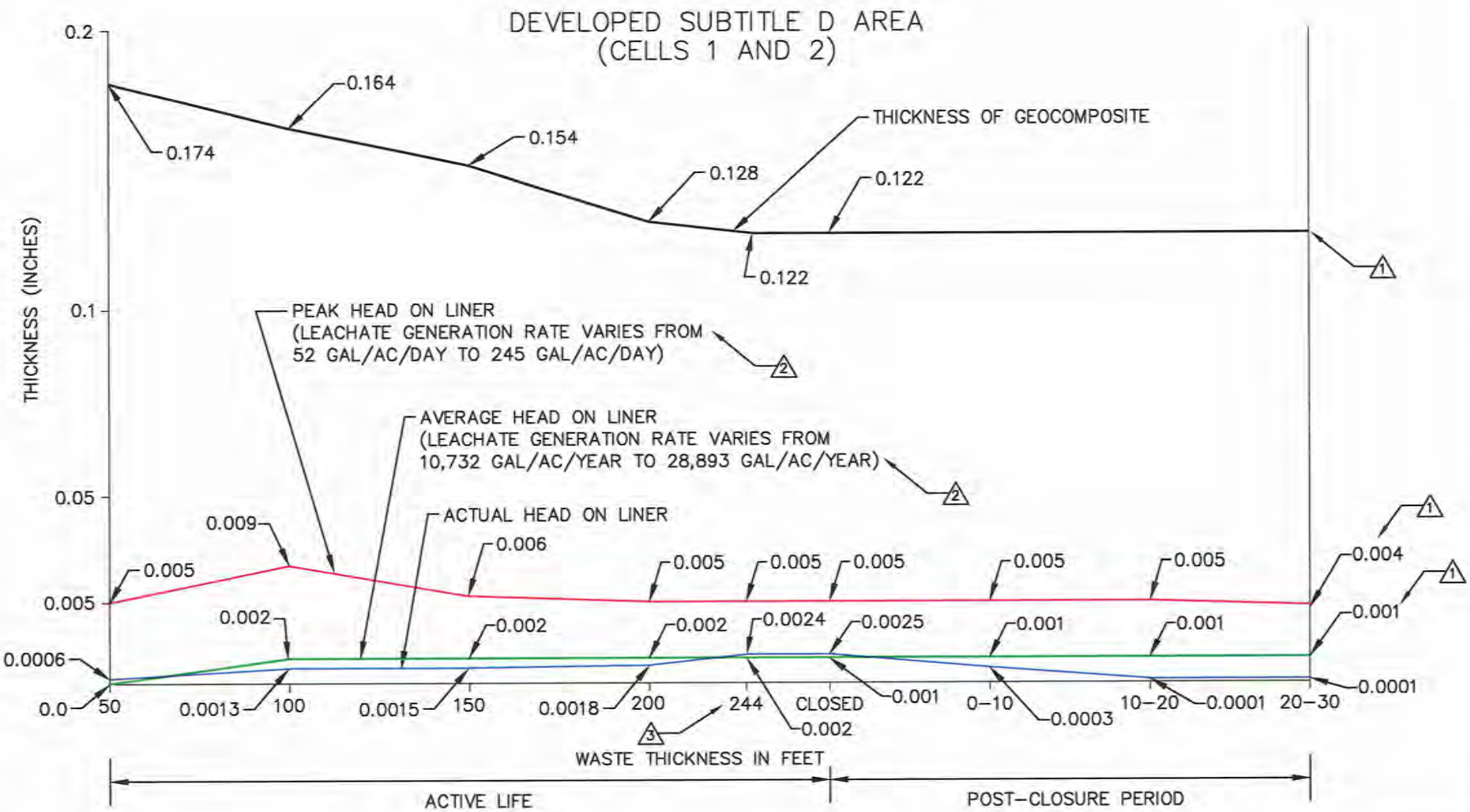
DRAWN BY: VRS	DATE: 03/2012	FILE: 1339–351–11
REVIEWED BY: JPY	CAD: FIG 6–2.DWG	FIGURE 6–2

O:\1339\351\EXPANSION 2009\PART III–SDP\IIIC\FIGURE 6–2.dwg, jwilson, 1:1



△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED HEAD ON LINER VALUES.
2. UPDATED LEACHATE GENERATION RATES.
3. UPDATED WASTE THICKNESS.

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ESTIMATION OF LEACHATE THICKNESS ON LINER SYSTEM

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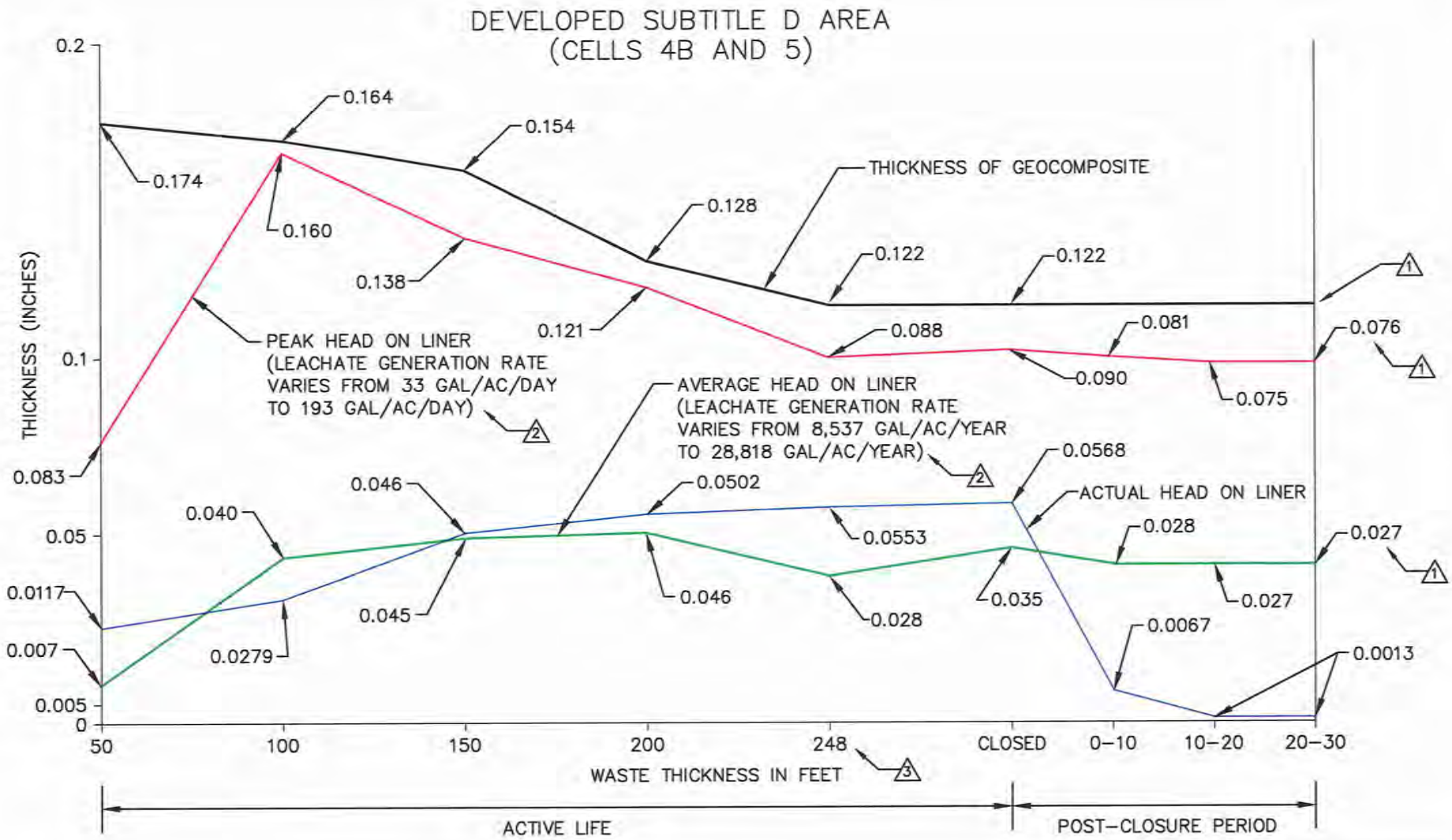
REVIEWED BY: JPY	CAD: FIG 6-3.DWG	FIGURE 6-3

O:\1339\351\EXPANSION 2009\PART III-SDP\IIC\FIGURE 6-3.dwg, jwilson, 1:1



△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED HEAD ON LINER VALUES.
2. UPDATED LEACHATE GENERATION RATES.
3. UPDATED WASTE THICKNESS.

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ESTIMATION OF LEACHATE THICKNESS ON LINER SYSTEM

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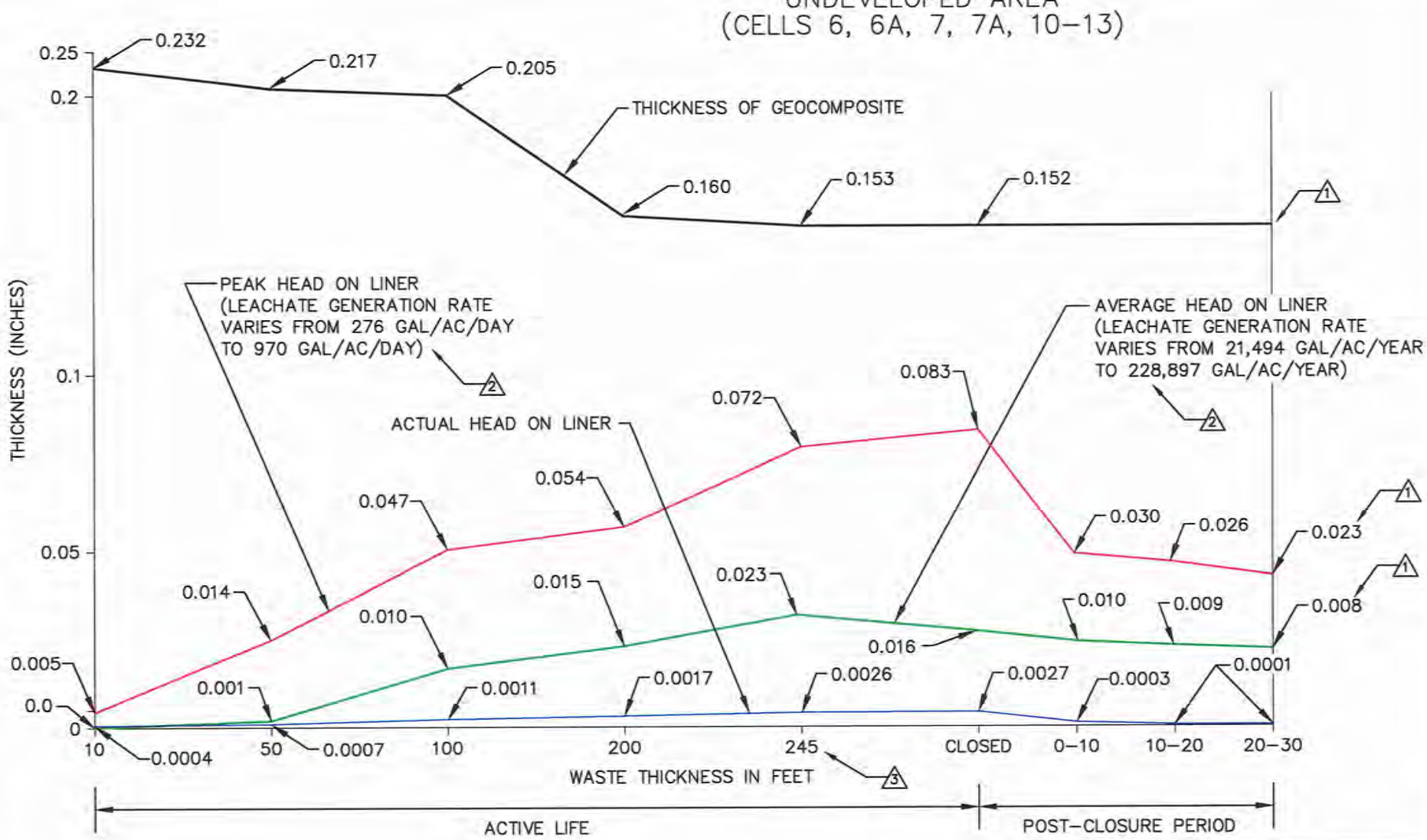
G:\1339\351\EXPANSION 2009\PART III-SDP\IIC\FIGURE 6-4.dwg, jwilson, 1:1



△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED HEAD ON LINER VALUES.
2. UPDATED LEACHATE GENERATION RATES.
3. UPDATED WASTE THICKNESS.

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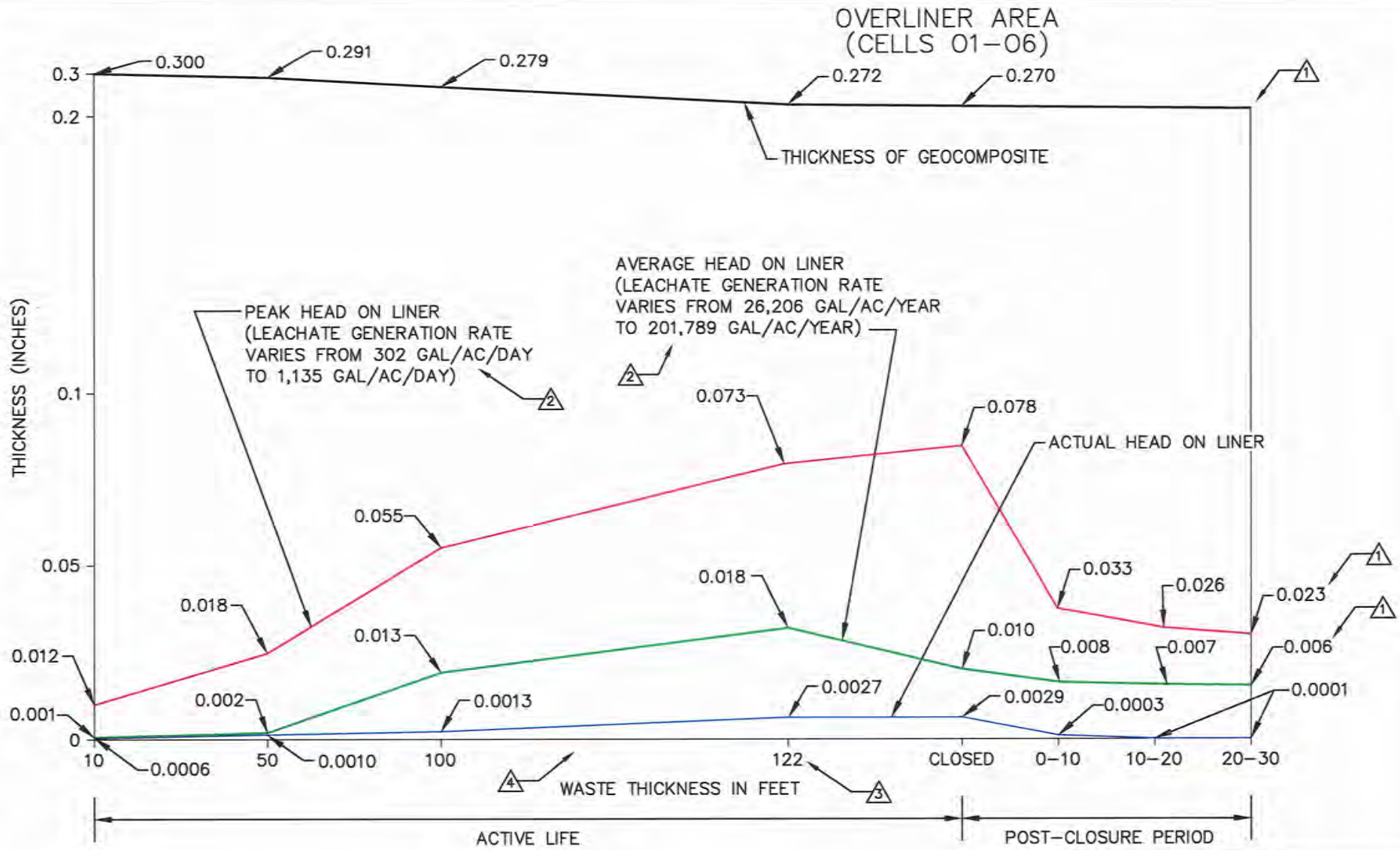
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIC\FIGURE 6-5.dwg, jwilson, 1:1



△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED HEAD ON LINER VALUES.
2. UPDATED LEACHATE GENERATION RATES.
3. UPDATED WASTE THICKNESS.
4. DELETED 150 FEET WASTE THICKNESS.

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ESTIMATION OF LEACHATE THICKNESS ON LINER SYSTEM

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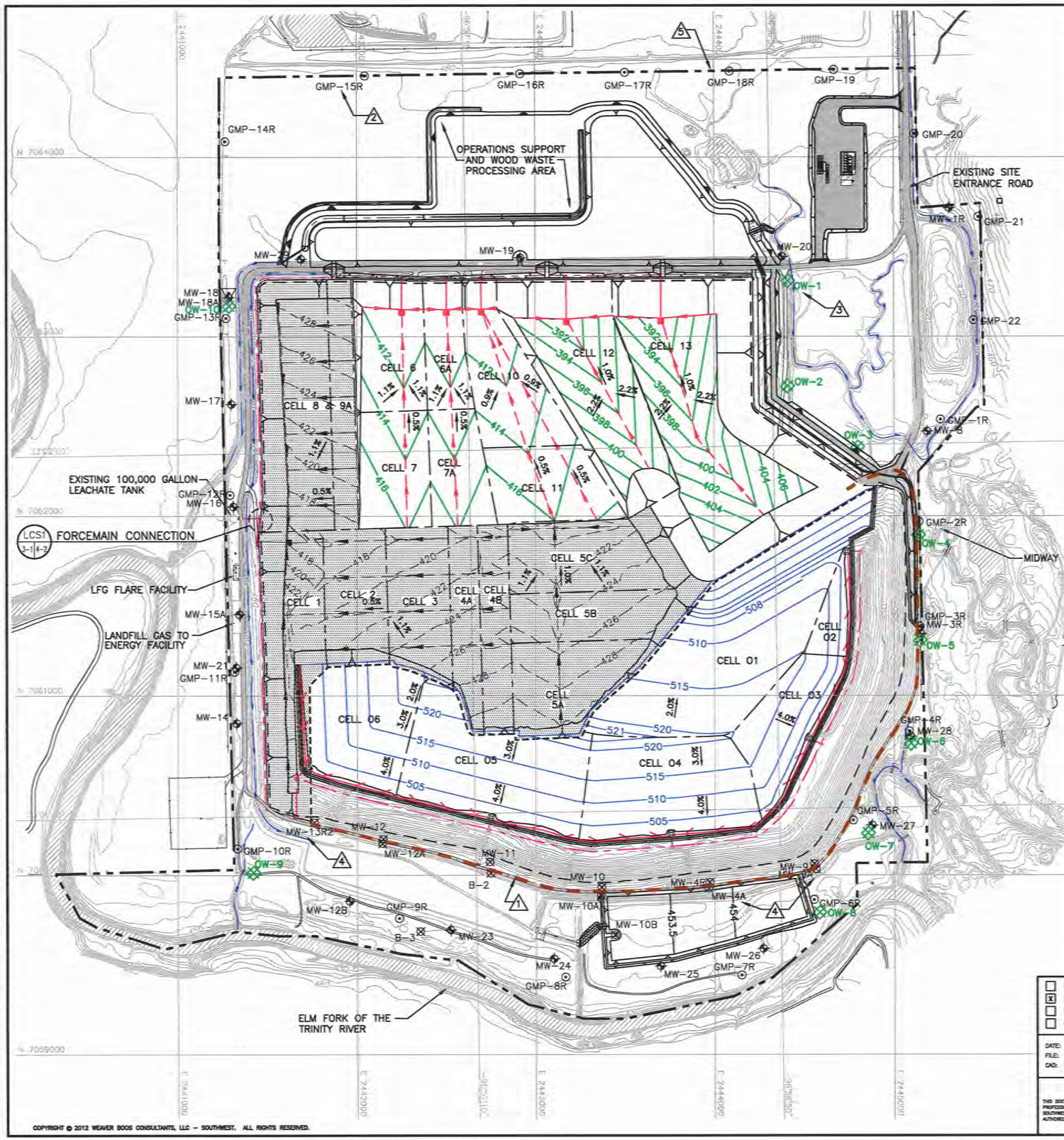
REVIEWED BY: JPY	CAD: FIG 6-6.DWG	FIGURE 6-6

O:\1339\351\EXPANSION 2009\PART III-SDP\IIC\FIGURE 6-6.dwg, jwilson, 1:1



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 8)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- 2 — MW-8 — GROUNDWATER MONITORING WELL
- 4 — GMP-1 — GAS MONITORING PROBE
- 3 — MW-12 — OBSERVATION/MONITORING WELL
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- EXISTING SUBTITLE D COMPOSITE LINER AREA
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

N

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

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NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. SEE APPENDIX IIIC-D FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
4. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
5. LINER AND LEACHATE COLLECTION SYSTEM DETAILS ARE PRESENTED IN APPENDIX IIIA-A.
6. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE WITH A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPE WITH A MINIMUM OF 0.6% TO SUMPS.
7. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
8. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
9. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).
10. THE LEACHATE FORCEMAIN FOR THE PRE-SUBTITLE D AND THE SUBTITLE D AREAS WILL BE A 3-INCH MINIMUM DIAMETER DUAL-CONTAINMENT PIPE (6-INCH MINIMUM OUTER CONTAINMENT PIPE).

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CAD: 3-1 LEACH. COLL. SYS.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

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1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
LEACHATE COLLECTION SYSTEM PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 3-1

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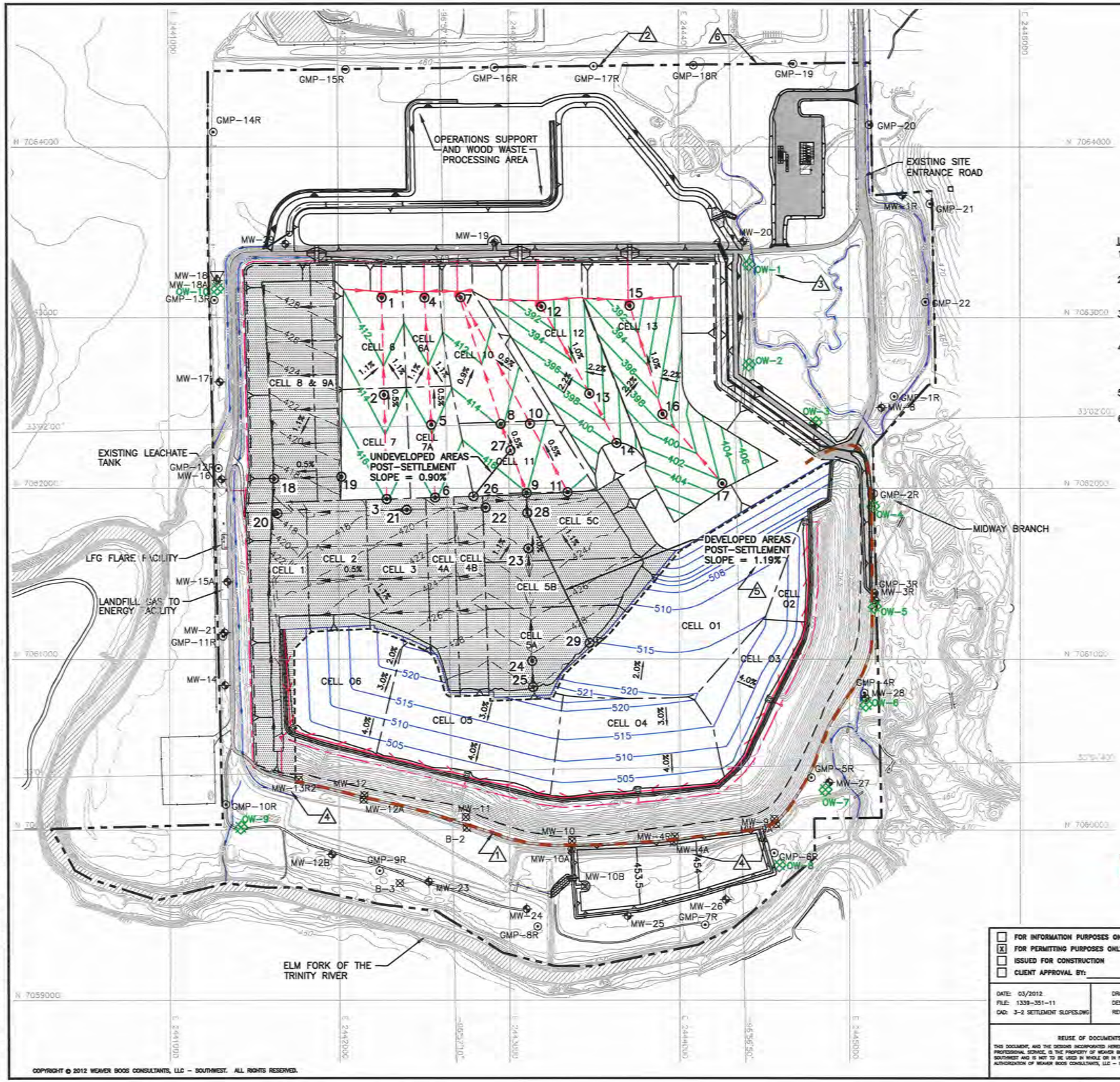
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIC\3-1 LEACHATE COLLECTION SYSTEM.dwg, sfor d, 1:2



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 8)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- 2 — MW-8 — GROUNDWATER MONITORING WELL
- GMP-1 — GAS MONITORING PROBE
- 4 — MW-12 — OBSERVATION/MONITORING WELL
- 3 — OW-1 — PROPOSED WOODBINE MONITOR WELL
- EXISTING SUBTITLE D COMPOSITE LINER AREA
- 4 — SETTLEMENT EVALUATION POINT
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED POST-SETTELMENT SLOPE.
6. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. SEE APPENDIX IIIC-D FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
4. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
5. LINER AND LEACHATE COLLECTION SYSTEM DETAILS ARE PRESENTED IN APPENDIX IIIA-A.
6. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE WITH A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPE WITH A MINIMUM OF 0.6% TO SUMPS.
7. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
8. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
9. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).

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REVISIONS

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1	12/2012	SUPPLEMENTAL SUBMITTAL
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10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SUBTITLE D AREA
POST-SETTLEMENT SLOPES

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FIGURE 3-2

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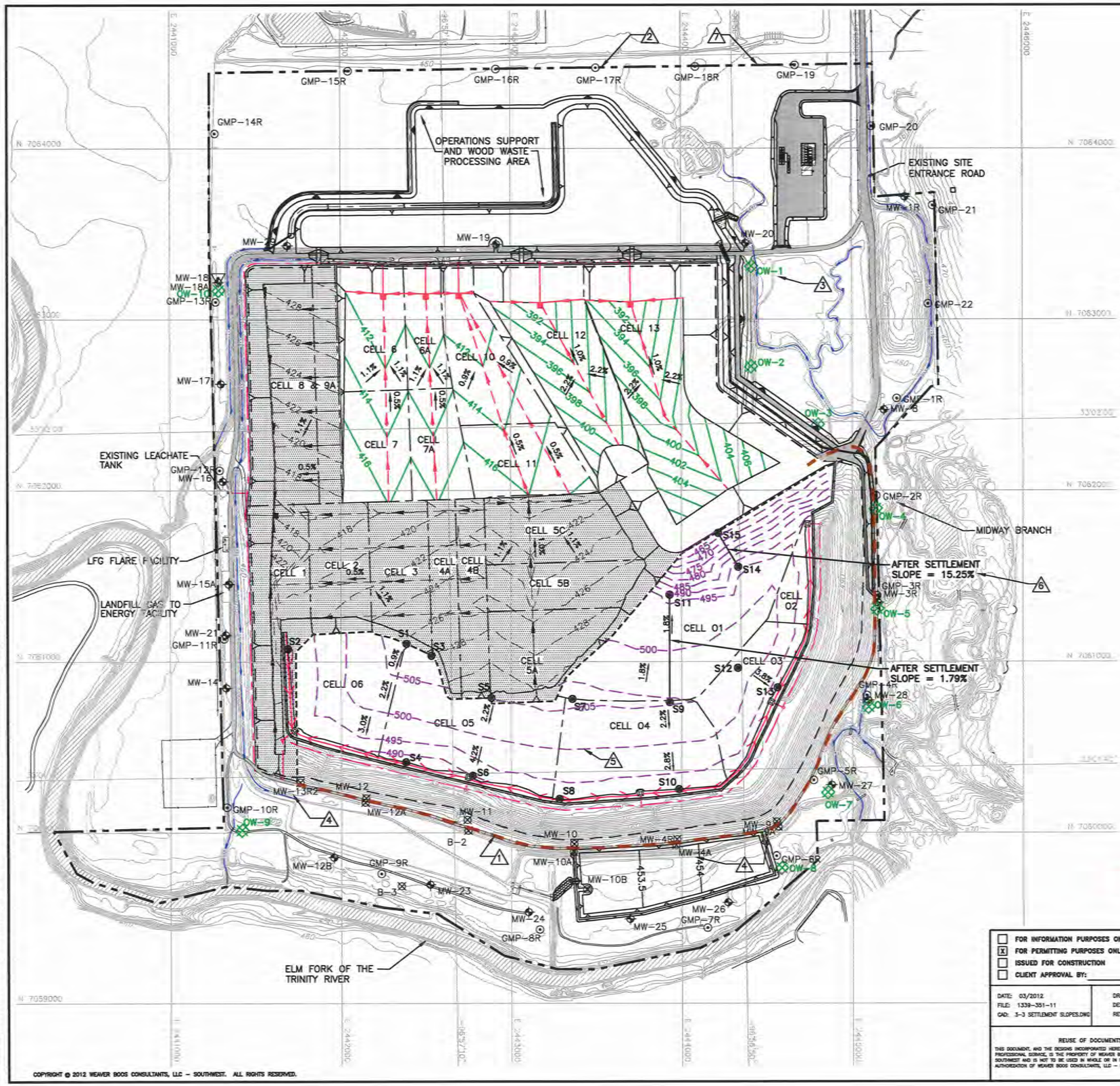
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIC\3-2 SUB D AREA AFTER SETTLEMENT SLOPES.dwg, sford, 1:2



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- EASEMENT
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 8)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 5 — 500 — OVERLINER POST SETTLEMENT CONTOURS
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- 2 — MW-8 — GROUNDWATER MONITORING WELL
- GMP-1 — GAS MONITORING PROBE
- 4 — MW-12 — OBSERVATION/MINTORING WELL
- 3 — OW-1 — PROPOSED WOODBINE MONITOR WELL
- EXISTING SUBTITLE D COMPOSITE LINER AREA
- S12 — STRAIN/SLOPE EVALUATION POINT
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED POST-SETTELMENT CONTOURS.
6. UPDATED POST-SETTELMENT SLOPES.
7. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. SEE APPENDIX IIIC-D FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
4. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
5. LINER AND LEACHATE COLLECTION SYSTEM DETAILS ARE PRESENTED IN APPENDIX IIIA-A.
6. THE OVERLINER DESIGN IS DETAILED IN PART III, APPENDIX IIIA-A.
7. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
8. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
9. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).

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DESIGN BY: MDM
REVIEWED BY: JPY

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1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER POST-SETTLEMENT SLOPES

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FIGURE 3-3

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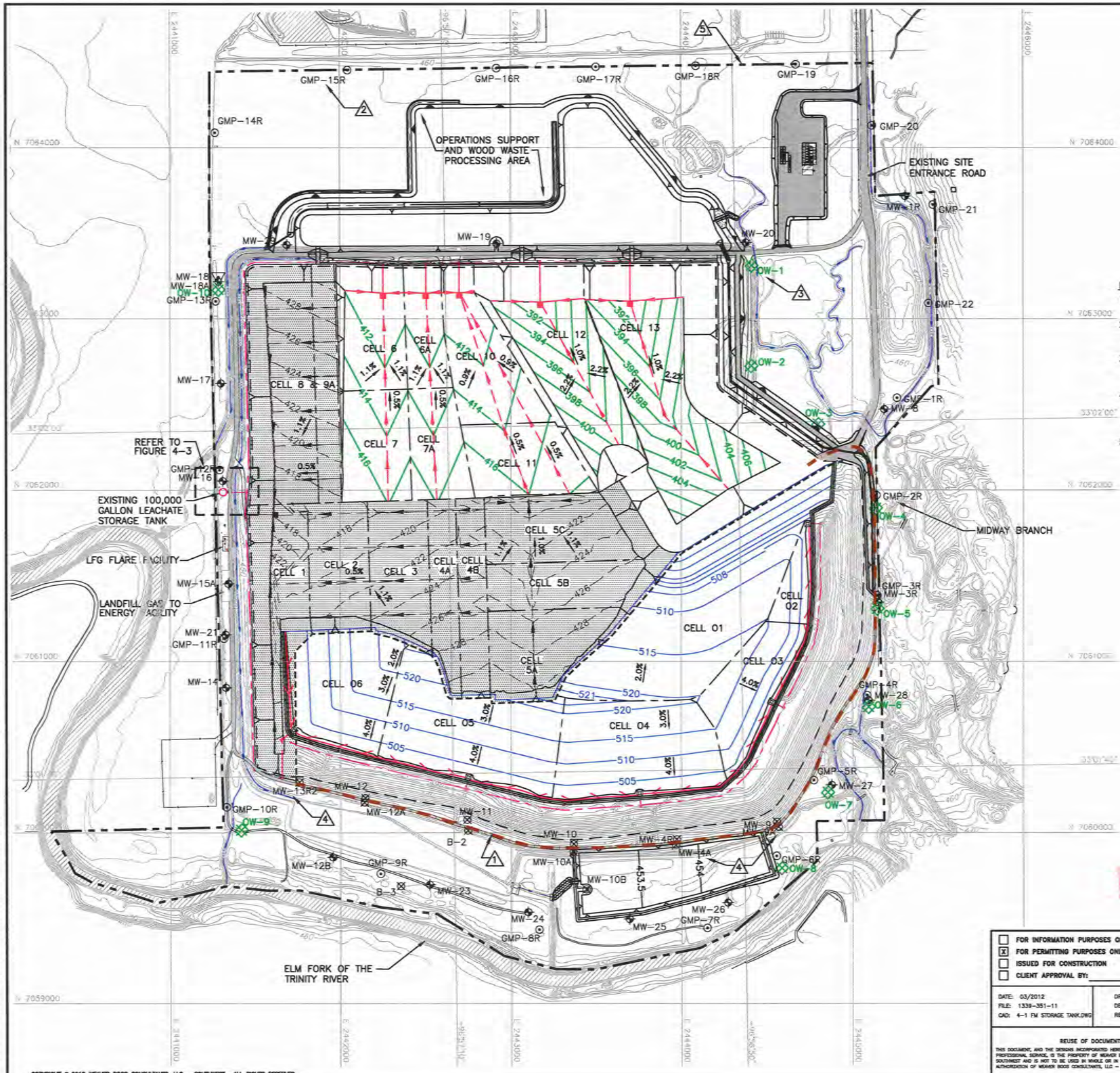
O:\1339\351\EXPANSION 2009\PART III-SDP\IIC\3-3 OVERLINER AFTER SETTLEMENT SLOPES.dwg, afor4, 1:2



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- CELL BOUNDARY
- PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 8)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- GROUNDWATER MONITORING WELL
- GAS MONITORING PROBE
- OBSERVATION/MONITORING WELL
- PROPOSED WOODBINE MONITOR WELL
- EXISTING SUBTITLE D COMPOSITE LINER AREA
- EXISTING 100,000 GALLON LEACHATE STORAGE TANK
- EXISTING SLURRY WALL
- INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
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3. SEE APPENDIX IIIC-D FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
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5. LINER AND LEACHATE COLLECTION SYSTEM DETAILS ARE PRESENTED IN APPENDIX IIIA-A.
6. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE WITH A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPE WITH A MINIMUM OF 0.6% TO SUMPS.
7. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
8. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
9. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).
10. THE LEACHATE FORCEMAIN FOR THE PRE-SUBTITLE D AND THE SUBTITLE D AREAS WILL BE A 3-INCH MINIMUM DIAMETER DUAL-CONTAINMENT PIPE (6-INCH MINIMUM OUTER CONTAINMENT PIPE).

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CAD: 4-1 FM STORAGE TANK.DWG

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DESIGN BY: MDM
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

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2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT FORCEMAIN AND STORAGE TANK PLAN

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DENTON COUNTY, TEXAS

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GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 4-1

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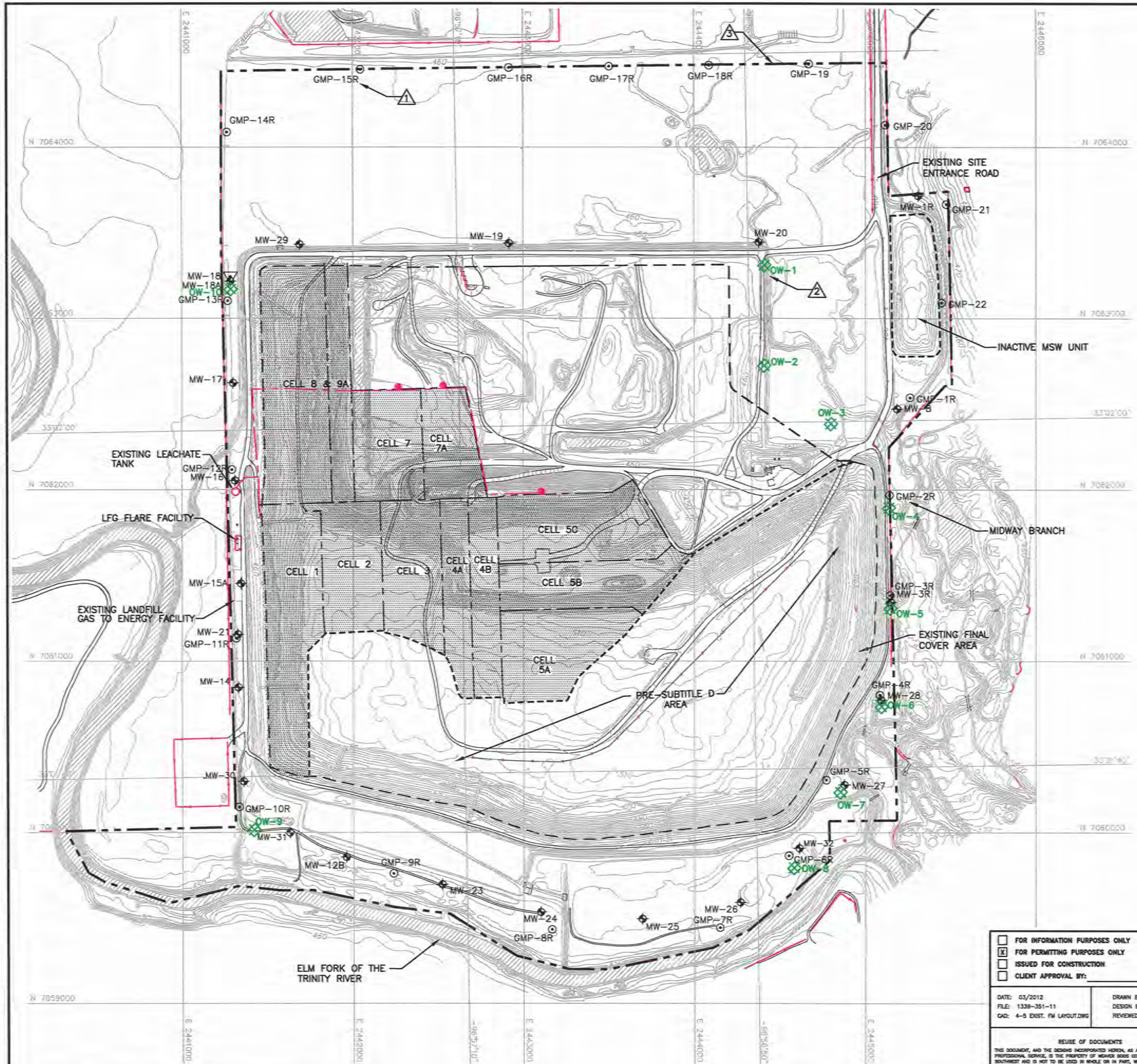
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIC\4-1 FORCEMAIN_STORAGE TANK PLAN.dwg, sfor4, 1:2



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- CELL BOUNDARY
- EXISTING LEACHATE FORCEMAIN
- TEMPORAY LEACHATE SUMP
- EXISTING FENCE
- 1 MW-8 GROUNDWATER MONITORING WELL
- 2 GMP-1 GAS MONITORING PROBE
- OW-1 PROPOSED WOODBINE MONITOR WELL
- EXISTING SUBTITLE D COMPOSITE LINER AREA
- EXISTING 100,000 GALLON LEACHATE STORAGE TANK
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. (3) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. SEE APPENDIX IIIC-D FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
4. THE EXISTING LEACHATE FORCEMAIN IS A 3-INCH MINIMUM DIAMETER DUAL-CONTAINMENT PIPE (6-INCH MINIMUM OUTER CONTAINMENT PIPE).

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NO.	DATE	DESCRIPTION
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2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT EXISTING FORCEMAIN LAYOUT

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FIGURE 4-5

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APPENDIX IIIC-A

LEACHATE GENERATION MODEL

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Includes pages IIIC-A-1 through IIIC-A-236

LEACHATE GENERATION MODEL

HELP MODEL

The Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3.07 was used to estimate quantity of leachate that will be generated during the active life and postclosure period of the Camelot Landfill. The HELP Model is a quasi-two-dimensional hydrologic model of water movement across, into, through, and out of the landfill. The model uses climate, soil, and landfill design data to perform a solution technique that accounts for the effects of surface storage, runoff, infiltration, percolation, soil moisture storage, evapotranspiration, and lateral drainage.

MODEL SETUP

The site was modeled as a 1-acre unit area for the following stages of landfill development in undeveloped Subtitle D areas:

- Working face with 10 feet of waste
- 50 feet of waste with intermediate cover
- 100 feet of waste with intermediate cover
- 200 feet of waste with intermediate cover
- ~~287~~ 245 feet of waste with intermediate cover
- ~~287~~ 245 feet of waste with final cover

The site was modeled as a 1-acre unit area for the following stages of landfill development in developed Cells 1 and 2:

- 50 feet of waste with intermediate cover
- 100 feet of waste with intermediate cover
- 150 feet of waste with intermediate cover
- 200 feet of waste with intermediate cover
- ~~282~~ 244 feet of waste with intermediate cover
- ~~282~~ 244 feet of waste with final cover

The site was modeled as a 1-acre unit area for the following stages of landfill development in developed Cells 4B and 5:

- 50 feet of waste with intermediate cover
- 100 feet of waste with intermediate cover
- 150 feet of waste with intermediate cover
- 200 feet of waste with intermediate cover
- ~~298~~ 248 feet of waste with intermediate cover
- ~~298~~ 248 feet of waste with final cover

No HELP models were developed for Cells 3, 4A, 8, and 9A since they used tire chips as the drainage layer. However, calculations addressing the maximum head on the liner for these cells are provided in Appendix IIIC-B.

The overliner pre-Subtitle D area maximum waste column thicknesses represent the thickness of waste above the overliner system. Each area was modeled as a 1-acre unit area for the following stages of landfill development:

- Working face with 10 feet of waste
- 50 feet of waste with intermediate cover
- 100 feet of waste with intermediate cover
- ~~150 feet of waste with intermediate cover~~
- ~~188~~ 122 feet of waste with intermediate cover
- ~~188~~ 122 feet of waste with final cover

The active stage was modeled for one year with initial moisture contents initialized at 25 percent. The interim stages with intermediate cover were modeled for various lengths of time selected based on the projected duration each condition is likely to occur. The closed landfill condition was modeled for 30 years. The evaporative zone depth was selected to be 10 inches for the active and interim cases and 18 inches for the closed case. The leaf area index was selected to be 0 for the active case, 2 for the interim cases and 4.5 for the closed case based on the selected ground area. The Soil Conservation Service (SCS) runoff curve numbers were calculated by HELP based on soil data and expected ground cover, surface slope, and slope length. The active case models a curve number of 80.3 and percent runoff area of zero, which is representative given that this condition assumes complete infiltration (minus evapotranspiration). The interim cases utilize the default curve number assigned by the HELP model which is 87.1 and corresponds to "fair" ground cover. The percent runoff area used varies between 70 to 90. This is representative of the intermediate cover, which will be 12 inches of compacted soil with 60 percent or more vegetation coverage. The final case models a curve number of 80.1 and percent runoff area of 100, which corresponds to "good" ground cover. This is representative of the final cover, which will have a minimum 90 percent vegetation coverage.

samples. The figure above shows the change of protective cover hydraulic conductivity under varying over burden pressures. As shown on the figure, even under low overburden pressure, the hydraulic conductivity of the proposed cover is well below the hydraulic conductivity values used for the HELP model demonstrations. As the waste column thickness increases, the additional overburden pressure decreases the hydraulic conductivity of the protective cover.

The reduced hydraulic conductivity of the protective cover results in reduced flux of leachate into the leachate collection system, thus the hydraulic head on the liner is expected to be lower than what is estimated in the HELP Model using the hydraulic conductivities shown on the graph for the soil protective cover. As noted in Appendix IIIC-B, the chimney drains installed over the leachate collection pipes provide a passage for the leachate that may be retained above soil protective cover. As designed, the chimney drains convey the entire leachate flow to the leachate collection pipe in the event that the protective cover does not transmit leachate.

Waste Layers

Waste layers of 10, 50, 100, 150, 200, ~~282~~ 244, ~~287~~ 245, and ~~298~~ 248 feet were used to represent the various stages of landfill development in the Subtitle D areas, while the pre-Subtitle D overliner areas had waste layers of 10, 50, 100, ~~150,~~ and ~~188~~ 122 feet. A default wilting point was selected from HELP to represent municipal solid waste. The waste column was split into two layers. The top 125-foot layer was modeled with a hydraulic conductivity of $1x10^{-3}$ cm/s. A lower hydraulic conductivity of $1x10^{-4}$ cm/s was used for the bottom layer because the additional overburden pressure will cause additional consolidation to this layer that will likely lower the hydraulic conductivity. The moisture content, field capacity, and porosity values were selected as discussed previously.

Intermediate Cover

The intermediate cover consists of a 12-inch-thick layer of soil placed over the waste. Default soil characteristics were selected from HELP to represent the available onsite soils.

Final Cover

The final cover over the Subtitle D and pre-Subtitle D areas consists of a 24-inch erosion layer with the top 6 inches capable of sustaining growth of vegetation, a geocomposite drainage layer (to be conservative this layer is not considered in HELP modeling), a 40-mil LLDPE geomembrane liner, and an 18-inch infiltration layer. The geomembrane liner was modeled for good installation quality, 4 construction defects per acre, and a pinhole density of 1 hole per acre. The infiltration layer consists of compacted soil with a hydraulic conductivity of $1x10^{-5}$ cm/sec.

HELP MODEL OUTPUT

The HELP summary table and output files for the various stages of the landfill development are presented on pages IIIC-A-27 through IIIC-A-~~236~~ 227.

Required:

Estimate the properties of the 200 mil geocomposite leachate collection layer for the developed Subtitle D cells (1and 2).

Method:

1. Determine the 200 mil geocomposite leachate collection layer thickness under the expected loading conditions.
2. Determine factors of safety for strength and environmental conditions based on the expected duration of each stage of landfill development.
3. Identify the minimum transmissivity for the 200 mil thick double-sided geocomposite collection layer.
4. Compute the transmissivity of the 200 mil geocomposite leachate collection layer for each stage of landfill development using the calculated thicknesses and the reduction factors.

References:

1. Koerner, R.M., Designing With Geosynthetics, Third Edition, 1994.
2. Gray, Donald H., Koerner, Robert M., Qian, Xuede, Geotechnical Aspects of Landfill Design and Construction, 2002.
3. Geosynthetic Institute, GRI Standard GC-8, 2001.
4. GSE Drainage Design Manual, May 2004.
5. Acar, Yalcin B.& Daniel, David E., *Geoenvironment 2000 Characterization, Containment, Remediation, and Performance in Environmental Geotechnics,* Volume 2, American Society of Civil Engineers, 1995.

Solution:

1. Geocomposite Leachate Collection Layer Thickness:

Assume the geocomposite leachate collection layer will undergo compression due to the weight of soil (in the form of daily cover, intermediate cover, protective cover, or final cover) and waste.

Unloaded Geocomposite Thickness (200 mil)=	0.20	in
Unit Weight of Soil =	115	pcf

Table 1 - Geocomposite Thickness (200 mil) for Cells 1 and 2

Fill Condition	d_W[1] (ft)	d_S[2] (ft)	γ[3] (pcf)	P[4] (psf)	t[5] (in)	t[5] (m)
Interim - 50'	50	3	55	3,095	0.174	0.004
Interim - 100'	100	3	57	6,045	0.164	0.004
Interim - 150'	150	3	64	9,945	0.154	0.004
Interim - 200'	200	3	71	14,545	0.128	0.003
Interim ~~282'~~ **244'**	~~282~~ **244**	3	~~78~~ **75**	~~22,341~~ **18,645**	~~0.120~~ **0.122**	0.003
Closed	~~282~~ **244**	6.5	~~78~~ **75**	~~22,744~~ **19,048**	~~0.119~~ **0.122**	0.003

[1] d_W is the depth of waste and daily cover soil above the geocomposite leachate collection layer.

[2] d_S is the depth of soil (protective cover, intermediate cover, overliner foundation, and final cover) above the geocomposite leachate collection layer.

[3] The unit weight of waste/soil is selected at the midpoint of the waste column thickness using the Unit Weight Profile for MSW graph provided in Ref 5.

[4] P is the pressure on the geocomposite leachate collection layer due to the weight of the waste and soil.

[5] t is the thickness of the geocomposite leachate collection layer after being subjected to compression based on the chart below adapted from Reference 4.

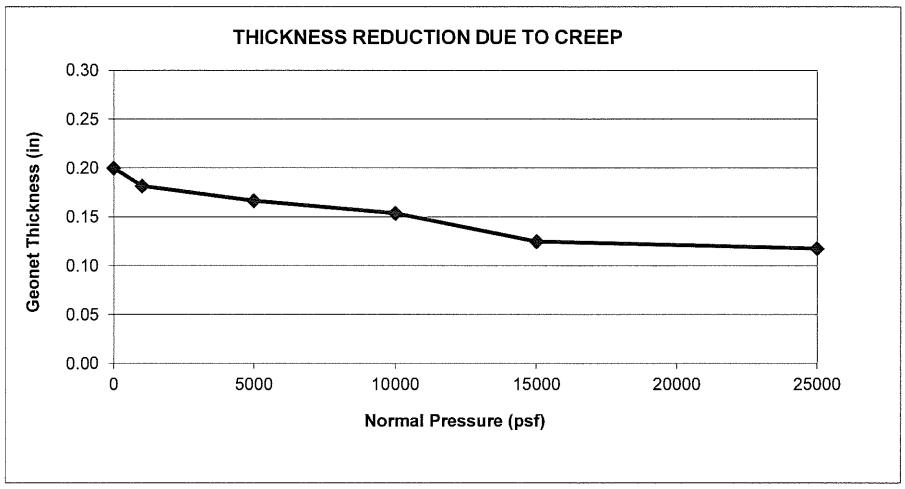


Table 2 - Reduction Factors and Factor of Safety

Reduction Factors[1]		Fill Condition					
		Interim (50' Waste)	Interim (100' Waste)	Interim (150' Waste)	Interim (200' Waste)	Interim (~~282'~~ **244'** Waste)	Closed Final Cover
RF_{IN}	Delayed Intrusion	1.1	1.1	1.1	1.1	1.1	1.1
RF_{CC}	Chemical Clogging	1.0	1.5	1.6	1.8	1.9	2.0
RF_{BC}	Biological Clogging	1.0	1.1	1.1	1.2	1.2	1.3
Total Reduction Factor[2]		1.10	1.82	1.94	2.38	2.51	2.86
Overall Factor of Safety to Account For Uncertainties		2.0	2.0	2.0	2.0	2.0	2.0
Overall Reduction Factor (ORF)[3]		2.20	3.63	3.87	4.75	5.02	5.72

[1] Values are obtained from References 1, 2, and 3.

[2] The Total Reduction Factors are a product of all the reduction factors for each fill condition.

[3] The Overall Reduction Factors are a product of the Total Reduction Factor and Overall Factor of Safety to Account For Uncertainties for each fill condition.

3. Transmissivity Data

The transmissivity for the 200-mil-thick single sided geocomposite with 8 oz/sy is shown on Sheet IIIC-A-23.

4. Compute the Transmissivity (T) of the Geocomposite Leachate Collection Layer:

Table 3 - Estimate the As-built Transmissivity (200 mil and 8 oz/sy for Cells 1 and 2)

Fill Condition	d_W[1] (ft)	P[2] (psf)	t[3] (in)	T[4] (m^2/s)	ORF[5]	T_{DES}[6] (m^2/s)	k[7] (cm/s)
Interim - 50'	50	3,095	0.174	1.15E-03	2.20	5.23E-04	11.83
Interim - 100'	100	6,045	0.164	8.54E-04	3.63	2.35E-04	5.65
Interim - 150'	150	9,945	0.154	7.02E-04	3.87	1.81E-04	4.63
Interim - 200'	200	14,545	0.128	6.08E-04	4.75	1.28E-04	3.94
Interim ~~282'~~ **244'**	~~282~~ **244**	~~22,341~~ **18,645**	~~0.120~~ **0.122**	~~4.50E-04~~ **5.31E-04**	5.02	~~8.97E-05~~ **1.06E-04**	~~2.94~~ **3.42**
Closed	~~282~~ **244**	~~22,744~~ **19,048**	~~0.119~~ **0.122**	~~4.42E-04~~ **5.22E-04**	5.72	~~7.73E-05~~ **9.13E-05**	~~2.56~~ **2.94**

[1] d_W is the depth of waste above the geocomposite leachate collection layer.

[2] P is the pressure on the geocomposite leachate collection layer due to the weight of the waste and soil from Table 1.

[3] t is the calculated geocomposite leachate collection layer thickness from Table 1 for 200 mil drainage geocomposites.

[4] T is obtained from the specified transmissivity values for a representative geocomposite leachate collection layer (200-mil-thick geonet and 8 oz/sy polypropylene geotextile) as shown on Sheet IIIC-A-23.

[5] ORF is the Overall Reduction Factor obtained from Table 2.

[6] T_{DES} is the design transmissivity value calculated using the following equation:

$$T_{DES} = T / ORF$$

[7] k is hydraulic conductivity and calculated using the following equation:

$$k = T_{DES}/t$$

Required:

Estimate the properties of the 200 mil geocomposite leachate collection layer for the developed Subtitle D cells (4B and 5).

Method:

1. Determine the 200 mil geocomposite leachate collection layer thickness under the expected loading conditions.
2. Determine factors of safety for strength and environmental conditions based on the expected duration of each stage of landfill development.
3. Identify the minimum transmissivity for the 200 mil thick double-sided geocomposite collection layer.
4. Compute the transmissivity of the 200 mil geocomposite leachate collection layer for each stage of landfill development using the calculated thicknesses and the reduction factors.

References:

1. Koerner, R.M., Designing With Geosynthetics, Third Edition, 1994.
2. Gray, Donald H., Koerner, Robert M., Qian, Xuede, Geotechnical Aspects of Landfill Design and Construction, 2002.
3. Geosynthetic Institute, GRI Standard GC-8, 2001.
4. GSE Drainage Design Manual, May 2004.
5. Acar, Yalcin B.& Daniel, David E., *Geoenvironment 2000 Characterization, Containment, Remediation, and Performance in Environmental Geotechnics,* Volume 2, American Society of Civil Engineers, 1995.

Solution:

1. Geocomposite Leachate Collection Layer Thickness:

Assume the geocomposite leachate collection layer will undergo compression due to the weight of soil (in the form of daily cover, intermediate cover, protective cover, or final cover) and waste.

Unloaded Geocomposite Thickness (200 mil)=	0.20	in
Unit Weight of Soil =	115	pcf

Table 1 - Geocomposite Thickness (200 mil) for Sectors 4B, and 5

Fill Condition	d_W[1] (ft)	d_S[2] (ft)	γ[3] (pcf)	P[4] (psf)	t[5] (in)	t[5] (m)
Interim - 50'	50	3	55	3,095	0.174	0.004
Interim - 100'	100	3	57	6,045	0.164	0.004
Interim - 150'	150	3	64	9,945	0.154	0.004
Interim - 200'	200	3	71	14,545	0.128	0.003
Interim - ~~298'~~ **248'**	~~298~~ **248**	3	~~79~~ **76**	~~23,887~~ **19,193**	~~0.118~~ **0.122**	0.003
Closed	~~298~~ **248**	6.5	~~79~~ **76**	~~24,290~~ **19,596**	~~0.118~~ **0.122**	0.003

[1] d_W is the depth of waste and daily cover soil above the geocomposite leachate collection layer.

[2] d_S is the depth of soil (protective cover, intermediate cover, overliner foundation, and final cover) above the geocomposite leachate collection layer.

[3] The unit weight of waste/soil is selected at the midpoint of the waste column thickness using the Unit Weight Profile for MSW graph provided in Ref 5.

[4] P is the pressure on the geocomposite leachate collection layer due to the weight of the waste and soil.

[5] t is the thickness of the geocomposite leachate collection layer after being subjected to compression based on the chart below adapted from Reference 4.

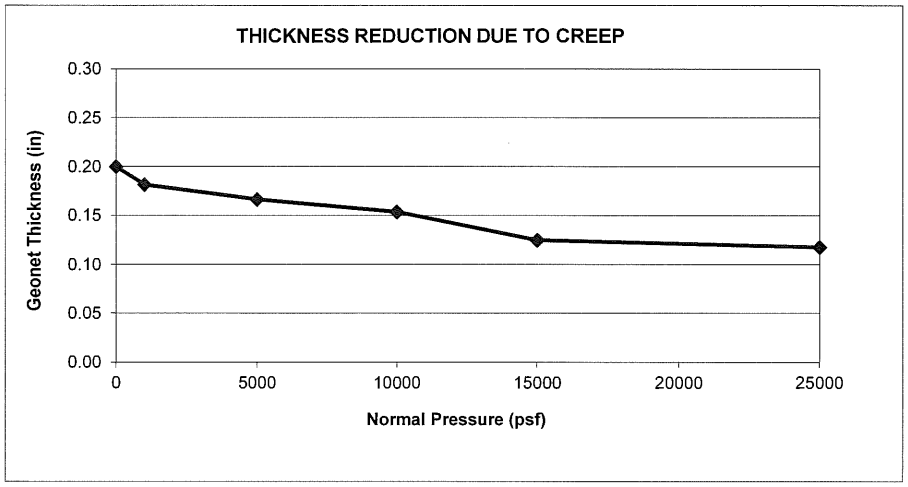


Table 2 - Reduction Factors and Factor of Safety

Reduction Factors[1]		Fill Condition					
		Interim (50' Waste)	Interim (100' Waste)	Interim (150' Waste)	Interim (200' Waste)	Interim (~~298'~~ **248'** Waste)	Closed Final Cover
RF_{IN}	Delayed Intrusion	1.1	1.1	1.1	1.1	1.1	1.1
RF_{CC}	Chemical Clogging	1.0	1.5	1.6	1.8	1.9	2.0
RF_{BC}	Biological Clogging	1.0	1.1	1.1	1.2	1.2	1.3
Total Reduction Factor[2]		1.10	1.82	1.94	2.38	2.51	2.86
Overall Factor of Safety to Account For Uncertainties		2.0	2.0	2.0	2.0	2.0	2.0
Overall Reduction Factor (ORF)[3]		2.20	3.63	3.87	4.75	5.02	5.72

[1] Values are obtained from References 1, 2, and 3.

[2] The Total Reduction Factors are a product of all the reduction factors for each fill condition.

[3] The Overall Reduction Factors are a product of the Total Reduction Factor and Overall Factor of Safety to Account For Uncertainties for each fill condition.

3. Transmissivity Data

The transmissivity for the 200-mil-thick double sided geocomposite with 8 oz/sy is shown on Sheet IIIC-A-24.

4. Compute the Transmissivity (T) of the Geocomposite Leachate Collection Layer:

Table 3 - Estimate the As-built Transmissivity (200 mil and 8 oz/sy for Sectors 4B, 5)

Fill Condition	d_W[1] (ft)	P[2] (psf)	t[3] (in)	T[4] (m^2/s)	ORF[5]	T_{DES}[6] (m^2/s)	k[7] (cm/s)
Interim - 50'	50	3,095	0.174	2.30E-04	2.20	1.05E-04	2.37
Interim - 100'	100	6,045	0.164	1.49E-04	3.63	4.10E-05	0.99
Interim - 150'	150	9,945	0.154	9.06E-05	3.87	2.34E-05	0.60
Interim - 200'	200	14,545	0.128	8.54E-05	4.75	1.80E-05	0.55
Interim - ~~298'~~ **248'**	~~298~~ **248**	~~23,887~~ **19,193**	~~0.118~~ **0.122**	~~7.57E-05~~ **7.85E-05**	5.02	~~1.51E-05~~ **1.56E-05**	~~0.49~~ **0.51**
Closed	~~298~~ **248**	~~24,290~~ **19,596**	~~0.118~~ **0.122**	~~7.54E-05~~ **7.82E-05**	5.72	~~1.32E-05~~ **1.37E-05**	~~0.43~~ **0.44**

[1] d_W is the depth of waste above the geocomposite leachate collection layer.

[2] P is the pressure on the geocomposite leachate collection layer due to the weight of the waste and soil from Table 1.

[3] t is the calculated geocomposite leachate collection layer thickness from Table 1 for 200 mil drainage geocomposites.

[4] T is obtained from the specified transmissivity values for a representative geocomposite leachate collection layer (200-mil-thick geonet and 8 oz/sy polypropylene geotextile) as shown on Sheet IIIC-A-24.

[5] ORF is the Overall Reduction Factor obtained from Table 2.

[6] T_{DES} is the design transmissivity value calculated using the following equation:

$$T_{DES} = T / ORF$$

[7] k is hydraulic conductivity and calculated using the following equation:

$$k = T_{DES}/t$$

Required:

Determine the minimum requirements of the 250 mil geocomposite leachate collection layer for the undeveloped Subtitle D sectors.

Method:

1. Determine the 250 mil geocomposite leachate collection layer thickness under the expected loading conditions.
2. Determine factors of safety for strength and environmental conditions based on the expected duration of each stage of landfill development.
3. Identify the minimum required transmissivity for the 250 mil thick single-sided geocomposite collection layer.
4. Compute the design transmissivity of the 250 mil geocomposite leachate collection layer for each stage of landfill development using the calculated thicknesses and the reduction factors.
5. Specify the geocomposite properties for the leachate collection layer.

References:

1. Koerner, R.M., Designing With Geosynthetics, Third Edition, 1994.
2. Gray, Donald H., Koerner, Robert M., Qian, Xuede, Geotechnical Aspects of Landfill Design and Construction, 2002.
3. Geosynthetic Institute, GRI Standard GC-8, 2001.
4. GSE Drainage Design Manual, May 2004.
5. Acar, Yalcin B.& Daniel, David E., *Geoenvironment 2000 Characterization, Containment, Remediation, and Performance in Environmental Geotechnics,* Volume 2, American Society of Civil Engineers, 1995.

Solution:

1. Geocomposite Leachate Collection Layer Thickness:

Assume the geocomposite leachate collection layer will undergo compression due to the weight of soil (in the form of daily cover, intermediate cover, protective cover, or final cover) and waste.

Unloaded Geocomposite Thickness (250 mil)=	0.25	in
Unit Weight of Soil =	115	pcf

Table 1 - Geocomposite Thickness (250 mil) for Undeveloped Areas

Fill Condition	d_W[1] (ft)	d_S[2] (ft)	γ[3] (pcf)	P[4] (psf)	t[5] (in)	t[5] (m)
Active - 10'	10	2	55	780	0.232	0.006
Interim - 50'	50	3	55	3,095	0.217	0.006
Interim - 100'	100	3	57	6,045	0.205	0.005
Interim - 200'	200	3	71	14,545	0.160	0.004
Interim - ~~287'~~ **245'**	~~287~~ **245**	3	~~79~~ **76**	~~23,018~~ **18,965**	~~0.149~~ **0.153**	0.004
Closed	~~287~~ **245**	6.5	~~79~~ **76**	~~23,421~~ **19,368**	~~0.149~~ **0.152**	0.004

[1] d_W is the depth of waste and daily cover soil above the geocomposite leachate collection layer.

[2] d_S is the depth of soil (protective cover, intermediate cover and final cover) above the geocomposite leachate collection layer.

[3] The unit weight of waste/soil is selected at the midpoint of the waste column thickness using the Unit Weight Profile for MSW graph provided in Ref 5.

[4] P is the pressure on the geocomposite leachate collection layer due to the weight of the waste and soil.

[5] t is the thickness of the geocomposite leachate collection layer after being subjected to compression based on the chart below adapted from Reference 4.

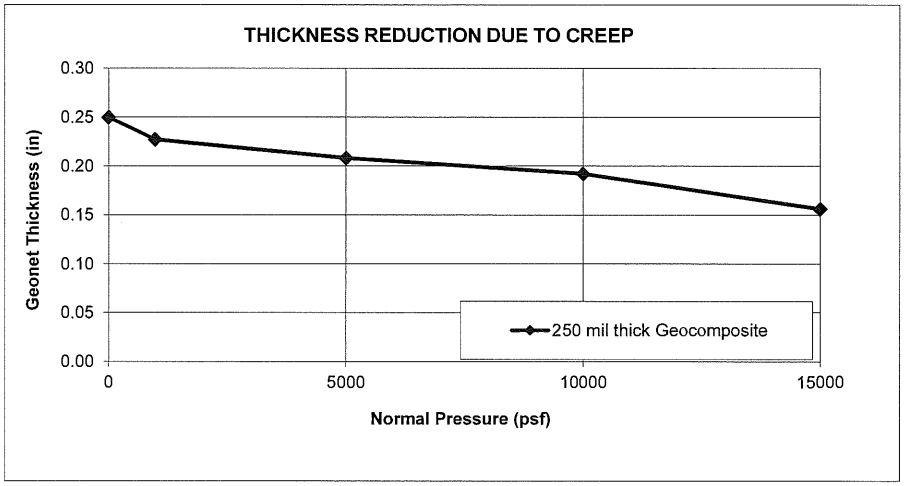


Table 2 - Reduction Factors and Factor of Safety

Reduction Factors[1]		Fill Condition					
		Active (10' Waste)	Interim (50' Waste)	Interim (100' Waste)	Interim (200' Waste)	Interim (~~287'~~ **245'** Waste)	Closed Final Cover
RF_{IN}	Delayed Intrusion	1.1	1.1	1.1	1.1	1.1	1.1
RF_{CC}	Chemical Clogging	1.0	1.3	1.5	1.8	1.9	2.0
RF_{BC}	Biological Clogging	1.0	1.1	1.2	1.2	1.2	1.3
Total Reduction Factor[2]		1.10	1.57	1.98	2.38	2.51	2.86
Overall Factor of Safety to Account For Uncertainties		2.0	2.0	2.0	2.0	2.0	2.0
Overall Reduction Factor (ORF)[3]		2.20	3.15	3.96	4.75	5.02	5.72

[1] Values are obtained from References 1, 2, and 3.

[2] The Total Reduction Factors are a product of all the reduction factors for each fill condition.

[3] The Overall Reduction Factors are a product of the Total Reduction Factor and Overall Factor of Safety to Account For Uncertainties for each fill condition.

3. Transmissivity Data

The required minimum transmissivity for the 250-mil-thick single sided geocomposite with 6 oz/sy is shown on Sheet IIIC-A-25.

4. Compute the Design Transmissivity (T) of the Geocomposite Leachate Collection Layer:

Table 3 - Calculate the Required Transmissivity (250 mil and 6oz/sy for Undeveloped Area)

Fill Condition	d_W[1] (ft)	P[2] (psf)	t[3] (in)	T[4] (m^2/s)	ORF[5]	T_{DES}[6] (m^2/s)	k[7] (cm/s)
Active	10	780	0.232	4.07E-03	2.20	1.85E-03	31.38
Interim - 50'	50	3,095	0.217	3.40E-03	3.15	1.08E-03	19.63
Interim - 100'	100	6,045	0.205	2.71E-03	3.96	6.85E-04	13.15
Interim - 200'	200	14,545	0.160	1.54E-03	4.75	3.24E-04	7.97
Interim - ~~287'~~ **245'**	~~287~~ **245**	~~23,018~~ **18,965**	~~0.149~~ **0.153**	~~1.02E-03~~ **1.32E-03**	5.02	~~2.03E-04~~ **2.63E-04**	~~5.37~~ **6.77**
Closed	~~287~~ **245**	~~23,421~~ **19,368**	~~0.149~~ **0.152**	~~9.94E-04~~ **1.28E-03**	5.72	~~1.74E-04~~ **2.24E-04**	~~4.59~~ **5.80**

[1] d_W is the depth of waste above the geocomposite leachate collection layer.

[2] P is the pressure on the geocomposite leachate collection layer due to the weight of the waste and soil from Table 1.

[3] t is the calculated geocomposite leachate collection layer thickness from Table 1 for 250 mil drainage geocomposites.

[4] T is obtained from the specified transmissivity values for a representative geocomposite leachate collection layer (250-mil-thick geonet and 6 oz/sy polypropylene geotextile) as shown on Sheet IIIC-A-25.

[5] ORF is the Overall Reduction Factor obtained from Table 2.

[6] T_{DES} is the design transmissivity value calculated using the following equation:

$$T_{DES} = T / ORF$$

[7] k is hydraulic conductivity and calculated using the following equation:

$$k = T_{DES}/t$$

5. Specify drainage geocomposite properties for undeveloped areas

As shown on the HELP model summary sheets, a geocomposite with characteristics similar to the graph shown on IIIC-A-24 will provide a drainage layer that will maintain less than twelve inches of head on the liner system.

The drainage geocomposite required transmissivity values will be measured at a gradient of 0.009 under normal pressures of 1,000, 15,000 and ~~23,421~~ **19,368** psf (or higher), boundary conditions consisting of soil/geocomposite/geomembrane with minimum seating time of 100 hours and will be run for the first 100,000 square feet of liner construction. For each additional 100,000 square feet of single-sided geocomposite placement area, one additional transmissivity test will be run under the minimum normal stress (i.e., ~~23,421~~ **19,368** psf) with all the same assumptions as the first three tests. The minimum transmissivity will be ~~9.94×10^{-4}~~ **1.28×10^{-3}** m^2/s.

Solution:

1. Overliner Geocomposite Leachate Collection Layer Thickness:

Assume the overliner geocomposite leachate collection layer will undergo compression due to the weight of soil (in the form of daily cover, intermediate cover, protective cover, or final cover) and waste.

Unloaded Geocomposite Thickness (300 mil)=	0.30	in
Unit Weight of Soil =	115	pcf

Table 1 - Overliner Geocomposite Thickness

Fill Condition	d_W[1] (ft)	d_S[2] (ft)	γ[3] (psf)	P[4] (psf)	t[5] (in)	t[5] (m)
Active - 10'	10	2	55	780	0.300	0.008
Interim - 50'	50	3	55	3,095	0.291	0.007
Interim - 100'	100	3	57	6,045	0.279	0.007
~~Interim - 150'~~	~~150~~	~~3~~	~~64~~	~~9,945~~	~~0.262~~	~~0.007~~
Interim - ~~188'~~ **122'**	~~188~~ **122**	3	~~69~~ **60**	~~13,317~~ **7,665**	~~0.247~~ **0.272**	~~0.006~~ **0.007**
Closed	~~188~~ **122**	6.5	~~69~~ **60**	~~13,720~~ **8,068**	~~0.246~~ **0.270**	~~0.006~~ **0.007**

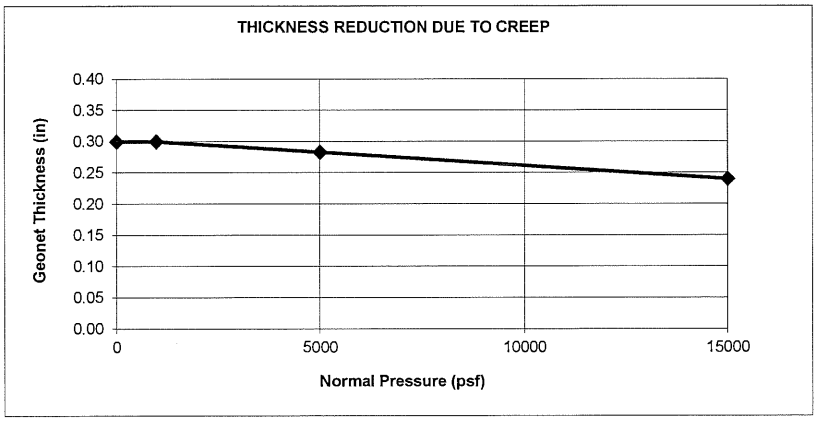
[1] d_W is the depth of waste and daily cover soil above the overliner geocomposite leachate collection layer.

[2] d_S is the depth of soil (protective cover, intermediate cover, or final cover) above the overliner geocomposite leachate collection layer.

[3] The unit weight of waste/soil is selected at the midpoint of the waste column thickness using the Unit Weight Profile for MSW graph provided in Ref 5.

[4] P is the pressure on the overliner geocomposite leachate collection layer due to the weight of the waste and soil.

[5] t is the thickness of the overliner geocomposite leachate collection layer after being subjected to compression based on the following chart adapted from Reference 4.



2. Reduction Factors and Factor of Safety for Strength and Environmental Conditions

Table 2 - Reduction Factors and Factor of Safety

Reduction Factors[1]		Fill Condition					
		Active (10' Waste)	Interim (50' Waste)	Interim (100' Waste)	~~Interim (150' Waste)~~	Interim (~~188'~~ **122'** Waste)	Closed Final Cover
RF_{IN}	Delayed Intrusion	1.1	1.1	1.1	~~1.1~~	1.1	1.1
RF_{CC}	Chemical Clogging	1.0	1.3	1.5	~~1.8~~	1.9	2.0
RF_{BC}	Biological Clogging	1.0	1.1	1.2	~~1.2~~	1.2	1.3
Total Reduction Factor[2]		1.10	1.57	1.98	~~2.38~~	2.51	2.86
Overall Factor of Safety to Account For Uncertainties		2.0	2.0	2.0	~~2.0~~	2.0	2.0
Overall Reduction Factor (ORF)[3]		2.20	3.15	3.96	~~4.75~~	5.02	5.72

[1] Values are obtained from References 1, 2, and 3.

[2] The Total Reduction Factors are a product of all the reduction factors for each fill condition.

[3] The Overall Reduction Factors are a product of the Total Reduction Factor and Overall Factor of Safety to Account For Uncertainties for each fill condition.

3. Transmissivity Data

The required minimum transmissivity for the 300-mil-thick double-sided geocomposite is shown on Sheet IIIC-A-26.

4. Compute the Design Transmissivity (T) of the Overliner Geocomposite Leachate Collection Layer:

Table 3 - Required Transmissivity for Overliner

Fill Condition	d_W[1] (ft)	P[2] (psf)	t[3] (in)	T[4] (m^2/s)	ORF[5]	T_{DES}[6] (m^2/s)	k[7,8] (cm/s)
Active - 10'	10	780	0.300	6.82E-03	2.20	3.10E-03	40.65
Interim - 50'	50	3,095	0.291	6.07E-03	3.15	1.93E-03	26.10
Interim - 100'	100	6,045	0.279	5.24E-03	3.96	1.32E-03	18.70
~~Interim - 150'~~	~~150~~	~~9,945~~	~~0.262~~	~~4.31E-03~~	~~4.75~~	~~9.07E-04~~	~~13.65~~
Interim - ~~188'~~ **122'**	~~188~~ **122**	~~13,317~~ **7,665**	~~0.247~~ **0.272**	~~2.91E-03~~ **4.83E-03**	5.02	~~5.79E-04~~ **9.63E-04**	~~9.22~~ **13.94**
Closed	~~188~~ **122**	~~13,720~~ **8,068**	~~0.246~~ **0.270**	~~2.77E-03~~ **4.74E-03**	5.72	~~4.84E-04~~ **8.29E-04**	~~7.77~~ **12.08**

[1] d_W is the depth of waste above the overliner geocomposite leachate collection layer.

[2] P is the pressure on the overliner geocomposite leachate collection layer due to the weight of the waste and soil from Table 1.

[3] t is the calculated overliner geocomposite leachate collection layer thickness from Table 1 for a 300 mil drainage geocomposite.

[4] T is obtained from the specified transmissivity values for a representative geocomposite leachate collection layer (6 oz/sy polypropylene geotextile with 300-mil-thick geonet) as shown on Sheet IIIC-A-26.

[5] ORF is the Overall Reduction Factor obtained from Table 2.

[6] T_{DES} is the design transmissivity value calculated using the following equation:

$$T_{DES} = T / ORF$$

[7] k is hydraulic conductivity and calculated using the following equation:

$$k = T_{DES}/t$$

[8] The calculated hydraulic conductivity values for the 300 mil geocomposite are used in the overliner HELP Model demonstration for the fill conditions shown in this table.

5. Specify drainage geocomposite properties for undeveloped areas.

As shown on the HELP model summary sheet, a geocomposite with characteristics similar to the graphs shown on IIIC-A-25 will provide a drainage layer that will maintain less than twelve inches of head on the liner system.

The transmissivity of the overliner double-sided geocomposite will be measured at a minimum gradient of 0.01 under a minimum normal pressure of 1,000, 10,000 and ~~13,720~~ **8,068** (or higher) psf, boundary conditions consisting of soil/geocomposite/geomembrane with minimum seating time of 100 hours. The minimum transmissivity will be ~~2.77×10^{-3}~~ **4.74×10^{-3}** m^2/s. For each additional 100,000 square feet liner geocomposite placement area, one additional transmissivity test will be run under the minimum normal stress of ~~13,720~~ **8,068** psf with all the same assumptions as the first three tests.

Prep By: JLG
Date: 2/19/2016

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY SHEET
DEVELOPED SUBTITLE D AREA (CELLS 1 AND 2)

Chkd By: ___
Date: ___

		INTERIM (50 FT WASTE)	INTERIM (100 FT WASTE)	INTERIM (150 FT WASTE)	INTERIM (200 FT WASTE)	INTERIM (~~282~~ **244** FT WASTE)	CLOSED (~~282~~ **244** FT WASTE)
GENERAL INFORMATION	Case No.	1	2	3	4	5	6
	No. of Years	5	10	15	10	5	30
	Ground Cover	FAIR	FAIR	FAIR	FAIR	FAIR	GOOD
	SCS Runoff Curve No.	87.1	87.1	87.1	87.1	88.1	82.4
	Model Area (acre)	1	1	1	1	1	1
	Runoff Area (%)	70	70	80	80	90	100
	Maximum Leaf Area Index	2.0	2.0	2.0	2.0	2.0	4.5
	Evaporative Zone Depth (inch)	10	10	10	10	10	18
TOPSOIL LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
EROSION LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)						0.04
	Hyd. Conductivity (cm/s)						4.0E-13
	Pinhole Density (holes/acre)						1
	Install. Defects (holes/acre)						4
	Placement Quality						GOOD
INFILTRATION LAYER (Texture = 0)	Thickness (in)						18
	Porosity (vol/vol)						0.4270
	Field Capacity (vol/vol)						0.4180
	Wilting Point (vol/vol)						0.3670
	Init. Moisture Content (vol/vol)						0.4270
	Hyd. Conductivity (cm/s)						1.0E-05
INTERMEDIATE COVER (Texture = 11)	Thickness (in)	12	12	12	12	12	12
	Porosity (vol/vol)	0.4640	0.4640	0.4640	0.4640	0.4640	0.4640
	Field Capacity (vol/vol)	0.3100	0.3100	0.3100	0.3100	0.3100	0.3100
	Wilting Point (vol/vol)	0.1870	0.1870	0.1870	0.1870	0.1870	0.1870
	Init. Moisture Content (vol/vol)	0.3100	0.3100	0.3100	0.3100	0.3100	0.3100
	Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	6.4E-05	6.4E-05	6.4E-05	6.4E-05
WASTE TOP[2] (Texture = 0)	Thickness (in)	600	1200	1500	1500	1500	1500
	Porosity (vol/vol)	0.6376	0.6247	0.6148	0.6148	0.6148	0.6148
	Field Capacity (vol/vol)	0.5185	0.5144	0.5114	0.5114	0.5114	0.5114
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.2500	0.3800	0.3800	0.3800	0.3800	0.3800
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03	1.0E-03	1.0E-03	1.0E-03
WASTE BOTTOM[2] (Texture = 0)	Thickness (in)			300	900	~~1884~~ **1428**	~~1884~~ **1428**
	Porosity (vol/vol)			0.5539	0.5337	~~0.5007~~ **0.5159**	~~0.5007~~ **0.5159**
	Field Capacity (vol/vol)			0.4945	0.4886	~~0.4793~~ **0.4838**	~~0.4793~~ **0.4838**
	Wilting Point (vol/vol)			0.0770	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)			0.3800	0.3800	0.3800	0.3800
	Hyd. Conductivity (cm/s)			1.0E-04	1.0E-04	1.0E-04	1.0E-04
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24	24	24	24
	Porosity (vol/vol)	0.3980	0.3980	0.3980	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.5E-05	1.1E-05	9.0E-06	5.7E-06	5.5E-06
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	0.174	0.164	0.154	0.128	~~0.120~~ **0.122**	~~0.119~~ **0.122**
	Porosity (vol/vol)	0.8500	0.8500	0.8500	0.8500	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	11.83	5.65	4.63	3.94	~~2.94~~ **3.42**	~~2.56~~ **2.94**
	Slope[1] (%)	1.1	1.1	1.1	1.1	1.1	1.1
	Slope Length (ft)	220	220	220	220	220	220
FLEXIBLE MEMBRANE LINER (Texture = 35)	Thickness (in)	0.06	0.06	0.06	0.06	0.06	0.06
	Hyd. Conductivity (cm/s)	2.0E-13	2.0E-13	2.0E-13	2.0E-13	2.0E-13	2.0E-13
	Pinhole Density (holes/acre)	0	0	0	0	0	0
	Install. Defects (holes/acre)	0	0	0	0	0	0
	Placement Quality	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD
COMPACTED CLAY LINER (Texture = 16)	Thickness (in)	24	24	24	24	24	24
	Porosity (vol/vol)	0.4270	0.4270	0.4270	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-07	1.0E-07	1.0E-07	1.0E-07	1.0E-07	1.0E-07
PRECIPITATION	Average Annual (in)	38.98	36.80	35.60	36.80	38.98	34.26
RUNOFF	Average Annual (in)	3.26	1.98	2.50	2.25	4.52	3.96
EVAPOTRANSPIRATION	Average Annual (in)	25.31	27.01	25.51	27.03	25.21	30.03
LATERAL DRAINAGE COLLECTED	Average Annual (cf/year)	1,601.6	3,862.2	2,651.2	2,484.3	~~1,935.7~~ **1,699.4**	~~2,035.8~~ **1,837.9**
	Peak Daily (cf/day)	32.7	26.7	15.0	11.5	~~9.9~~ **8.7**	~~8.9~~ **8.4**
HEAD ON LINER	Average Annual (in)	0.000	0.002	0.002	0.002	~~0.002~~ **0.001**	0.002
	Peak Daily (in)	0.005	0.009	0.006	0.006	~~0.006~~ **0.005**	~~0.007~~ **0.005**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the developed area presented in Appendix III.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. a*Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-594.

Prep By: JLG
Date: 2/19/2016

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY SHEET
DEVELOPED SUBTITLE D AREA (CELLS 4B, 5)

Chkd By: ___
Date: ___

		INTERIM (50 FT WASTE)	INTERIM (100 FT WASTE)	INTERIM (150 FT WASTE)	INTERIM (200 FT WASTE)	INTERIM (~~298~~ **248** FT WASTE)	CLOSED (~~298~~ **248** FT WASTE)
GENERAL INFORMATION	Case No.	1	2	3	4	5	6
	No. of Years	5	10	15	10	5	30
	Ground Cover	FAIR	FAIR	FAIR	FAIR	FAIR	GOOD
	SCS Runoff Curve No.	87.1	87.1	87.1	87.1	86.7	80.1
	Model Area (acre)	1	1	1	1	1	1
	Runoff Area (%)	70	70	80	80	90	100
	Maximum Leaf Area Index	2.0	2.0	2.0	2.0	2.0	4.5
	Evaporative Zone Depth (inch)	10	10	10	10	10	18
TOPSOIL LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
EROSION LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)						0.04
	Hyd. Conductivity (cm/s)						4.0E-13
	Pinhole Density (holes/acre)						1
	Install. Defects (holes/acre)						4
	Placement Quality						GOOD
INFILTRATION LAYER (Texture = 0)	Thickness (in)						18
	Porosity (vol/vol)						0.4270
	Field Capacity (vol/vol)						0.4180
	Wilting Point (vol/vol)						0.3670
	Init. Moisture Content (vol/vol)						0.4270
	Hyd. Conductivity (cm/s)						1.0E-05
INTERMEDIATE COVER (Texture = 11)	Thickness (in)	12	12	12	12	12	12
	Porosity (vol/vol)	0.4640	0.4640	0.4640	0.4640	0.4640	0.4640
	Field Capacity (vol/vol)	0.3100	0.3100	0.3100	0.3100	0.3100	0.3100
	Wilting Point (vol/vol)	0.1870	0.1870	0.1870	0.1870	0.1870	0.1870
	Init. Moisture Content (vol/vol)	0.3100	0.3100	0.3100	0.3100	0.3100	0.3100
	Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	6.4E-05	6.4E-05	6.4E-05	6.4E-05
WASTE TOP[2] (Texture = 0)	Thickness (in)	600	1200	1500	1500	1500	1500
	Porosity (vol/vol)	0.6376	0.6247	0.6148	0.6148	0.6148	0.6148
	Field Capacity (vol/vol)	0.5185	0.5144	0.5114	0.5114	0.5114	0.5114
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.2500	0.3800	0.3800	0.3800	0.3800	0.3800
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03	1.0E-03	1.0E-03	1.0E-03
WASTE BOTTOM[2] (Texture = 0)	Thickness (in)			300	900	~~2076~~ **1476**	~~2076~~ **1476**
	Porosity (vol/vol)			0.5539	0.5337	~~0.4941~~ **0.5225**	~~0.4941~~ **0.5225**
	Field Capacity (vol/vol)			0.4945	0.4886	~~0.4775~~ **0.4856**	~~0.4775~~ **0.4856**
	Wilting Point (vol/vol)			0.0770	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)			0.3800	0.3800	0.3800	0.3800
	Hyd. Conductivity (cm/s)			1.0E-04	1.0E-04	1.0E-04	1.0E-04
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24	24	24	24
	Porosity (vol/vol)	0.3980	0.3980	0.3980	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.5E-05	1.1E-05	9.0E-06	5.0E-06	4.6E-06
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	0.174	0.164	0.154	0.128	~~0.118~~ **0.122**	~~0.118~~ **0.122**
	Porosity (vol/vol)	0.8500	0.8500	0.8500	0.8500	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	2.37	0.99	0.60	0.55	~~0.49~~ **0.51**	~~0.43~~ **0.44**
	Slope[1] (%)	1.1	1.1	1.1	1.1	1.1	1.1
	Slope Length (ft)	855	855	855	855	855	855
FLEXIBLE MEMBRANE LINER (Texture = 35)	Thickness (in)	0.06	0.06	0.06	0.06	0.06	0.06
	Hyd. Conductivity (cm/s)	2.0E-13	2.0E-13	2.0E-13	2.0E-13	2.0E-13	2.0E-13
	Pinhole Density (holes/acre)	0	0	0	0	0	0
	Install. Defects (holes/acre)	0	0	0	0	0	0
	Placement Quality	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD
COMPACTED CLAY LINER (Texture = 16)	Thickness (in)	24	24	24	24	24	24
	Porosity (vol/vol)	0.4270	0.4270	0.4270	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-07	1.0E-07	1.0E-07	1.0E-07	1.0E-07	1.0E-07
PRECIPITATION	Average Annual (in)	38.98	36.80	35.60	36.80	38.98	34.26
RUNOFF	Average Annual (in)	3.26	1.98	2.50	2.25	3.84	3.77
EVAPOTRANSPIRATION	Average Annual (in)	25.31	27.01	25.51	27.03	25.19	30.22
LATERAL DRAINAGE COLLECTED	Average Annual (cf/year)	1,579.2	3,852.1	2,639.1	2,470.6	~~1,661.7~~ **1,405.6**	~~1743.3~~ **1,470.3**
	Peak Daily (cf/day)	25.8	21.2	11.1	8.8	~~6.6~~ **5.9**	~~6.3~~ **5.3**
HEAD ON LINER	Average Annual (in)	0.007	0.040	0.045	0.046	~~0.034~~ **0.028**	~~0.041~~ **0.035**
	Peak Daily (in)	0.083	0.160	0.138	0.121	~~0.100~~ **0.088**	~~0.107~~ **0.090**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the developed area presented in Appendix III.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. a*Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-594.

Prep By: JLG
Date: 2/17/2016

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY
UNDEVELOPED AREA

Chkd By: ___
Date: ___

		ACTIVE (10 FT WASTE)	INTERIM (50 FT WASTE)	INTERIM (100 FT WASTE)	INTERIM (200 FT WASTE)	INTERIM (~~287~~ **245** FT WASTE)	CLOSED (~~287~~ **245** FT WASTE)
GENERAL INFORMATION	Case No.	1	2	3	4	5	6
	No. of Years	1	10	15	10	5	30
	Ground Cover	BARE	FAIR	FAIR	FAIR	FAIR	GOOD
	SCS Runoff Curve No.	80.3	87.1	87.1	87.1	86.7	80.1
	Model Area (acre)	1	1	1	1	1	1
	Runoff Area (%)	0	70	80	80	90	100
	Maximum Leaf Area Index	0.0	2.0	2.0	2.0	2.0	4.5
	Evaporative Zone Depth (inch)	10	10	10	10	10	18
TOPSOIL LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
EROSION LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)						0.04
	Hyd. Conductivity (cm/s)						4.0E-13
	Pinhole Density (holes/acre)						1
	Install. Defects (holes/acre)						4
	Placement Quality						GOOD
INFILTRATION LAYER (Texture = 0)	Thickness (in)						18
	Porosity (vol/vol)						0.4270
	Field Capacity (vol/vol)						0.4180
	Wilting Point (vol/vol)						0.3670
	Init. Moisture Content (vol/vol)						0.4270
	Hyd. Conductivity (cm/s)						1.0E-05
INTERMEDIATE COVER (Texture = 11)	Thickness (in)		12	12	12	12	12
	Porosity (vol/vol)		0.4640	0.4640	0.4640	0.4640	0.4640
	Field Capacity (vol/vol)		0.3100	0.3100	0.3100	0.3100	0.3100
	Wilting Point (vol/vol)		0.1870	0.1870	0.1870	0.1870	0.1870
	Init. Moisture Content (vol/vol)		0.3100	0.3100	0.3100	0.3100	0.3100
	Hyd. Conductivity (cm/s)		6.4E-05	6.4E-05	6.4E-05	6.4E-05	6.4E-05
WASTE TOP[2] (Texture = 0)	Thickness (in)	120	600	1200	1500	1500	1500
	Porosity (vol/vol)	0.6376	0.6376	0.6247	0.6148	0.6148	0.6148
	Field Capacity (vol/vol)	0.5185	0.5185	0.5144	0.5114	0.5114	0.5114
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.2500	0.2500	0.3800	0.3800	0.3800	0.3800
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03	1.0E-03	1.0E-03	1.0E-03
WASTE BOTTOM[2] (Texture = 0)	Thickness (in)				900	~~1944~~ **1440**	~~1944~~ **1440**
	Porosity (vol/vol)				0.5337	~~0.4985~~ **0.5155**	~~0.4985~~ **0.5155**
	Field Capacity (vol/vol)				0.4886	~~0.4790~~ **0.4834**	~~0.4790~~ **0.4834**
	Wilting Point (vol/vol)				0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)				0.3800	0.3800	0.3800
	Hyd. Conductivity (cm/s)				1.0E-04	1.0E-04	1.0E-04
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24	24	24	24
	Porosity (vol/vol)	0.3980	0.3980	0.3980	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04	1.2E-04	1.2E-04	1.2E-04
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	0.232	0.217	0.205	0.160	~~0.149~~ **0.153**	~~0.149~~ **0.152**
	Porosity (vol/vol)	0.8500	0.8500	0.8500	0.8500	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	31.38	19.63	13.15	7.97	~~5.37~~ **6.77**	~~4.59~~ **5.80**
	Slope[1] (%)	0.9	0.9	0.9	0.9	0.9	0.9
	Slope Length (ft)	350	350	350	350	350	350
FLEXIBLE MEMBRANE LINER (Texture = 35)	Thickness (in)	0.06	0.06	0.06	0.06	0.06	0.06
	Hyd. Conductivity (cm/s)	2.0E-13	2.0E-13	2.0E-13	2.0E-13	2.0E-13	2.0E-13
	Pinhole Density (holes/acre)	0	0	0	0	0	0
	Install. Defects (holes/acre)	0	0	0	0	0	0
	Placement Quality	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD
COMPACTED CLAY LINER (Texture = 16)	Thickness (in)	24	24	24	24	24	24
	Porosity (vol/vol)	0.4270	0.4270	0.4270	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-07	1.0E-07	1.0E-07	1.0E-07	1.0E-07	1.0E-07
PRECIPITATION	Average Annual (in)	45.93	36.80	35.60	36.80	38.98	34.26
RUNOFF	Average Annual (in)	0.00	1.98	2.50	2.25	3.84	3.77
EVAPOTRANSPIRATION	Average Annual (in)	32.90	27.01	25.51	27.03	25.19	30.22
LATERAL DRAINAGE COLLECTED[3]	Average Annual (cf/year)	2,873.2	4,559.7	23,742.8	20,879.6	~~34,033.5~~ **30,597.1**	~~21,609.7~~ **18,079.6**
	Peak Daily (cf/day)	36.9	66.4	147.9	104.0	~~154.1~~ **130.9**	~~170.5~~ **129.6**
LATERAL DRAINAGE RECIRCULATED	Average Annual (cf/year)	0.0	506.6	2,638.1	2,320.0	~~3,781.5~~ **3,059.7**	0.0
	Peak Daily (cf/day)	0.0	7.4	16.4	11.6	~~17.1~~ **13.1**	0.0
HEAD ON LINER	Average Annual (in)	0.000	0.001	0.010	0.015	~~0.036~~ **0.023**	~~0.024~~ **0.016**
	Peak Daily (in)	0.005	0.014	0.047	0.054	~~0.119~~ **0.072**	~~0.138~~ **0.083**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the undeveloped area presented in Appendix IIIJ-B

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. al, *Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-594.

[3] Drainage collected includes actual leachate pumped by the leachate pumps (i.e., the total of the collected and recirculated leachate).

Prep By: JLG
Date: 2/19/2016

Chkd By: ___
Date: ___

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY SHEET
OVERLINER DESIGN

		ACTIVE (10 FT WASTE)	INTERIM (50 FT WASTE)	INTERIM (100 FT WASTE)	~~INTERIM (150 FT WASTE)~~	INTERIM (~~188~~ **122** FT WASTE)	CLOSED (~~188~~ **122** FT WASTE)
GENERAL INFORMATION	Case No.	1	2	3	4	5	6
	No. of Years	1	10	15	~~10~~	5	30
	Ground Cover	BARE	FAIR	FAIR	~~FAIR~~	FAIR	GOOD
	SCS Runoff Curve No.	80.3	87.1	87.1	~~87.1~~	86.7	80.1
	Model Area (acre)	1	1	1	~~1~~	1	1
	Runoff Area (%)	0	70	80	~~80~~	90	100
	Maximum Leaf Area Index	0.0	2.0	2.0	~~2.0~~	2.0	4.5
	Evaporative Zone Depth (inch	10	10	10	~~10~~	10	18
TOPSOIL LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
EROSION LAYER (Texture = 10)	Thickness (in)						12
	Porosity (vol/vol)						0.3980
	Field Capacity (vol/vol)						0.2440
	Wilting Point (vol/vol)						0.1360
	Init. Moisture Content (vol/vol)						0.2440
	Hyd. Conductivity (cm/s)						1.2E-04
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)						0.04
	Hyd. Conductivity (cm/s)						4.0E-13
	Pinhole Density (holes/acre)						1
	Install. Defects (holes/acre)						4
	Placement Quality						GOOD
INFILTRATION LAYER (Texture = 0)	Thickness (in)						18
	Porosity (vol/vol)						0.4270
	Field Capacity (vol/vol)						0.4180
	Wilting Point (vol/vol)						0.3670
	Init. Moisture Content (vol/vol)						0.4270
	Hyd. Conductivity (cm/s)						1.0E-05
INTERMEDIATE COVER (Texture = 11)	Thickness (in)		12	12	~~12~~	12	12
	Porosity (vol/vol)		0.4640	0.4640	~~0.4640~~	0.4640	0.4640
	Field Capacity (vol/vol)		0.3100	0.3100	~~0.3100~~	0.3100	0.3100
	Wilting Point (vol/vol)		0.1870	0.1870	~~0.1870~~	0.1870	0.1870
	Init. Moisture Content (vol/vol)		0.3100	0.3100	~~0.3100~~	0.3100	0.3100
	Hyd. Conductivity (cm/s)		6.4E-05	6.4E-05	~~6.4E-05~~	6.4E-05	6.4E-05
WASTE ~~TOP~~[2] (Texture = 0)	Thickness (in)	120	600	1200	~~1500~~	~~1500~~ **1464**	~~1500~~ **1464**
	Porosity (vol/vol)	0.6376	0.6376	0.6247	~~0.6148~~	~~0.6148~~ **0.6159**	~~0.6148~~ **0.6159**
	Field Capacity (vol/vol)	0.5185	0.5185	0.5144	~~0.5114~~	~~0.5114~~ **0.5118**	~~0.5114~~ **0.5118**
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770	~~0.0770~~	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.2500	0.2500	0.3800	~~0.3800~~	0.3800	0.3800
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03	~~1.0E-03~~	1.0E-03	1.0E-03
~~WASTE BOTTOM~~[2] ~~(Texture = 0)~~	~~Thickness (in)~~				~~300~~	~~756~~	~~756~~
	~~Porosity (vol/vol)~~				~~0.5539~~	~~0.5387~~	~~0.5387~~
	~~Field Capacity (vol/vol)~~				~~0.4945~~	~~0.4900~~	~~0.4900~~
	~~Wilting Point (vol/vol)~~				~~0.0770~~	~~0.0770~~	~~0.0770~~
	~~Init. Moisture Content (vol/vol)~~				~~0.3800~~	~~0.3800~~	~~0.3800~~
	~~Hyd. Conductivity (cm/s)~~				~~1.0E-04~~	~~1.0E-04~~	~~1.0E-04~~
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24	~~24~~	24	24
	Porosity (vol/vol)	0.3980	0.3980	0.3980	~~0.3980~~	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440	~~0.2440~~	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360	~~0.1360~~	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440	~~0.2440~~	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04	~~1.2E-04~~	1.2E-04	1.2E-04
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	0.300	0.291	0.279	~~0.262~~	~~0.247~~ **0.272**	~~0.246~~ **0.270**
	Porosity (vol/vol)	0.8500	0.8500	0.8500	~~0.8500~~	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	0.0100	~~0.0100~~	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050	~~0.0050~~	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100	~~0.0100~~	0.0100	0.0100
	Hyd. Conductivity (cm/s)	40.65	26.10	18.70	~~13.65~~	~~9.22~~ **13.94**	~~7.77~~ **12.08**
	Slope[1] (%)	1	1	1	~~1~~	1	1
	Slope Length (ft)	700	700	700	~~700~~	700	700
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)	0.04	0.04	0.04	~~0.04~~	0.04	0.04
	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13	~~4.0E-13~~	4.0E-13	4.0E-13
	Pinhole Density (holes/acre)	0	0	0	~~0~~	0	0
	Install. Defects (holes/acre)	0	0	0	~~0~~	0	0
	Placement Quality	GOOD	GOOD	GOOD	~~GOOD~~	GOOD	GOOD
GEOSYNTHETIC CLAY LINER (Texture = 0)	Thickness (in)	0.25	0.25	0.25	~~0.25~~	0.25	0.25
	Porosity (vol/vol)	0.7500	0.7500	0.7500	~~0.7500~~	0.7500	0.7500
	Field Capacity (vol/vol)	0.7470	0.7470	0.7470	~~0.7470~~	0.7470	0.7470
	Wilting Point (vol/vol)	0.4000	0.4000	0.4000	~~0.4000~~	0.4000	0.4000
	Init. Moisture Content (vol/vol)	0.7500	0.7500	0.7500	~~0.7500~~	0.7500	0.7500
	Hyd. Conductivity (cm/s)	5.0E-09	5.0E-09	5.0E-09	~~5.0E-09~~	5.0E-09	5.0E-09
PRECIPITATION	Average Annual (in)	45.93	36.80	35.60	~~36.80~~	38.98	34.26
RUNOFF	Average Annual (in)	0.00	1.98	2.50	~~2.25~~	3.84	3.77
EVAPOTRANSPIRATION	Average Annual (in)	32.32	26.99	25.51	~~27.03~~	25.19	30.22
LATERAL DRAINAGE COLLECTED	Average Annual (cf/year)	3,503.0	4,961.5	25,113.2	~~19,406.4~~	~~23,103.6~~ **26,973.5**	~~14,207.5~~ **12,799.1**
	Peak Daily (cf/day)	50.0	72.8	151.8	~~89.9~~	~~104.2~~ **151.9**	~~102.4~~ **138.0**
HEAD ON LINER	Average Annual (in)	0.001	0.002	0.013	~~0.013~~	~~0.023~~ **0.018**	~~0.017~~ **0.010**
	Peak Daily (in)	0.012	0.018	0.055	~~0.045~~	~~0.077~~ **0.073**	~~0.089~~ **0.078**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the overliner presented in Appendix III.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. a*Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-594

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******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP 307\CAM\1AND2\I244\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\1AND2\I244\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\1AND2\I244\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\1AND2\I244\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\1AND2\I244\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\1AND2\I244\I244.OUT


TIME:  13:31     DATE:   2/11/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-CELLS 1 AND 2 INTERIM 244'

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  11
          THICKNESS                  =     12.00   INCHES
          POROSITY                   =      0.4640 VOL/VOL
          FIELD CAPACITY             =      0.3100 VOL/VOL
          WILTING POINT              =      0.1870 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.3100 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.639999998000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

```
                    LAYER  2
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =   1500.00   INCHES
POROSITY                     =      0.6148 VOL/VOL
FIELD CAPACITY               =      0.5114 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                    LAYER  3
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =   1428.00   INCHES
POROSITY                     =      0.5159 VOL/VOL
FIELD CAPACITY               =      0.4838 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-04 CM/SEC


                    LAYER  4
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.570000020000E-05 CM/SEC


                    LAYER  5
                    --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.12   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
```

```
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   3.42000008000     CM/SEC
SLOPE                       =      1.10   PERCENT
DRAINAGE LENGTH             =    220.0    FEET
```

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

```
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD
```

LAYER 7

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

```
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4270 VOL/VOL
FIELD CAPACITY              =      0.4180 VOL/VOL
WILTING POINT               =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000001000E-06 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #11 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 20.% AND A SLOPE LENGTH OF 120. FEET.

```
SCS RUNOFF CURVE NUMBER             =     88.10
FRACTION OF AREA ALLOWING RUNOFF    =     90.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =     10.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      3.100  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      4.640  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      1.870  INCHES
```

INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	1132.465	INCHES
TOTAL INITIAL WATER	=	1132.465	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 6 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.19	2.92	2.56	3.32	5.03	3.09
	3.21	2.21	2.74	5.78	3.54	3.38
STD. DEVIATIONS	0.70	1.06	1.38	2.23	3.28	2.03
	2.38	1.68	1.48	3.85	2.95	2.55
RUNOFF						
TOTALS	0.000	0.127	0.154	0.306	0.781	0.268
	0.717	0.171	0.145	1.130	0.540	0.184
STD. DEVIATIONS	0.000	0.066	0.215	0.340	1.202	0.246
	0.973	0.166	0.200	1.410	0.772	0.216
EVAPOTRANSPIRATION						
TOTALS	1.477	2.007	2.453	2.568	2.562	2.888
	1.609	1.712	2.189	2.425	1.649	1.671
STD. DEVIATIONS	0.364	0.712	0.943	1.109	1.288	1.075
	0.754	1.369	1.260	1.040	0.692	0.672
LATERAL DRAINAGE COLLECTED FROM LAYER 5						
TOTALS	0.0388	0.0302	0.0372	0.0374	0.0389	0.0416
	0.0429	0.0417	0.0347	0.0377	0.0393	0.0478
STD. DEVIATIONS	0.0225	0.0167	0.0212	0.0198	0.0208	0.0224
	0.0204	0.0183	0.0153	0.0201	0.0150	0.0141
PERCOLATION/LEAKAGE THROUGH LAYER 7						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0013	0.0011	0.0012	0.0013	0.0013	0.0014
	0.0014	0.0014	0.0012	0.0013	0.0014	0.0016
STD. DEVIATIONS	0.0007	0.0006	0.0007	0.0007	0.0007	0.0008
	0.0007	0.0006	0.0005	0.0007	0.0005	0.0005

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 6 THROUGH 10

	INCHES		CU. FEET	PERCENT
PRECIPITATION	38.98	(7.188)	141490.1	100.00
RUNOFF	4.521	(1.4578)	16411.19	11.599
EVAPOTRANSPIRATION	25.210	(3.0807)	91511.17	64.677
LATERAL DRAINAGE COLLECTED FROM LAYER 5	0.46815	(0.21549)	1699.395	1.20107
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00000	(0.00000)	0.009	0.00001
AVERAGE HEAD ON TOP OF LAYER 6	0.001	(0.001)		
CHANGE IN WATER STORAGE	8.779	(3.3049)	31868.23	22.523

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              PEAK DAILY VALUES FOR YEARS    6 THROUGH   10
  ---------------------------------------------------------------------------
                                                (INCHES)       (CU. FT.)
                                               ----------    -------------
     PRECIPITATION                               4.72          17133.600

     RUNOFF                                      1.960          7115.2412

     DRAINAGE COLLECTED FROM LAYER  5            0.00239           8.66544

     PERCOLATION/LEAKAGE THROUGH LAYER  7        0.000000          0.00002

     AVERAGE HEAD ON TOP OF LAYER  6             0.002

     MAXIMUM HEAD ON TOP OF LAYER  6             0.005

     LOCATION OF MAXIMUM HEAD IN LAYER  5
           (DISTANCE FROM DRAIN)                16.4 FEET

     SNOW WATER                                  0.86           3135.2500


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                    0.4482

     MINIMUM VEG. SOIL WATER (VOL/VOL)                    0.1870

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

*******************************************************************************
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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	3.7213	0.3101
2	616.2353	0.4108
3	539.3717	0.3777
4	6.7827	0.2826
5	0.0020	0.0164
6	0.0000	0.0000
7	10.2480	0.4270
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP 307\CAM\1AND2\CLOSD\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\1AND2\CLOSD\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\1AND2\CLOSD\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\1AND2\CLOSD\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\1AND2\CLOSD\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\1AND2\CLOSD\CLOSD.OUT


TIME:  13:32     DATE:   2/11/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-CELLS 1 AND 2 CLOSED 244'

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
          THICKNESS                  =     12.00   INCHES
          POROSITY                   =      0.3980 VOL/VOL
          FIELD CAPACITY             =      0.2440 VOL/VOL
          WILTING POINT              =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.2440 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

```
                        LAYER  2
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                        LAYER  5
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  11
THICKNESS                    =     12.00   INCHES
```

```
POROSITY                      =      0.4640 VOL/VOL
FIELD CAPACITY                =      0.3100 VOL/VOL
WILTING POINT                 =      0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =  0.639999998000E-04 CM/SEC


                        LAYER  6
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                     =   1500.00   INCHES
POROSITY                      =      0.6148 VOL/VOL
FIELD CAPACITY                =      0.5114 VOL/VOL
WILTING POINT                 =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =  0.100000005000E-02 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                     =   1428.00   INCHES
POROSITY                      =      0.5159 VOL/VOL
FIELD CAPACITY                =      0.4838 VOL/VOL
WILTING POINT                 =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-04 CM/SEC


                        LAYER  8
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                     =     24.00   INCHES
POROSITY                      =      0.3980 VOL/VOL
FIELD CAPACITY                =      0.2440 VOL/VOL
WILTING POINT                 =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT    =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.     =  0.550000004000E-05 CM/SEC


                        LAYER  9
                        --------
```

```
            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.12   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   2.94000006000     CM/SEC
SLOPE                        =      1.10   PERCENT
DRAINAGE LENGTH              =    220.0    FEET


                        LAYER 10
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER 11
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER  16
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000001000E-06 CM/SEC


          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
         SOIL DATA BASE USING SOIL TEXTURE #10 WITH A
         GOOD STAND OF GRASS, A SURFACE SLOPE OF 20.%
         AND A SLOPE LENGTH OF  120. FEET.

SCS RUNOFF CURVE NUMBER              =     82.40
```

FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.392	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.164	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.448	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	1146.007	INCHES
TOTAL INITIAL WATER	=	1146.007	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.49	2.20	2.80	3.08	4.59	3.29
	2.94	1.93	2.75	4.15	2.36	2.71
STD. DEVIATIONS	1.02	1.27	1.67	1.89	2.17	2.13
	2.33	1.43	1.52	3.45	1.80	1.93
RUNOFF						
TOTALS	0.229	0.159	0.319	0.211	0.394	0.152
	0.170	0.027	0.039	0.863	0.520	0.881
STD. DEVIATIONS	0.407	0.408	0.694	0.448	0.804	0.263
	0.366	0.062	0.075	1.578	1.008	1.509
EVAPOTRANSPIRATION						
TOTALS	1.672	1.775	2.663	4.407	4.685	3.411
	2.907	1.918	2.392	1.756	1.037	1.403
STD. DEVIATIONS	0.410	0.586	0.944	1.001	1.848	1.911
	1.926	1.514	1.379	0.871	0.371	0.422
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0313	0.0272	0.0304	0.0240	0.0157	0.0132
	0.0133	0.0123	0.0119	0.0192	0.0253	0.0308
STD. DEVIATIONS	0.0126	0.0096	0.0092	0.0080	0.0060	0.0032
	0.0033	0.0023	0.0024	0.0101	0.0139	0.0142
LATERAL DRAINAGE COLLECTED FROM LAYER 9						
TOTALS	0.0418	0.0375	0.0417	0.0432	0.0420	0.0426
	0.0436	0.0432	0.0414	0.0417	0.0420	0.0457
STD. DEVIATIONS	0.0095	0.0090	0.0107	0.0100	0.0097	0.0100
	0.0091	0.0085	0.0079	0.0096	0.0091	0.0067

PERCOLATION/LEAKAGE THROUGH LAYER 11

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	15.3355	14.6313	14.9179	12.0426	7.4335	6.3967
	6.2349	5.7141	5.7131	9.2092	12.7119	15.0495
STD. DEVIATIONS	6.3426	5.3131	4.6169	4.1564	3.0030	1.6034
	1.6241	1.0930	1.1600	5.0768	7.2484	7.1537

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0016	0.0016	0.0016	0.0017	0.0016	0.0017
	0.0017	0.0017	0.0017	0.0016	0.0017	0.0018
STD. DEVIATIONS	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
	0.0004	0.0003	0.0003	0.0004	0.0004	0.0003

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.26	(6.276)	124371.1	100.00
RUNOFF	3.964	(2.9031)	14390.76	11.571
EVAPOTRANSPIRATION	30.028	(4.1461)	109001.06	87.642
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.25443	(0.06134)	923.564	0.74259
AVERAGE HEAD ON TOP OF LAYER 3	10.449	(2.581)		
LATERAL DRAINAGE COLLECTED FROM LAYER 9	0.50629	(0.08479)	1837.850	1.47771
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00000	(0.00000)	0.009	0.00001

```
 AVERAGE HEAD ON TOP              0.002 (     0.000)
   OF LAYER 10

 CHANGE IN WATER STORAGE         -0.237    (  2.1712)        -858.62      -0.690

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*******************************************************************************

              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
  ---------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
     PRECIPITATION                               6.00         21780.000

     RUNOFF                                      3.429        12448.3271

     PERCOLATION/LEAKAGE THROUGH LAYER  4        0.001567         5.68974

     AVERAGE HEAD ON TOP OF LAYER  3            24.000

     DRAINAGE COLLECTED FROM LAYER  9            0.00230          8.35588

     PERCOLATION/LEAKAGE THROUGH LAYER 11        0.000000         0.00002

     AVERAGE HEAD ON TOP OF LAYER 10             0.003

     MAXIMUM HEAD ON TOP OF LAYER 10             0.005

     LOCATION OF MAXIMUM HEAD IN LAYER  9
           (DISTANCE FROM DRAIN)                 5.9 FEET

     SNOW WATER                                  2.40          8713.1436


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                   0.3980

     MINIMUM VEG. SOIL WATER (VOL/VOL)                   0.1360

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4319	0.2027
2	3.8842	0.3237
3	0.0000	0.0000
4	7.6860	0.4270
5	3.7200	0.3100
6	577.6328	0.3851
7	526.6370	0.3688
8	6.6686	0.2779
9	0.0027	0.0218
10	0.0000	0.0000
11	10.2480	0.4270
SNOW WATER	0.000	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\HELP 307\CAM\4BAND5\I248\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\4BAND5\I248\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\4BAND5\I248\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\4BAND5\I248\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\4BAND5\I248\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\4BAND5\I248\I248.OUT


TIME:  13:48     DATE:   2/11/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-CELLS 4B AND 5 INTERIM 248'

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  11
          THICKNESS                    =     12.00   INCHES
          POROSITY                     =      0.4640 VOL/VOL
          FIELD CAPACITY               =      0.3100 VOL/VOL
          WILTING POINT                =      0.1870 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3100 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.639999998000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

```
                        LAYER  2
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =   1500.00   INCHES
POROSITY                    =      0.6148 VOL/VOL
FIELD CAPACITY              =      0.5114 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER  3
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =   1476.00   INCHES
POROSITY                    =      0.5225 VOL/VOL
FIELD CAPACITY              =      0.4856 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-04 CM/SEC


                        LAYER  4
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.499999987000E-05 CM/SEC


                        LAYER  5
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.12   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
```

```
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.509999990000     CM/SEC
SLOPE                       =      1.10   PERCENT
DRAINAGE LENGTH             =    855.0    FEET
```

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

```
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD
```

LAYER 7

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

```
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4270 VOL/VOL
FIELD CAPACITY              =      0.4180 VOL/VOL
WILTING POINT               =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000001000E-06 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #11 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 500. FEET.

```
SCS RUNOFF CURVE NUMBER             =     86.70
FRACTION OF AREA ALLOWING RUNOFF    =     90.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =     10.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      3.100  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      4.640  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      1.870  INCHES
```

INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	1150.705	INCHES
TOTAL INITIAL WATER	=	1150.705	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 6 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.19	2.92	2.56	3.32	5.03	3.09
	3.21	2.21	2.74	5.78	3.54	3.38
STD. DEVIATIONS	0.70	1.06	1.38	2.23	3.28	2.03
	2.38	1.68	1.48	3.85	2.95	2.55
RUNOFF						
TOTALS	0.000	0.087	0.118	0.252	0.682	0.213
	0.667	0.127	0.112	0.977	0.474	0.134
STD. DEVIATIONS	0.000	0.047	0.181	0.294	1.106	0.200
	0.925	0.132	0.155	1.267	0.697	0.160
EVAPOTRANSPIRATION						
TOTALS	1.473	2.016	2.397	2.581	2.527	2.908
	1.612	1.724	2.207	2.428	1.656	1.662
STD. DEVIATIONS	0.351	0.710	0.968	1.152	1.287	1.081
	0.751	1.364	1.288	1.022	0.691	0.646
LATERAL DRAINAGE COLLECTED FROM LAYER 5						
TOTALS	0.0286	0.0279	0.0315	0.0315	0.0338	0.0308
	0.0322	0.0333	0.0324	0.0322	0.0356	0.0375
STD. DEVIATIONS	0.0186	0.0167	0.0184	0.0175	0.0187	0.0168
	0.0178	0.0164	0.0175	0.0149	0.0162	0.0099
PERCOLATION/LEAKAGE THROUGH LAYER 7						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0248	0.0266	0.0273	0.0283	0.0293	0.0276
	0.0279	0.0289	0.0291	0.0279	0.0319	0.0325
STD. DEVIATIONS	0.0162	0.0160	0.0159	0.0156	0.0162	0.0151
	0.0154	0.0143	0.0157	0.0129	0.0145	0.0086

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 6 THROUGH 10

	INCHES		CU. FEET	PERCENT
PRECIPITATION	38.98	(7.188)	141490.1	100.00
RUNOFF	3.843	(1.2223)	13950.84	9.860
EVAPOTRANSPIRATION	25.190	(3.1191)	91438.16	64.625
LATERAL DRAINAGE COLLECTED FROM LAYER 5	0.38721	(0.19425)	1405.577	0.99341
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00000	(0.00000)	0.009	0.00001
AVERAGE HEAD ON TOP OF LAYER 6	0.028	(0.014)		
CHANGE IN WATER STORAGE	9.558	(3.4832)	34695.57	24.522

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              PEAK DAILY VALUES FOR YEARS    6 THROUGH   10
  ---------------------------------------------------------------------------
                                                (INCHES)       (CU. FT.)
                                               ----------    -------------
     PRECIPITATION                               4.72          17133.600

     RUNOFF                                      1.917          6957.3447

     DRAINAGE COLLECTED FROM LAYER  5            0.00162           5.88132

     PERCOLATION/LEAKAGE THROUGH LAYER  7        0.000000          0.00002

     AVERAGE HEAD ON TOP OF LAYER  6             0.044

     MAXIMUM HEAD ON TOP OF LAYER  6             0.088

     LOCATION OF MAXIMUM HEAD IN LAYER  5
           (DISTANCE FROM DRAIN)                 0.0 FEET

     SNOW WATER                                  0.86           3135.2500


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                   0.4613

     MINIMUM VEG. SOIL WATER (VOL/VOL)                   0.1870

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	3.7169	0.3097
2	619.7291	0.4132
3	558.0576	0.3781
4	6.7187	0.2799
5	0.0248	0.2030
6	0.0000	0.0000
7	10.2480	0.4270
SNOW WATER	0.000	

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**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\HELP 307\CAM\4BAND5\CLOSD\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\4BAND5\CLOSD\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\4BAND5\CLOSD\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\4BAND5\CLOSD\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\4BAND5\CLOSD\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\4BAND5\CLOSD\CLOSD.OUT


TIME:  13:49     DATE:   2/11/2016


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     TITLE:  CAMELOT LANDFILL-CELLS 4B AND 5 CLOSED 248'

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
          THICKNESS                  =     12.00   INCHES
          POROSITY                   =      0.3980 VOL/VOL
          FIELD CAPACITY             =      0.2440 VOL/VOL
          WILTING POINT              =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.2440 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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                        LAYER  2
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                        LAYER  5
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  11
THICKNESS                    =     12.00   INCHES
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POROSITY                     =      0.4640 VOL/VOL
FIELD CAPACITY               =      0.3100 VOL/VOL
WILTING POINT                =      0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.639999998000E-04 CM/SEC


                        LAYER  6
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =   1500.00   INCHES
POROSITY                     =      0.6148 VOL/VOL
FIELD CAPACITY               =      0.5114 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =   1476.00   INCHES
POROSITY                     =      0.5225 VOL/VOL
FIELD CAPACITY               =      0.4856 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-04 CM/SEC


                        LAYER  8
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.460000001000E-05 CM/SEC


                        LAYER  9
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            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.12   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.439999998000     CM/SEC
SLOPE                        =      1.10   PERCENT
DRAINAGE LENGTH              =    855.0    FEET


                        LAYER 10
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER 11
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER  16
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000001000E-06 CM/SEC


          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE #10 WITH A
          GOOD STAND OF GRASS, A SURFACE SLOPE OF  4.%
          AND A SLOPE LENGTH OF  500. FEET.

SCS RUNOFF CURVE NUMBER             =     80.10
```

FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.392	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.164	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.448	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	1164.247	INCHES
TOTAL INITIAL WATER	=	1164.247	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.49	2.20	2.80	3.08	4.59	3.29
	2.94	1.93	2.75	4.15	2.36	2.71
STD. DEVIATIONS	1.02	1.27	1.67	1.89	2.17	2.13
	2.33	1.43	1.52	3.45	1.80	1.93
RUNOFF						
TOTALS	0.231	0.154	0.318	0.189	0.352	0.106
	0.124	0.016	0.022	0.847	0.537	0.879
STD. DEVIATIONS	0.410	0.410	0.709	0.443	0.820	0.204
	0.289	0.039	0.049	1.590	1.034	1.518
EVAPOTRANSPIRATION						
TOTALS	1.673	1.770	2.669	4.424	4.729	3.465
	2.959	1.935	2.408	1.751	1.035	1.400
STD. DEVIATIONS	0.408	0.585	0.943	1.005	1.869	1.948
	1.993	1.548	1.397	0.866	0.367	0.421
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0314	0.0274	0.0306	0.0241	0.0158	0.0134
	0.0135	0.0123	0.0119	0.0195	0.0255	0.0309
STD. DEVIATIONS	0.0126	0.0096	0.0093	0.0081	0.0061	0.0034
	0.0036	0.0024	0.0025	0.0103	0.0141	0.0142
LATERAL DRAINAGE COLLECTED FROM LAYER 9						
TOTALS	0.0328	0.0315	0.0348	0.0328	0.0343	0.0335
	0.0346	0.0344	0.0335	0.0346	0.0337	0.0345
STD. DEVIATIONS	0.0086	0.0076	0.0077	0.0069	0.0074	0.0069
	0.0067	0.0066	0.0067	0.0063	0.0058	0.0060

PERCOLATION/LEAKAGE THROUGH LAYER 11

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	15.3998	14.7275	15.0076	12.1243	7.5029	6.5148
	6.3332	5.7299	5.7205	9.3725	12.8499	15.1297
STD. DEVIATIONS	6.3262	5.3059	4.6271	4.1758	3.0544	1.7389
	1.7835	1.1462	1.2067	5.1851	7.3282	7.1434

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0329	0.0348	0.0350	0.0340	0.0345	0.0348
	0.0348	0.0345	0.0348	0.0348	0.0350	0.0346
STD. DEVIATIONS	0.0086	0.0085	0.0077	0.0072	0.0075	0.0071
	0.0068	0.0066	0.0070	0.0063	0.0060	0.0061

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.26	(6.276)	124371.1	100.00
RUNOFF	3.774	(2.9347)	13698.63	11.014
EVAPOTRANSPIRATION	30.216	(4.2443)	109684.16	88.191
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.25638	(0.06252)	930.642	0.74828
AVERAGE HEAD ON TOP OF LAYER 3	10.534	(2.625)		
LATERAL DRAINAGE COLLECTED FROM LAYER 9	0.40503	(0.07423)	1470.268	1.18216
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00000	(0.00000)	0.009	0.00001

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 AVERAGE HEAD ON TOP              0.035 (     0.006)
   OF LAYER 10

 CHANGE IN WATER STORAGE         -0.133    (  2.1751)        -482.01      -0.388

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	6.00	21780.000
RUNOFF	3.413	12389.1777
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.001567	5.68974
AVERAGE HEAD ON TOP OF LAYER 3	24.000	
DRAINAGE COLLECTED FROM LAYER 9	0.00146	5.28539
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 10	0.045	
MAXIMUM HEAD ON TOP OF LAYER 10	0.090	
LOCATION OF MAXIMUM HEAD IN LAYER 9 (DISTANCE FROM DRAIN)	3.6 FEET	
SNOW WATER	2.40	8713.1436

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3980
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4409	0.2034
2	3.8913	0.3243
3	0.0000	0.0000
4	7.6860	0.4270
5	3.7200	0.3100
6	577.6912	0.3851
7	547.8823	0.3712
8	6.6709	0.2780
9	0.0330	0.2702
10	0.0000	0.0000
11	10.2480	0.4270
SNOW WATER	0.000	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\HELP 307\CAM\UNDEV\I245\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\UNDEV\I245\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\UNDEV\I245\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\UNDEV\I245\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\UNDEV\I245\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\UNDEV\I245\I245.OUT


TIME:  14: 9     DATE:   2/11/2016


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     TITLE:  CAMELOT LANDFILL-UNDEV AREA INTERIM 245'

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  11
          THICKNESS                    =     12.00   INCHES
          POROSITY                     =      0.4640 VOL/VOL
          FIELD CAPACITY               =      0.3100 VOL/VOL
          WILTING POINT                =      0.1870 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3100 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.639999998000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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                         LAYER  2
                         --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
  THICKNESS                   =   1500.00   INCHES
  POROSITY                    =      0.6148 VOL/VOL
  FIELD CAPACITY              =      0.5114 VOL/VOL
  WILTING POINT               =      0.0770 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC
NOTE:   10.00 PERCENT OF THE DRAINAGE COLLECTED FROM LAYER # 5
         IS RECIRCULATED INTO THIS LAYER.


                         LAYER  3
                         --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
  THICKNESS                   =   1440.00   INCHES
  POROSITY                    =      0.5155 VOL/VOL
  FIELD CAPACITY              =      0.4834 VOL/VOL
  WILTING POINT               =      0.0770 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-04 CM/SEC


                         LAYER  4
                         --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
  THICKNESS                   =     24.00   INCHES
  POROSITY                    =      0.3980 VOL/VOL
  FIELD CAPACITY              =      0.2440 VOL/VOL
  WILTING POINT               =      0.1360 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                         LAYER  5
                         --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
  THICKNESS                   =      0.15   INCHES
  POROSITY                    =      0.8500 VOL/VOL
```

```
  FIELD CAPACITY              =      0.0100 VOL/VOL
  WILTING POINT               =      0.0050 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =   6.76999998000     CM/SEC
  SLOPE                       =      0.90   PERCENT
  DRAINAGE LENGTH             =    350.0    FEET
NOTE:   10.00 PERCENT OF THE DRAINAGE COLLECTED FROM THIS
         LAYER IS RECIRCULATED INTO LAYER #  2.


                        LAYER  6
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
  THICKNESS                   =      0.06   INCHES
  POROSITY                    =      0.0000 VOL/VOL
  FIELD CAPACITY              =      0.0000 VOL/VOL
  WILTING POINT               =      0.0000 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
  FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
  FML INSTALLATION DEFECTS    =      0.00   HOLES/ACRE
  FML PLACEMENT QUALITY       =  3 - GOOD


                        LAYER  7
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER  16
  THICKNESS                   =     24.00   INCHES
  POROSITY                    =      0.4270 VOL/VOL
  FIELD CAPACITY              =      0.4180 VOL/VOL
  WILTING POINT               =      0.3670 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.4270 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.100000001000E-06 CM/SEC


          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
         SOIL DATA BASE USING SOIL TEXTURE #11 WITH A
         FAIR STAND OF GRASS, A SURFACE SLOPE OF  4.%
         AND A SLOPE LENGTH OF  500. FEET.

SCS RUNOFF CURVE NUMBER             =     86.70
FRACTION OF AREA ALLOWING RUNOFF    =     90.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
```

EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.100	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	4.640	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.870	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	1137.026	INCHES
TOTAL INITIAL WATER	=	1137.026	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

AND STATION LATITUDE = 32.85 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 6 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.19	2.92	2.56	3.32	5.03	3.09
	3.21	2.21	2.74	5.78	3.54	3.38
STD. DEVIATIONS	0.70	1.06	1.38	2.23	3.28	2.03
	2.38	1.68	1.48	3.85	2.95	2.55
RUNOFF						
TOTALS	0.000	0.087	0.118	0.252	0.682	0.213
	0.667	0.127	0.112	0.977	0.474	0.134
STD. DEVIATIONS	0.000	0.047	0.181	0.294	1.106	0.200
	0.925	0.132	0.155	1.267	0.697	0.160
EVAPOTRANSPIRATION						
TOTALS	1.473	2.016	2.397	2.581	2.527	2.908
	1.612	1.724	2.207	2.428	1.656	1.662
STD. DEVIATIONS	0.351	0.710	0.968	1.152	1.287	1.081
	0.751	1.364	1.288	1.022	0.691	0.646
LATERAL DRAINAGE RECIRCULATED INTO LAYER 2						
TOTALS	0.0636	0.0685	0.0755	0.0712	0.0749	0.0699
	0.0718	0.0699	0.0687	0.0708	0.0680	0.0701
STD. DEVIATIONS	0.0161	0.0104	0.0092	0.0097	0.0120	0.0097
	0.0100	0.0106	0.0107	0.0085	0.0095	0.0091
LATERAL DRAINAGE COLLECTED FROM LAYER 5						
TOTALS	0.5726	0.6168	0.6797	0.6408	0.6737	0.6290
	0.6461	0.6292	0.6181	0.6369	0.6123	0.6309
STD. DEVIATIONS	0.1451	0.0939	0.0832	0.0872	0.1084	0.0871
	0.0897	0.0956	0.0961	0.0766	0.0858	0.0817
LATERAL DRAINAGE RECIRCULATED FROM LAYER 5						
TOTALS	0.0636	0.0685	0.0755	0.0712	0.0749	0.0699

	0.0718	0.0699	0.0687	0.0708	0.0680	0.0701
STD. DEVIATIONS	0.0161	0.0104	0.0092	0.0097	0.0120	0.0097
	0.0100	0.0106	0.0107	0.0085	0.0095	0.0091

PERCOLATION/LEAKAGE THROUGH LAYER 7

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0208	0.0246	0.0247	0.0240	0.0245	0.0236
	0.0235	0.0229	0.0232	0.0231	0.0230	0.0229
STD. DEVIATIONS	0.0053	0.0037	0.0030	0.0033	0.0039	0.0033
	0.0033	0.0035	0.0036	0.0028	0.0032	0.0030

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 6 THROUGH 10

	INCHES		CU. FEET	PERCENT
PRECIPITATION	38.98	(7.188)	141490.1	100.00
RUNOFF	3.843	(1.2223)	13950.84	9.860
EVAPOTRANSPIRATION	25.190	(3.1191)	91438.16	64.625
DRAINAGE RECIRCULATED INTO LAYER 2	0.84290	(0.10418)	3059.710	2.16249
LATERAL DRAINAGE COLLECTED FROM LAYER 5	7.58605	(0.93762)	27537.379	19.46240
DRAINAGE RECIRCULATED FROM LAYER 5	0.84290	(0.10418)	3059.710	2.16249
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00000	(0.00000)	0.009	0.00001
AVERAGE HEAD ON TOP OF LAYER 6	0.023	(0.003)		

CHANGE IN WATER STORAGE	2.359	(3.6429)	8564.53	6.053

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              PEAK DAILY VALUES FOR YEARS    6 THROUGH   10
  ---------------------------------------------------------------------------
                                              (INCHES)      (CU. FT.)
                                             ----------   -------------
     PRECIPITATION                              4.72        17133.600

     RUNOFF                                     1.917        6957.3447

     DRAINAGE RECIRCULATED INTO LAYER  2        0.00361        13.09155

     DRAINAGE COLLECTED FROM LAYER  5           0.03246       117.82394

     DRAINAGE RECIRCULATED FROM LAYER  5        0.00361        13.09155

     PERCOLATION/LEAKAGE THROUGH LAYER  7       0.000000        0.00002

     AVERAGE HEAD ON TOP OF LAYER  6            0.037

     MAXIMUM HEAD ON TOP OF LAYER  6            0.072

     LOCATION OF MAXIMUM HEAD IN LAYER  5
           (DISTANCE FROM DRAIN)                3.1 FEET

     SNOW WATER                                 0.86         3135.2500


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.4613

     MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1870

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	3.7169	0.3097
2	620.9144	0.4139
3	507.4056	0.3524
4	6.5198	0.2717
5	0.0178	0.1161
6	0.0000	0.0000
7	10.2480	0.4270
SNOW WATER	0.000	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP 307\CAM\UNDEV\CLOSD\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\UNDEV\CLOSD\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\UNDEV\CLOSD\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\UNDEV\CLOSD\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\UNDEV\CLOSD\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\UNDEV\CLOSD\CLOSD.OUT


TIME:  14: 9     DATE:   2/11/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-UNDEV AREA CLOSED

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
          THICKNESS                  =     12.00   INCHES
          POROSITY                   =      0.3980 VOL/VOL
          FIELD CAPACITY             =      0.2440 VOL/VOL
          WILTING POINT              =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.2440 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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                        LAYER  2
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                        LAYER  5
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  11
THICKNESS                    =     12.00   INCHES
```

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POROSITY                    =      0.4640 VOL/VOL
FIELD CAPACITY              =      0.3100 VOL/VOL
WILTING POINT               =      0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.639999998000E-04 CM/SEC


                       LAYER  6
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =   1500.00   INCHES
POROSITY                    =      0.6148 VOL/VOL
FIELD CAPACITY              =      0.5114 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                       LAYER  7
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =   1440.00   INCHES
POROSITY                    =      0.5155 VOL/VOL
FIELD CAPACITY              =      0.4834 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-04 CM/SEC


                       LAYER  8
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                       LAYER  9
                       --------
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```
            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.15   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   5.80000019000     CM/SEC
SLOPE                        =      0.90   PERCENT
DRAINAGE LENGTH              =    350.0    FEET


                        LAYER 10
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER 11
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER  16
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000001000E-06 CM/SEC


         GENERAL DESIGN AND EVAPORATIVE ZONE DATA
         ----------------------------------------

NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
         SOIL DATA BASE USING SOIL TEXTURE #10 WITH A
         GOOD STAND OF GRASS, A SURFACE SLOPE OF  4.%
         AND A SLOPE LENGTH OF  500. FEET.

SCS RUNOFF CURVE NUMBER              =     80.10
```

FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.392	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.164	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.448	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	1150.567	INCHES
TOTAL INITIAL WATER	=	1150.567	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.49	2.20	2.80	3.08	4.59	3.29
	2.94	1.93	2.75	4.15	2.36	2.71
STD. DEVIATIONS	1.02	1.27	1.67	1.89	2.17	2.13
	2.33	1.43	1.52	3.45	1.80	1.93
RUNOFF						
TOTALS	0.231	0.154	0.318	0.189	0.352	0.106
	0.124	0.016	0.022	0.847	0.537	0.879
STD. DEVIATIONS	0.410	0.410	0.709	0.443	0.820	0.204
	0.289	0.039	0.049	1.590	1.034	1.518
EVAPOTRANSPIRATION						
TOTALS	1.673	1.770	2.669	4.424	4.729	3.465
	2.959	1.935	2.408	1.751	1.035	1.400
STD. DEVIATIONS	0.408	0.585	0.943	1.005	1.869	1.948
	1.993	1.548	1.397	0.866	0.367	0.421
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0314	0.0274	0.0306	0.0241	0.0158	0.0134
	0.0135	0.0123	0.0119	0.0195	0.0255	0.0309
STD. DEVIATIONS	0.0126	0.0096	0.0093	0.0081	0.0061	0.0034
	0.0036	0.0024	0.0025	0.0103	0.0141	0.0142
LATERAL DRAINAGE COLLECTED FROM LAYER 9						
TOTALS	0.4155	0.3926	0.4322	0.4162	0.4272	0.4093
	0.4227	0.4198	0.4053	0.4178	0.4069	0.4152
STD. DEVIATIONS	0.1393	0.1516	0.1671	0.1568	0.1674	0.1515
	0.1547	0.1507	0.1497	0.1496	0.1457	0.1477

PERCOLATION/LEAKAGE THROUGH LAYER 11

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	15.3998	14.7275	15.0076	12.1243	7.5029	6.5148
	6.3332	5.7299	5.7205	9.3725	12.8499	15.1297
STD. DEVIATIONS	6.3262	5.3059	4.6271	4.1758	3.0544	1.7389
	1.7835	1.1462	1.2067	5.1851	7.3282	7.1434

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0159	0.0165	0.0165	0.0164	0.0163	0.0161
	0.0161	0.0160	0.0160	0.0159	0.0160	0.0158
STD. DEVIATIONS	0.0053	0.0064	0.0064	0.0062	0.0064	0.0060
	0.0059	0.0057	0.0059	0.0057	0.0057	0.0056

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.26	(6.276)	124371.1	100.00
RUNOFF	3.774	(2.9347)	13698.63	11.014
EVAPOTRANSPIRATION	30.216	(4.2443)	109684.16	88.191
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.25638	(0.06252)	930.642	0.74828
AVERAGE HEAD ON TOP OF LAYER 3	10.534	(2.625)		
LATERAL DRAINAGE COLLECTED FROM LAYER 9	4.98060	(1.80545)	18079.562	14.53679
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00000	(0.00000)	0.009	0.00001

```
 AVERAGE HEAD ON TOP              0.016 (     0.006)
   OF LAYER 10

 CHANGE IN WATER STORAGE         -4.708    (  2.7116)     -17091.29    -13.742

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              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
  ---------------------------------------------------------------------------
                                              (INCHES)      (CU. FT.)
                                             ----------   -------------
     PRECIPITATION                             6.00         21780.000

     RUNOFF                                    3.413        12389.1777

     PERCOLATION/LEAKAGE THROUGH LAYER  4      0.001567         5.68974

     AVERAGE HEAD ON TOP OF LAYER  3          24.000

     DRAINAGE COLLECTED FROM LAYER  9          0.03570        129.58148

     PERCOLATION/LEAKAGE THROUGH LAYER 11      0.000000         0.00002

     AVERAGE HEAD ON TOP OF LAYER 10           0.042

     MAXIMUM HEAD ON TOP OF LAYER 10           0.083

     LOCATION OF MAXIMUM HEAD IN LAYER  9
           (DISTANCE FROM DRAIN)               4.2 FEET

     SNOW WATER                                2.40          8713.1436


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                 0.3980

     MINIMUM VEG. SOIL WATER (VOL/VOL)                 0.1360

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4409	0.2034
2	3.8913	0.3243
3	0.0000	0.0000
4	7.6860	0.4270
5	3.7200	0.3100
6	535.0848	0.3567
7	440.0077	0.3056
8	6.2291	0.2595
9	0.0092	0.0605
10	0.0000	0.0000
11	10.2480	0.4270
SNOW WATER	0.000	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\HELP 307\CAM\I122\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\I122\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\I122\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\I122\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\I122\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\I122\I122.OUT


TIME:  15:34     DATE:   2/17/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-OVERLINER INTERIM 122'

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  11
          THICKNESS                  =     12.00   INCHES
          POROSITY                   =      0.4640 VOL/VOL
          FIELD CAPACITY             =      0.3100 VOL/VOL
          WILTING POINT              =      0.1870 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.3100 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.639999998000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

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                        LAYER  2
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =   1464.00   INCHES
POROSITY                    =      0.6159 VOL/VOL
FIELD CAPACITY              =      0.5118 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER  3
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  4
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.27   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   13.9399996000     CM/SEC
SLOPE                       =      1.00   PERCENT
DRAINAGE LENGTH             =    700.0    FEET


                        LAYER  5
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                   =      0.04   INCHES
POROSITY                    =      0.0000 VOL/VOL
```

```
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD
```

LAYER 6

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

```
THICKNESS                   =      0.25   INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.499999997000E-08 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #11 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 500. FEET.

```
SCS RUNOFF CURVE NUMBER             =     86.70
FRACTION OF AREA ALLOWING RUNOFF    =     90.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =     10.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      3.100  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      4.640  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      1.870  INCHES
INITIAL SNOW WATER                  =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS    =    566.086  INCHES
TOTAL INITIAL WATER                 =    566.086  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM DALLAS TEXAS

```
STATION LATITUDE                    =  32.85 DEGREES
```

MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	63
END OF GROWING SEASON (JULIAN DATE)	=	329
EVAPORATIVE ZONE DEPTH	=	10.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 6 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.19	2.92	2.56	3.32	5.03	3.09
	3.21	2.21	2.74	5.78	3.54	3.38

STD. DEVIATIONS	0.70	1.06	1.38	2.23	3.28	2.03
	2.38	1.68	1.48	3.85	2.95	2.55

RUNOFF

TOTALS	0.000	0.087	0.118	0.252	0.682	0.213
	0.667	0.127	0.112	0.977	0.474	0.134
STD. DEVIATIONS	0.000	0.047	0.181	0.294	1.106	0.200
	0.925	0.132	0.155	1.267	0.697	0.160

EVAPOTRANSPIRATION

TOTALS	1.473	2.016	2.397	2.581	2.527	2.908
	1.612	1.724	2.207	2.428	1.656	1.662
STD. DEVIATIONS	0.351	0.710	0.968	1.152	1.287	1.081
	0.751	1.364	1.288	1.022	0.691	0.646

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS	0.5548	0.5772	0.6321	0.6187	0.6145	0.6250
	0.6468	0.6169	0.6476	0.6139	0.6217	0.6615
STD. DEVIATIONS	0.1393	0.0410	0.0469	0.0636	0.0451	0.0584
	0.0922	0.0697	0.0581	0.0309	0.0733	0.1105

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.0159	0.0181	0.0181	0.0183	0.0176	0.0185
	0.0185	0.0176	0.0191	0.0175	0.0184	0.0189
STD. DEVIATIONS	0.0040	0.0014	0.0013	0.0019	0.0013	0.0017
	0.0026	0.0020	0.0017	0.0009	0.0022	0.0032

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 6 THROUGH 10

	INCHES		CU. FEET	PERCENT
PRECIPITATION	38.98	(7.188)	141490.1	100.00
RUNOFF	3.843	(1.2223)	13950.84	9.860
EVAPOTRANSPIRATION	25.190	(3.1191)	91438.16	64.625
LATERAL DRAINAGE COLLECTED FROM LAYER 4	7.43071	(0.36132)	26973.477	19.06386
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00000	(0.00000)	0.018	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.018	(0.001)		
CHANGE IN WATER STORAGE	2.515	(3.4992)	9127.64	6.451

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PEAK DAILY VALUES FOR YEARS 6 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	4.72	17133.600
RUNOFF	1.917	6957.3447
DRAINAGE COLLECTED FROM LAYER 4	0.04184	151.86119
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00005
AVERAGE HEAD ON TOP OF LAYER 5	0.037	
MAXIMUM HEAD ON TOP OF LAYER 5	0.073	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	9.0 FEET	
SNOW WATER	0.86	3135.2500

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4613
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1870

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	3.7169	0.3097
2	568.2604	0.3882
3	6.4728	0.2697
4	0.0210	0.0772
5	0.0000	0.0000
6	0.1875	0.7500
SNOW WATER	0.000	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP 307\CAM\CLOSD\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP 307\CAM\CLOSD\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP 307\CAM\CLOSD\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP 307\CAM\CLOSD\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP 307\CAM\CLOSD\DATA10.D10
OUTPUT DATA FILE:           C:\HELP 307\CAM\CLOSD\CLOSED.OUT


TIME:  15:34     DATE:   2/17/2016


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     TITLE:  CAMELOT LANDFILL-OVERLINER CLOSED

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
          THICKNESS                  =     12.00   INCHES
          POROSITY                   =      0.3980 VOL/VOL
          FIELD CAPACITY             =      0.2440 VOL/VOL
          WILTING POINT              =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.2440 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

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                        LAYER  2
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                        LAYER  5
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  11
THICKNESS                    =     12.00   INCHES
```

```
POROSITY                    =      0.4640 VOL/VOL
FIELD CAPACITY              =      0.3100 VOL/VOL
WILTING POINT               =      0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.639999998000E-04 CM/SEC


                        LAYER  6
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =   1464.00   INCHES
POROSITY                    =      0.6159 VOL/VOL
FIELD CAPACITY              =      0.5118 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3800 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  8
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.27   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   12.0799999000     CM/SEC
SLOPE                       =      1.00   PERCENT
DRAINAGE LENGTH             =    700.0    FEET


                        LAYER  9
```

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 10

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999997000E-08	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.392	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.164	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.448	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	579.628	INCHES
TOTAL INITIAL WATER	=	579.628	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION						
TOTALS	1.49	2.20	2.80	3.08	4.59	3.29
	2.94	1.93	2.75	4.15	2.36	2.71
STD. DEVIATIONS	1.02	1.27	1.67	1.89	2.17	2.13
	2.33	1.43	1.52	3.45	1.80	1.93
RUNOFF						
TOTALS	0.231	0.154	0.318	0.189	0.352	0.106
	0.124	0.016	0.022	0.847	0.537	0.879
STD. DEVIATIONS	0.410	0.410	0.709	0.443	0.820	0.204
	0.289	0.039	0.049	1.590	1.034	1.518
EVAPOTRANSPIRATION						
TOTALS	1.673	1.770	2.669	4.424	4.729	3.465
	2.959	1.935	2.408	1.751	1.035	1.400
STD. DEVIATIONS	0.408	0.585	0.943	1.005	1.869	1.948
	1.993	1.548	1.397	0.866	0.367	0.421
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0314	0.0274	0.0306	0.0241	0.0158	0.0134
	0.0135	0.0123	0.0119	0.0195	0.0255	0.0309
STD. DEVIATIONS	0.0126	0.0096	0.0093	0.0081	0.0061	0.0034
	0.0036	0.0024	0.0025	0.0103	0.0141	0.0142
LATERAL DRAINAGE COLLECTED FROM LAYER 8						
TOTALS	0.3024	0.2800	0.2990	0.2934	0.2983	0.2860
	0.3082	0.2962	0.2911	0.2957	0.2858	0.2898
STD. DEVIATIONS	0.1091	0.1128	0.1156	0.1179	0.1063	0.1101
	0.1217	0.1057	0.1132	0.1146	0.1065	0.0998
PERCOLATION/LEAKAGE THROUGH LAYER 10						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	15.3998	14.7275	15.0076	12.1243	7.5029	6.5148
	6.3332	5.7299	5.7205	9.3725	12.8499	15.1297
STD. DEVIATIONS	6.3262	5.3059	4.6271	4.1758	3.0544	1.7389
	1.7835	1.1462	1.2067	5.1851	7.3282	7.1434

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0100	0.0101	0.0099	0.0100	0.0098	0.0097
	0.0102	0.0098	0.0099	0.0098	0.0097	0.0096
STD. DEVIATIONS	0.0036	0.0041	0.0038	0.0040	0.0035	0.0038
	0.0040	0.0035	0.0039	0.0038	0.0036	0.0033

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.26	(6.276)	124371.1	100.00
RUNOFF	3.774	(2.9347)	13698.63	11.014
EVAPOTRANSPIRATION	30.216	(4.2443)	109684.16	88.191
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.25638	(0.06252)	930.642	0.74828
AVERAGE HEAD ON TOP OF LAYER 3	10.534	(2.625)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	3.52593	(1.29917)	12799.122	10.29108
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000	(0.00000)	0.018	0.00001
AVERAGE HEAD ON TOP OF LAYER 9	0.010	(0.004)		
CHANGE IN WATER STORAGE	-3.254	(2.4206)	-11810.86	-9.496

****

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*******************************************************************************

              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
  ------------------------------------------------------------------------
                                              (INCHES)      (CU. FT.)
                                             ----------   -------------
     PRECIPITATION                             6.00         21780.000

     RUNOFF                                    3.413        12389.1777

     PERCOLATION/LEAKAGE THROUGH LAYER  4      0.001567         5.68974

     AVERAGE HEAD ON TOP OF LAYER  3          24.000

     DRAINAGE COLLECTED FROM LAYER  8          0.03801        137.98470

     PERCOLATION/LEAKAGE THROUGH LAYER 10      0.000000         0.00005

     AVERAGE HEAD ON TOP OF LAYER  9           0.039

     MAXIMUM HEAD ON TOP OF LAYER  9           0.078

     LOCATION OF MAXIMUM HEAD IN LAYER  8
           (DISTANCE FROM DRAIN)               1.1 FEET

     SNOW WATER                                2.40          8713.1436


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.3980

     MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1360

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4409	0.2034
2	3.8913	0.3243
3	0.0000	0.0000
4	7.6860	0.4270
5	3.7200	0.3100
6	458.0822	0.3129
7	6.0023	0.2501
8	0.0075	0.0278
9	0.0000	0.0000
10	0.1875	0.7500
SNOW WATER	0.000	

****
****

PAGES IIIC-A-228 THROUGH IIIC-A-236 HAVE BEEN REMOVED FROM THE APPLICATION.

APPENDIX IIIC-B

LEACHATE COLLECTION SYSTEM DESIGN CALCULATIONS

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION,
BIDDING, OR PERMIT PURPOSES.

Includes pages IIIC-B-1 through IIIC-B-105

SOLUTION:

Determine the peak daily flow rate estimate:

The following tables summarize the fill conditions that are likely to be present and have the greatest contribution of leachate into the LCS. The peak flow rate (lateral drainage in the LCS layer) is shown for each condition.

Developed Cells :
From the HELP model (Appendix IIIC-A; Developed Subtitle D area (Cells 1 and 2 and Cells 4B and 5)

CONDITION	PEAK cfd/ac	PEAK gpd/ac
Interim, 50' Waste	32.7	245
Interim, 100' Waste	26.7	200
Interim, 150' Waste	15.0	112
Interim, 200' Waste	11.5	86
Interim, ~~282'/298'~~ **244'/248'** Waste	~~9.9~~ **8.7**	~~74~~ **65**

For the developed cells the largest area draining to a leachate collection pipe is 29.5 acres (pipe in Cells 1-4B). For each fill condition, the highest leachate generation rate from the HELP runs for Developed Subtitle D cells (Cells 1 and 2) and (Cells 4B and 5) was used to be conservative. Also, even though there are four leachate pipes located in this area, the calculations were conservatively performed assuming that the entire drainage area will contribute flow to one pipe.

Therefore, the maximum leachate production expected in the leachate collection pipe is predicted to occur assuming the following scenario:

1. Interim condition, 50' waste over 5.50 ac
2. Interim condition, 100' waste over 6.40 ac
3. Interim condition, 150' waste over 8.50 ac
4. Interim condition, 200' waste over 5.50 ac
5. Interim condition, ~~282'/298'~~ **244'/248'** waste over 3.60 ac

CONDITION	AREA ac	PEAK gpd/ac	PEAK gpd	PEAK cfs
Interim, 50' Waste	5.50	245	1,345	0.0021
Interim, 100' Waste	6.40	200	1,278	0.0020
Interim, 150' Waste	8.50	112	954	0.0015
Interim, 200' Waste	5.50	86	473	0.0007
Interim, ~~282'/298'~~ **244'/248'** Waste	3.60	~~74~~ **65**	~~267~~ **234**	~~0.0004~~ **0.0004**
Total=	29.50		~~4,317~~ **4,284.5**	~~0.0067~~ **0.0066**

Undeveloped Cells :

From the HELP model (Appendix IIIC-A; Undeveloped area (Cells 6, 6A, 7, 7A, 10-13), Developed Subtitle D area (Cell 5), and Overliner area (a portion of Cell O1))

CONDITION	PEAK[1] cfd/ac	PEAK gpd/ac
Active, 10' Waste	50.0	374
Interim, 50' Waste	73.8	552
Interim, 100' Waste	164.3	1,229
Interim, 200' Waste	115.6	865
Interim, ~~287'~~ **245'** Waste	~~171.2~~ **151.9**	~~1,281~~ **1,136**

[1]This leachate value is the sum of the leachate recirculated and the leachate collected for each condition, if applicable.

For the undeveloped cells, the largest area draining to a leachate collection pipe is 43.9 acres (pipe in Cells 10 and 11). The leachate from Cell 5 and portion of Cell O1 will also drain to the pipe in Cells 10 and 11 and hence these areas were also considered. For each fill condition, the highest leachate generation rate from the HELP runs for Developed Subtitle D area for Cells 4B and 5, the Overliner area and the Undeveloped area was used to be conservative. Also, even though there are two leachate pipes located in this area, the calculations were conservatively performed assuming that the entire drainage will contribute flow to one pipe.

Therefore, the maximum leachate production expected in the leachate collection pipe is predicted to occur assuming the following scenario:

1. Active condition, 10' waste over 8.10 ac
2. Interim condition, 50' waste over 11.50 ac
3. Interim condition, 100' waste over 13.90 ac
4. Interim condition, 200' waste over 6.90 ac
5. Interim condition, ~~287'~~ **245'** waste over 3.50 ac

CONDITION	AREA ac	PEAK gpd/ac	PEAK gpd	PEAK cfs
Active, 10' Waste	8.10	374	3,029	0.0047
Interim, 50' Waste	11.50	552	6,348	0.0098
Interim, 100' Waste	13.90	1,229	17,083	0.0264
Interim, 200' Waste	6.90	865	5,966	0.0092
Interim, ~~287'~~ **245'** Waste	3.50	~~1,281~~ **1,136**	~~4,482~~ **3,977**	~~0.0069~~ **0.0062**
Total=	43.90		~~36,909~~ **36,403**	~~0.0571~~ **0.0563**

SUMMARY OF LEACHATE PRODUCTION:

Developed Cells Peak Leachate

Production (cfs) ~~0.0067~~ **0.0066**

Undeveloped Cells Peak Leachate

Production (cfs) ~~0.0571~~ **0.0563**

Developed Cells peak leachate production was used for the pipe capacity calculation for a 6" SDR 11 pipe.
Undeveloped Cells peak leachate production rate was used for the pipe capacity calculation for a 6" SDR 17 pipe.

Determination of flow capacity (Q_{full}) for proposed 6-inch SDR 17 perforated pipe:

Standard Dimension Ratio (SDR) = 17.0

ID = 5.845 in
= 0.487 ft

A = 0.186 sq ft

R = 0.122 ft

S = Design slope of pipe — S = 0.0030 ft / ft

n = Manning's number — n = 0.015

Q_{full} = 0.248 cfs

Compare Peak Q_{max} and Q_{full} for the 6" SDR 11 pipe:

Q_{full} =	0.203	cfs	>>	Q_{max} =	~~0.0067~~ **0.0066**	cfs

Compare Peak Q_{max} and Q_{full} for the 6" SDR 17 pipe:

Q_{full} =	0.248	cfs	>>	Q_{max} =	~~0.0571~~ **0.0563**	cfs

Conclusion:

The existing 6-inch SDR 11 pipes will continue to exceed flow capacity requirements. An SDR 17 pipe with a nominal diameter of 6 inches exceeds flow capacity requirements for the undeveloped cells.

SOLUTION:

A. Average flow rate into sump

A.1 Determine the per acre flow rate for specific leachate collection sumps.

The following tables summarize the fill conditions that are likely to be present within each cell and have the greatest contribution of leachate into the LCS and sump system. The average flow rates (lateral drainage in the LCS layer) are shown for each condition.

Leachate sump drainage areas are shown on Sheet IIIC-B-41 Sump Drainage Areas.

Developed Cells:
From the HELP model (Appendix IIIC-A; Developed Subtitle D area (Cells 1, 2, 3, 4A, 4B, 5, 8, & 9A))

For the Developed Cells, the largest area draining to the sump is 48.5 acres (sump located in Cell 1). For each fill condition, the highest leachate generation rate from the HELP runs for Developed Subtitle D cells (Cells 1 and 2 and Cells 4B and 5) was used to be conservative.

CONDITION	Average cfy/ac	Average gpd/ac
Interim, 50' Waste	1,601.6	32.8
Interim, 100' Waste	3,862.2	79.1
Interim, 150' Waste	2,651.2	54.3
Interim, 200' Waste	2,484.3	50.9
Interim, ~~282'/298'~~ **244'/248'** Waste	~~1,935.7~~ **1,699.4**	~~39.7~~ **34.8**
Closed, ~~282'/298'~~ **244'/248'** Waste	~~2,035.8~~ **1,837.9**	~~41.7~~ **37.7**

Undeveloped Cells:
From the HELP model (Appendix IIIC-A; Undeveloped area (Cells 6, 6A, 7, 7A, 10-13), Developed Subtitle D area (Cell 5), and Overliner area (a portion of Cell O1))

For the undeveloped cells, the largest area draining to a sump is 43.9 acres (sump located in Cell 10). The leachate from Cell 5 and portion of O1 will also drain to the sump in Cell 10 and hence these areas were also considered. For each fill condition, the highest leachate generation rate from the HELP runs for the Developed Subtitle D area (Cells 4B and 5), the Overliner area, and the Undeveloped area was used to be conservative.

CONDITION	Average[1] cfy/ac	Average gpd/ac
Active, 10' Waste	3,503.0	71.8
Interim, 50' Waste	5,066.3	103.8
Interim, 100' Waste	26,380.9	540.6
Interim, 200' Waste	23,199.6	475.4
Interim, ~~287'~~ **245'** Waste	~~37,815.0~~ **30,597.1**	~~774.9~~ **627.0**
Closed, ~~287'~~ **245'** Waste	~~21,609.7~~ **18,079.6**	~~442.9~~ **370.5**

[1]This leachate value is the sum of the leachate recirculated and the leachate collected for each condition, if applicable.

1. Sump for Developed Cells

48.5 acres

Condition	Rate (gpd/ac)	Active area (ac)	Active rate (gpd)	Inactive area (ac)	Inactive rate (gpd)	Closed area (ac)	Closed rate (gpd)
Interim, 50' Waste	32.8	4.9	159.2	0.0	0.0	0.0	0.0
Interim, 100' Waste	79.1	6.1	479.8	0.0	0.0	0.0	0.0
Interim, 150' Waste	54.3	8.5	461.1	0.0	0.0	0.0	0.0
Interim, 200' Waste	50.9	9.7	493.8	0.0	0.0	0.0	0.0
Interim, ~~282'/298'~~ **244'/248'** Waste	~~39.7~~ **34.8**	14.6	~~577.2~~ **506.7**	48.5	~~1,923.9~~ **1,689.1**	0.0	0.0
Closed, ~~282'/298'~~ ~~244'/248'~~ Waste	~~41.7~~ **37.7**	4.9	~~202.3~~ **182.7**	0.0	0.0	48.5	~~2,023.4~~ **1,826.7**
Total		48.5	~~2,373.5~~ **2,283.4**	48.5	~~1,923.9~~ **1,689.1**	48.5	~~2,023.4~~ **1,826.7**

2. Sump for Undeveloped Cells

43.9 acres

Condition	Rate (gpd/ac)	Active area (ac)	Active rate (gpd)	Inactive area (ac)	Inactive rate (gpd)	Closed area (ac)	Closed rate (gpd)
Active, 10' Waste	71.8	4.4	315.1	0.0	0.0	0.0	0.0
Interim, 50' Waste	103.8	5.5	569.7	0.0	0.0	0.0	0.0
Interim, 100' Waste	540.6	7.7	4,153.4	0.0	0.0	0.0	0.0
Interim, 200' Waste	475.4	8.8	4,174.3	0.0	0.0	0.0	0.0
Interim, ~~287'~~ **245'** Waste	~~774.9~~ **627.0**	13.2	~~10,206.1~~ **8,258.0**	43.9	~~34,020.2~~ **27,526.7**	0.0	0.0
Closed, ~~287'~~ **245'** Waste	~~442.9~~ **370.5**	4.4	~~1,944.1~~ **1,626.5**	0.0	0.0	43.9	~~19,441.2~~ **16,265.3**
Total		43.9	~~21,362.7~~ **19,097.1**	43.9	~~34,020.2~~ **27,526.7**	43.9	~~19,441.2~~ **16,265.3**

B. Required storage capacity of sump

Assumed porosity of drainage stone: P = 0.35

$V_{Daily\ Inflow} = V_C / P$

1. Active

	V_C (gpd)	V_C (cu ft/day)	$V_{Daily\ Inflow}$ (cu ft/day)
Developed Cells	~~2,373.5~~ **2,283.4**	~~317.3~~ **305.3**	~~906.6~~ **872.2**
Undeveloped Cells	~~21,362.7~~ **19,097.1**	~~2,856.0~~ **2,553.1**	~~8,159.9~~ **7,294.5**

2. Inactive with Intermediate Cover

	V_C (gpd)	V_C (cu ft/day)	$V_{Daily\ Inflow}$ (cu ft/day)
Developed Cells	~~1,923.9~~ **1,689.1**	~~257.2~~ **225.8**	~~734.9~~ **645.2**
Undeveloped Cells	~~34,020.2~~ **27,526.7**	~~4,548.2~~ **3,680.0**	~~12,994.7~~ **10,514.4**

3. Closed

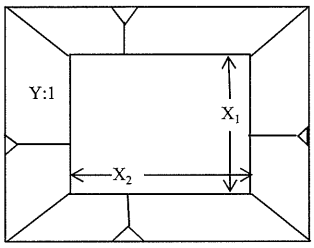
	V_C (gpd)	V_C (cu ft/day)	$V_{Daily\ Inflow}$ (cu ft/day)
Developed Cells	~~2,023.4~~ **1,826.7**	~~270.5~~ **244.2**	~~772.9~~ **697.8**
Undeveloped Cells	~~19,441.2~~ **16,265.3**	~~2,599.1~~ **2,174.5**	~~7,426.0~~ **6,212.9**

Total sump volume:

$$V_{TOT} = 1/3\left(A_1 + A_2 + \sqrt{(A_1 \cdot A_2)}\right)h$$

(Ref. 4, page 17)

Where:
A_1 = Area of bottom of sump
A_2 = Area of top of sump
h = Depth of sump



Y = Slope of sump side walls

$A_1 = X_1 * X_2$
$A_2 = (X_1 + 2(h*Y))*(X_2 + 2(h*Y))$

	X_1 (ft)	X_2 (ft)	Y (ft)	h (ft)	A_1 (ft^2)	A_2 (ft^2)	V_{TOT} (ft^3)
Developed Cells[1]	50	50	3	3.0	2,500	4,624	10,524
Undeveloped Cells	15	15	3	3.0	225	1,089	1,809

[1]Sump size for the sump in Cell 1 is assumed.

Compute the number of days storage provided for the following:

$$\text{STORAGE (Detention Time)} = \frac{V_{TOT}}{V_{\text{Daily Inflow}}}$$

1. Active

	$V_{\text{Daily Inflow}}$(cu ft/day)	V_{TOT} (cu ft)	Storage (days)
Developed Cells	~~907~~ **872**	10,524	~~11.61~~ **12.07**
Undeveloped Cells	~~8,160~~ **7,295**	1,809	~~0.22~~ **0.25**

2. Inactive with Intermediate Cover

	$V_{\text{Daily Inflow}}$(cu ft/day)	V_{TOT} (cu ft)	Storage (days)
Developed Cells	~~735~~ **645**	10,524	~~14.32~~ **16.31**
Undeveloped Cells	~~12,995~~ **10,514**	1,809	~~0.14~~ **0.17**

3. Closed

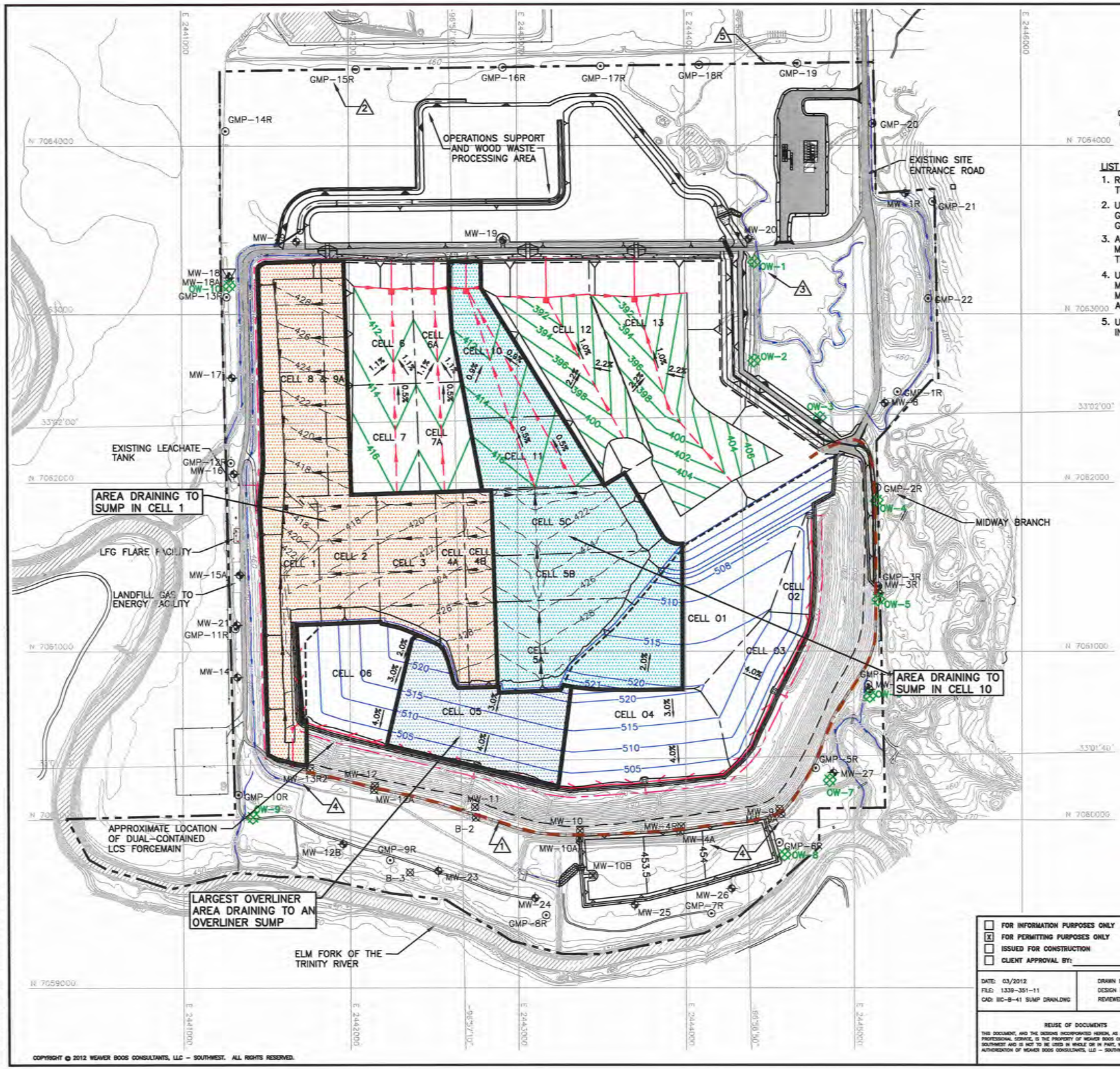
	$V_{\text{Daily Inflow}}$(cu ft/day)	V_{TOT} (cu ft)	Storage (days)
Developed Cells	~~773~~ **698**	10,524	~~13.62~~ **15.08**
Undeveloped Cells	~~7,426~~ **6,213**	1,809	~~0.24~~ **0.29**

C. Estimated rate of leachate removal.
Using condition with highest inflow rate above.

Submersible pump capacity = 25 gpm

	Production (gpd)	Average Pump Time (min/day)	(hr/day)
Developed Cells	~~2,373.5~~ **2,283.4**	~~94.9~~ **91.3**	~~1.6~~ **1.5**
Undeveloped Cells	~~34,020.2~~ **27,526.7**	~~1360.8~~ **1101.1**	~~22.7~~ **18.4**

Average pump time is less than 24 hours per day, therefore the design is acceptable. A pump with less capacity may also be used if it can be determined that the actual leachate generation is less than the design flow. Prior authorization from TCEQ will be obtained with a permit modification.



LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- 2 — MW-8 — GROUNDWATER MONITORING WELL
- 4 — GMP-1 — GAS MONITORING PROBE
- 3 — MW-12 — OBSERVATION/MONITORING WELL
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- DRAINAGE AREA BOUNDARY
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

SUMP DRAINAGE AREAS

CELLS	AREA (ACRES)
CELL 1	48.5
CELL 10	43.9
CELL 05	12.6

DRAFT

- ☐ FOR INFORMATION PURPOSES ONLY
- ☒ FOR PERMITTING PURPOSES ONLY
- ☐ ISSUED FOR CONSTRUCTION
- ☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIC-B-41 SUMP DRAINLDWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SUMP DRAINAGE AREAS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIC-B-41

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G:\1339\351\EXPANSION 2009\PART III-SDP\IIIC\IIIC-B-41 SUMP DRAINAGE AREAS.dwg, afor4, 1:2

SOLUTION:

Determine the peak daily flow rate estimate:

The following table summarizes the fill conditions that are likely to be present and have the greatest contribution of leachate into the overliner leachate drainage collection system.

From the HELP model (Appendix IIIC-A; Overliner) :

CONDITION	PEAK cfd/ac	PEAK gpd/ac
Active, 10' Waste	50.0	374.0
Interim, 50' Waste	72.8	544.5
Interim, 100' Waste	151.8	1,135.5
~~Interim, 150' Waste~~	~~89.9~~	~~672.5~~
Interim, ~~188'~~ **122'** Waste	~~104.2~~ **151.9**	~~779.4~~ **1,136.2**

The largest pre-Subtitle D overliner drainage area is 12.60 acres located in Cell O5. Even though there are two leachate pipes located in this cell, to be conservative the calculations were performed assuming that the entire drainage will contribute flow to one pipe.

Therefore, the maximum leachate production expected in the leachate collection pipe for the pre-Subtitle D overliner area is predicted to occur assuming the following scenario:

1. Active, 10' Waste 1.50 ac
2. Interim, 50' Waste ~~2.18~~ **3.2** ac
3. Interim, 100' Waste ~~3.40~~ **4.8** ac
4. ~~Interim, 150' Waste~~ ~~2.62~~ ~~ac~~
~~5~~ **4.** Interim, ~~188'~~ **122'** Waste ~~1.50~~ **2.6** ac

CONDITION	AREA ac	PEAK gpd/ac	PEAK gpd	PEAK cfs
Active, 10' Waste	1.5	374.0	561.0	0.0009
Interim, 50' Waste	3.2	544.5	1,742.5	0.0027
Interim, 100' Waste	~~4.2~~ **4.8**	1,135.5	~~4,768.9~~ **5,450.2**	~~0.0074~~ **0.0084**
~~Interim, 150' Waste~~	~~2.4~~	~~672.5~~	~~1,613.9~~	~~0.0025~~
Interim, ~~188'~~ **122'** Waste	~~1.3~~ **2.6**	~~779.4~~ **1,136.2**	~~1,013.2~~ **2,954.2**	~~0.0016~~ **0.0046**
Total=	12.6		~~9,699.6~~ **10,707.9**	~~0.0150~~ **0.0166**

The total pre-Subtitle D overliner peak leachate production (cfs)= ~~0.0150~~ **0.0166**

Determination of flow capacity (Q_{full}) for a 6-inch perforated pipe:

$$Q_{full} = \frac{1.486}{n} AR^{2/3}S^{1/2}$$

Where: A = Cross-sectional area of pipe, with d representing the inside diameter in feet
R = Hydraulic radius of pipe in feet under full flow conditions

From Pipe Structural Stability Calculations:

Standard Dimension Ratio (SDR) = 17

ID = 5.845 in
= 0.487 ft

$$A = \frac{\Pi \times d^2}{4}$$ A = 0.186 sq ft

$$R = \frac{d}{4}$$ R = 0.122 ft

S = Design slope of pipe S[1] = 0.005 ft / ft

[1]The 0.5 percent slope was chosen as the minimum slope for the overliner leachate collection pipes. The leachate collection pipes will be placed at a slope that ensures a minimum 0.5 percent slope after settlement. Refer to Appendix IIIE-B.

n = Manning's number n = 0.015

Q_{full} = 0.321 cfs

Compare Peak Q_{max} and Q_{full}:

Q_{full} =	0.321	cfs	>>	Q_{max} =	~~0.0150~~ **0.0166**	cfs

Conclusion:

An SDR 17 pipe with an outer diameter of 6 inches exceeds flow capacity requirements. A perforated SDR 17 HDPE pipe will be used in the leachate collection trenches.

SOLUTION:

A. Average flow rate into sump

A.1 Determine the per acre flow rate for specific leachate collection sumps.

The following tables summarize the fill conditions that are likely to be present within the pre-Subtitle D overliner area and have the greatest contribution of leachate into the LCS and sump system. The average flow rates (lateral drainage in the LCS layer) are shown:

From the HELP model (Appendix IIIC-A; pre-Subtitle D Overliner) for overliner:

CONDITION	AVERAGE cfy/ac	AVERAGE gpd/ac
Active, 10' Waste	3,503	72
Interim, 50' Waste	4,962	102
Interim, 100' Waste	25,113	515
~~Interim, 150' Waste~~	~~19,406~~	~~398~~
Interim, ~~188'~~ **122'** Waste	~~23,104~~ **26,974**	~~473~~ **553**
Closed, ~~188'~~ **122'** Waste	~~14,208~~ **12,799**	~~291~~ **262**

The area draining to the sump located in Cell O5 is 12.6 acres.

A.2 Determine the flow rate for the leachate collection sump.

1. Sump for pre-Subtitle D Overliner Area : 12.60 acres

Condition	Rate (gpd/ac)	Active		Inactive		Closed	
		area (ac)	rate (gpd)	area (ac)	rate(gpd)	area (ac)	rate(gpd)
Active, 10' Waste	72	0.9	65	0.0	0.00	0.0	0.00
Interim, 50' Waste	102	~~1.3~~ **2.2**	~~132~~ **224**	0.0	0.00	0.0	0.00
Interim, 100' Waste	515	~~3.2~~ **3.8**	~~1,637~~ **1,956**	0.0	0.00	0.0	0.00
~~Interim, 150' Waste~~	~~398~~	~~3.6~~	~~1,448~~	~~0.0~~	~~0.00~~	~~0.0~~	~~0.00~~
Interim, ~~188'~~ **122'** Waste	~~473~~ **553**	~~2.0~~ **3.6**	~~947~~ **1,990**	12.6	~~5,966~~ **6,965**	0.0	0.00
Interim, ~~188'~~ **122'** Waste	~~291~~ **262**	~~1.6~~ **2.1**	~~460~~ **551**	0.0	0.00	12.6	~~3,669~~ **3,305**
Total Area Draining to Cell O5 Sump		12.6	~~4,688~~ **4,785**	12.6	~~5,966~~ **6,965**	12.6	~~3,669~~ **3,305**

The total active case flow rate from pre-Subtitle D overliner drainage area is ~~4,688~~ **4,785** gpd.
The total inactive case flow rate from pre-Subtitle D overliner drainage area is ~~5,966~~ **6,965** gpd.
The total closed case flow rate from pre-Subtitle D overliner drainage area is ~~3,669~~ **3,305** gpd.

B. Required storage capacity of sump

Assumed porosity of drainage stone: P = 0.35

$V_{daily\ Inflow} = V_C / P$

1. Active

Sump Location	V_C (gpd)	V_C (cu ft/day)	$V_{Daily\ Inflow}$ (cu ft/day)
Cell O5	~~4,688~~ **4,785**	~~627~~ **640**	~~1,791~~ **1,828**

2. Inactive with Intermediate Cover

Sump Location	V_C (gpd)	V_C (cu ft/day)	$V_{Daily\ Inflow}$ (cu ft/day)
Cell O5	~~5,966~~ **6,965**	~~798~~ **931**	~~2,279~~ **2,660**

3. Closed

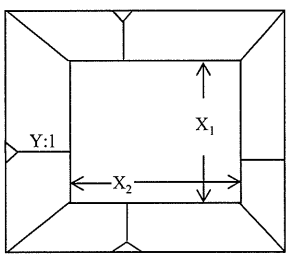
Sump Location	V_C (gpd)	V_C (cu ft/day)	$V_{Daily\ Inflow}$ (cu ft/day)
Cell O5	~~3,669~~ **3,305**	~~490~~ **442**	~~1,401~~ **1,262**

Total sump volume:

$$V_{TOT} = 1/3\left(A_1 + A_2 + \sqrt{(A_1 \cdot A_2)}\right)h$$

(Ref. 4, page 17)

Where:
A_1 = Area of bottom of sump
A_2 = Area of top of sump
h = Depth of sump



Y = Slope of sump side walls

$A_1 = X_1 * X_2$
$A_2 = (X_1 + 2(h*Y))*(X_2 + 2(h*Y))$

Sump Location	X_1 (ft)	X_2 (ft)	Y (ft)	h (ft)	A_1 (ft^2)	A_2 (ft^2)	V_{TOT} (ft^3)
Cell O5	15	15	3	3.00	225	1,089	1,809

Compute the number of days storage provided for the following:

$$\text{STORAGE (Detention Time)} = \frac{V_{TOT}}{V_{\text{Daily Inflow}}}$$

1. Active

Sump Location	$V_{\text{Daily Inflow}}$ (cu ft/day)	V_{TOT} (cu ft)	Storage (days)
Cell O5	~~1,791~~ **1,828**	1,809	~~1.01~~ **0.99**

2. Inactive with Intermediate Cover

Sump Location	$V_{\text{Daily Inflow}}$ (cu ft/day)	V_{TOT} (cu ft)	Storage (days)
Cell O5	~~2,279~~ **2,660**	1,809	~~0.79~~ **0.68**

3. Closed

Sump Location	$V_{\text{Daily Inflow}}$ (cu ft/day)	V_{TOT} (cu ft)	Storage (days)
Cell O5	~~1,401~~ **1,262**	1,809	~~1.29~~ **1.43**

C. Estimated rate of leachate removal (for active use)

Submersible pump capacity = 15 gpm

Sump Location	Production (gpd)	Average Pump Time (min/day)	(hr/day)
Cell O5	~~4,688~~ **4,785**	~~312.5~~ **319.0**	~~5.2~~ **5.3**

Example Calculation:

Leachate production rate = ~~4,688~~ **4,785** gpd
Pump capacity = 15.0 gpm
Average Pump Time = Leachate production rate / Pump capacity
= ~~4,688~~ **4,785** gpd / 15 gpm
= ~~312.5~~ **319.0** min/day
= ~~5.2~~ **5.3** hr/day

Average pump time is less than 24 hours per day, therefore the design is acceptable.

Solution:

1. Determine the maximum leachate inflow rate into the chimney drain.

A comparison of the developed Subtitle D area, undeveloped area, and overliner area was developed to determine the worst case scenario (i.e., which scenario generates the maximum leachate inflow rate).

Cells	Peak Daily Generation Rate, q		Maximum Drainage Length, L[1]	Inflow Rate, Q_{req}
	(cf/ac/day)	(cfs/sf)	(ft)	(cfs)
Developed Subtitle D Area (Cells 1 and 2)[2]	32.7	8.69E-09	440	3.82E-06
Developed Subtitle D Area (Cells 4B and 5)	25.8	6.86E-09	1710	1.17E-05
Undeveloped Area (Cells 6, 6A, 7, 7A, and 10-13)	~~170.5~~ **130.9**	~~4.53E-08~~ **3.48E-08**	700	~~3.17E-05~~ **2.43E-05**

[1] The maximum drainage length as shown takes in to account both sides draining to the chimney drain.

[2] Tire chip area (Cells 3, 4A, 8, and 9A) is included in the analysis for the Developed Subtitle D Area (Cells 1 and 2).

Note: The peak daily generation rate is from HELP model analyses in Appendix IIIC, Appendix IIIC-A.

Maximum leachate inflow rate to the chimney drain per unit length (1 ft) is calculated using the following equation:

$$Q_{req} = L * 1 * q$$

where:

Q_{req} = Maximum leachate inflow rate into chimney drain, cfs
L = Maximum length draining to chimney drain from both sides
q = Peak daily leachate generation rate from HELP model listed above, cfs/sf

Maximum Leachate Generation Rate from above table:

Q_{req} = ~~3.17E-05~~ **3.99E-05** cfs

2. Determine the minimum drainage capacity of the chimney drain.

Minimum drainage capacity of the chimney drain per unit length (1 ft):

$$Q_{ult} = k * i * w * 1$$

where:

Q_{ult} = Ultimate flow rate
k = Minimum permeability of the geotextile wrap
i = Hydraulic gradient = 1 under free drainage
w = Width of the chimney drain keyed into the waste layer, measured at the top of protective layer, min. 4 ft, as shown in Appendix IIIA-A, Drawing A.4.

k =	0.2	cm/s	=	6.56E-03 fps	(Ref. 1)
i =	1				
w =	4	ft			

Q_{ult} = 2.62E-02 cfs

To determine the allowable drainage capacity of the geotextile, the following reduction factors are used:

Table 1 - Reduction Factors[1]

RF_{SCB} = Reduction factor for soil clogging and blinding	2.0
RF_{CR} = Reduction factor for creep reduction of void space	2.0
RF_{IN} = Reduction factor for adjacent materials intruding into void spaces	1.2
RF_{CC} = Reduction factor for chemical clogging	1.5
RF_{BC} = Reduction factor for biological clogging	2.0
Overall Reduction Factor (ORF) =	14.4

[1] Reduction factors obtained from Ref. 2.

$$Q_{allow} = Q_{ult} / ORF$$

where:

Q_{allow} = Allowable flow rate
Q_{ult} = Ultimate flow rate
ORF = Overall reduction factor from Table 1

Q_{allow} = 1.82E-03 cfs

3. Compare the allowable flow rate to the required flow rate.

Q_{allow} = 1.82E-03 cfs > Q_{req} = ~~3.17E-05~~ **3.99E-05** cfs

The predicted flow does not exceed the capacity of the chimney drain geotextile. The proposed chimney drain design is adequate to convey the generated leachate to the leachate collection pipe.

Solution:

1. Determine the maximum leachate inflow rate into the chimney drain.

Note: The maximum leachate impingement rate is from HELP model analyses in Appendix IIIC, Appendix IIIC-A.

Overliner

Peak daily leachate generation rate, q =	~~151.5~~	**151.9**	cf/acre/day
=	~~4.03E-08~~	4.04E-08	cfs/sf

Maximum leachate inflow rate to the chimney drain per unit length (1 ft):

$$Q_{req} = L * 1 * q$$

where:

Q_{req} = Maximum leachate inflow rate into chimney drain, cfs
L = Maximum length draining to chimney drain
= 700 ft
q = Peak daily leachate generation rate from HELP model listed above, cfs/sf

Q_{req} = ~~2.82E-05~~ **2.83E-05** cfs

2. Determine the minimum drainage capacity of the chimney drain.

Minimum drainage capacity of the chimney drain per unit length (1 ft):

$$Q_{ult} = k * i * w * 1$$

where:

Q_{ult} = Ultimate flow rate
k = Minimum permeability of the geotextile wrap
i = Hydraulic gradient = 1 under free drainage
w = Width of the chimney drain keyed into the waste layer, measured at the top of protective layer, min. 4 ft, as shown in Appendix IIIA-A, Drawing A.9.

k =	0.2	cm/s	=	6.56E-03	fps	(Ref. 1)
i =	1					
w =	4	ft				

Q_{ult} = 2.62E-02 cfs

To determine the allowable drainage capacity of the geotextile, the following reduction factors are used:

Table 1 - Reduction Factors[1]

RF_{SCB} = Reduction factor for soil clogging and blinding	2.0
RF_{CR} = Reduction factor for creep reduction of void space	2.0
RF_{IN} = Reduction factor for adjacent materials intruding into void spaces	1.2
RF_{CC} = Reduction factor for chemical clogging	1.5
RF_{BC} = Reduction factor for biological clogging	2.0
Overall Reduction Factor (ORF) =	14.4

[1] Reduction factors obtained from Ref. 2.

$$Q_{allow} = Q_{ult} / ORF$$

where:

Q_{allow} = Allowable flow rate
Q_{ult} = Ultimate flow rate
ORF = Overall reduction factor from Table 1

Q_{allow} = 1.82E-03 cfs

3. Compare the allowable flow rate to the required flow rate.

Overliner

Q_{allow} = 1.82E-03 cfs >> Q_{req} = ~~2.82E-05~~ **2.83E-05** cfs

The proposed chimney drain design is adequate to convey the generated leachate to the leachate collection pipe.

Solution:

1.a. Determine the flow into the double-sided drainage geocomposite:

Note: The maximum flow into the double-sided geocomposite used on the 3H:1V area has been obtained from the peak leachate generation rate from the HELP Model analysis for the Undeveloped area since the flow rate is higher compared to that of the HELP Model analysis for the Overliner area in Appendix IIIC-A. The actual waste column thickness above the 3H:1V sideslope is 240ft. The flow rate was obtained from Closed 287ft run for the Undeveloped area.

Undeveloped area (Cells 6, 6A, 7, 7A, 10-13)

Flow into double-sided geocomposite, q = ~~170.5~~ **129.6** cf/ac/day, generated by HELP Model

Flow into unit area of geocomposite, $q_s = q / (43560 * 24 * 60 * 60)$

$q_s =$ ~~4.53E-08~~ **3.44E-08** cfs/sf

Longest 3H:1V sideslope, L_S= 830 ft (this drainage length includes Cell O1 that will drain into the 3H:1V sideslope of Cell 13)

Unit flow, $q_L = q_s * L_S$

$q_L =$ ~~3.76E-05~~ **2.86E-05** cf/ft-s (or sf/s)

Notes:
1. The value q_L is used to develop the minimum required transmissivity of the double-sided geocomposite.

1.b. Determine the required transmissivity (T_r) of the double-sided geocomposite:

Undeveloped area (Cells 6, 6A, 7, 7A, 10-13)

$T_r = q_L / (\sin \beta)$

$\beta =$ 18.4 ° (3H:1V placement slope for double-sided geocomposite)
$\sin \beta =$ 0.32

$T_r =$ ~~1.19E-04~~ **9.05E-05** sf/s
$T_r =$ ~~1.11E-05~~ **8.41E-06** m^2/s

2. Determine the transmissivity of the double-sided drainage geocomposite:

The transmissivity of geocomposite is first determined by laboratory testing. This transmissivity is reduced as detailed in step 2.b to determine the design transmissivity (T_D) value. T_D value is then compared to T_r value.

3. Required (T_r) versus reduced laboratory (T_{LbR}) transmissivity comparison:

Undeveloped area (Cells 6, 6A, 7, 7A, 10-13)

T_r =	~~1.11E-05~~	**8.41E-06**	m^2/s	This value was determined in Step 1.b.
T_{LbR}=	1.52E-05 m^2/s			This value was determined in Step 2.c.

Ratio of T_{LbR} to T_r should be higher than 1 in order for the specified geocomposite to be acceptable.

T_{LbR} / T_r= ~~1.37~~ **1.80**

4. Determine the head on the liner:

The head on liner is determined using the following formula:

$$T_{max} = \frac{\sqrt{(\tan^2\beta + \frac{4q_h}{k_1})} - \tan\beta}{2\cos\beta} * L$$ (Ref. 5)

where,
T_{max}= maximum head on liner, ft
β= slope, deg
q_h= inflow rate, in/s
k_1= hydraulic conductivity of geocomposite, in/s
L= slope length, ft

β=	18.4 °
$\tan\beta$=	0.33
$\tan^2\beta$=	0.11
$\cos\beta$=	0.95

k_1 is hydraulic conductivity and is calculated using the following equation:

k_1 = T_{LbR} / t

Undeveloped area (Cells 6, 6A, 7, 7A, 10-13)

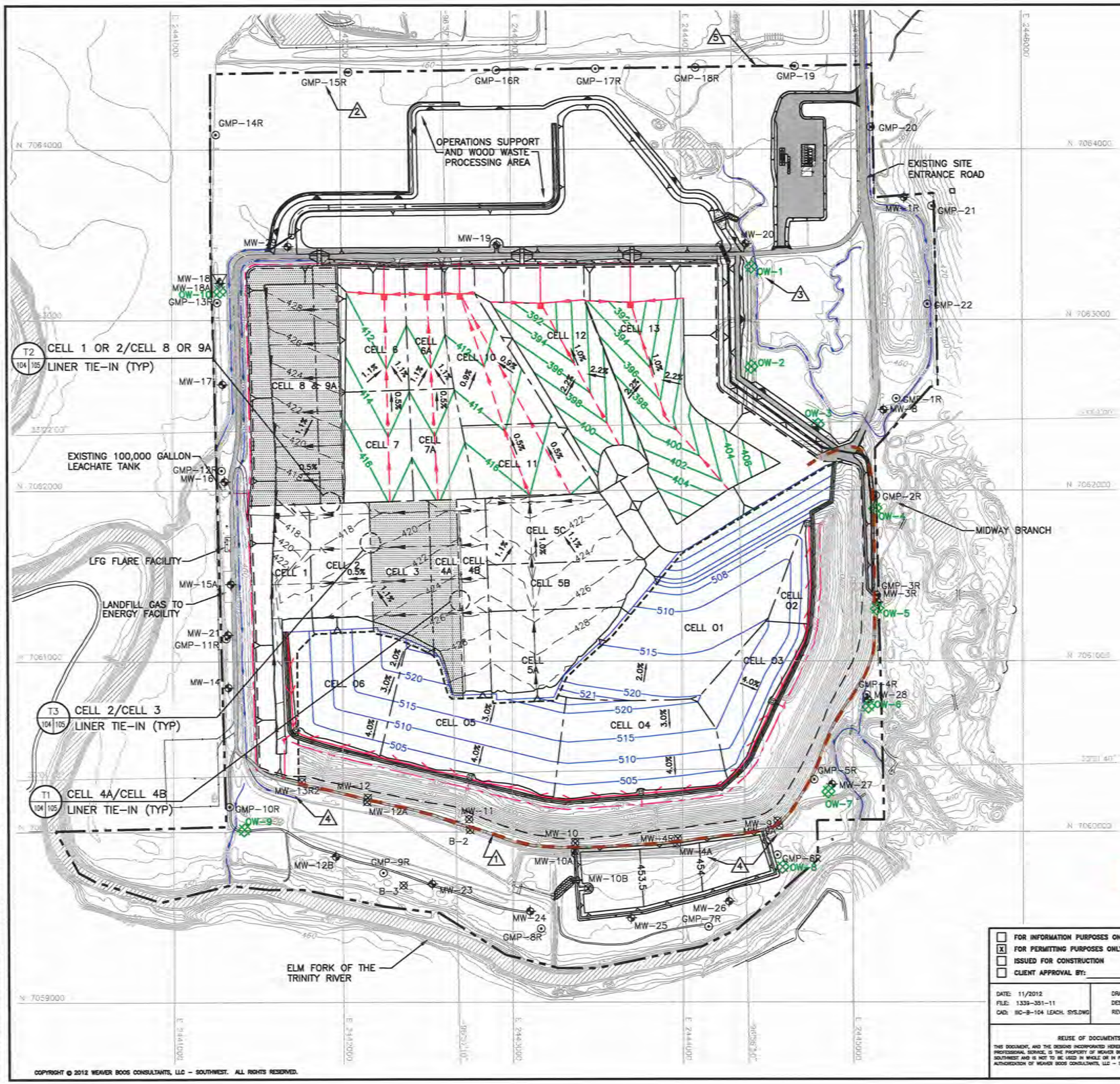
k_1 =	0.004	m/s	
=	0.16	in/s	
q_h=	~~4.53E-08~~	**3.44E-08**	fps
=	~~5.44E-07~~	**4.13E-07**	in/s
L=	830	ft	
T_{max}=	~~0.0087~~	**0.0066**	ft
=	~~0.104~~	**0.079**	in

T_{max} is less than the compressed thickness of the geocomposite listed in Table 1.1.

5. Conclusion:

The transmissivity of the specified doubled-sided drainage geocomposite is higher than the transmissivity that is required based on the lines and grades established for the leachate collection system. Therefore, the specified double-sided drainage geocomposite is acceptable for the design.

For the undeveloped Subtitle D liner areas using a 250-mil thick geocomposite, the transmissivity of the double-sided geocomposite shall be measured at a minimum gradient of 0.33 under a minimum normal pressure of 1,000, 10,000, and 18,748 psf (or higher), boundary conditions consisting of soil/ geocomposite/geomembrane with a minimum seating time of 100 hours. The minimum transmissivity shall be $6.24 \times 10^{-5} m^2/s$.



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 8)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- LEACHATE FORCEMAIN
- 3H:1V SLOPE (TYPICAL)
- 2 — MW-8 — GROUNDWATER MONITORING WELL
- 4 — GMP-1 — GAS MONITORING PROBE
- 3 — MW-12 — OBSERVATION/MONITORING WELL
- OW-1 — PROPOSED WOODBINE MONITOR WELL
- EXISTING SUBTITLE D COMPOSITE LINER AREA WITH TIRE CHIPS
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. SEE APPENDIX IIIC-D FOR LEACHATE FORCEMAIN AND STORAGE TANK INFORMATION.
4. MINIMUM EXCAVATION ELEVATION AT LCS SUMP IS 387 FT-MSL.
5. LINER AND LEACHATE COLLECTION SYSTEM DETAILS ARE PRESENTED IN APPENDIX IIIA-A.
6. SUBTITLE D AREA LCS PIPES SLOPE WITH A MINIMUM OF 0.5% TO SUMPS. LCS LATERAL DRAINAGE SLOPE WITH A MINIMUM OF 0.9% ALONG THE FLOW PATH. OVERLINER LCS PIPES SLOPE WITH A MINIMUM OF 0.6% TO SUMPS.
7. SEQUENCE OF SITE DEVELOPMENT IS PROVIDED IN PARTS I/II, APPENDIX I/IIA.
8. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.
9. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G. CHANNELS) ARE TYPICALLY 3(H):1(V).
10. THE LEACHATE FORCEMAIN FOR THE PRE-SUBTITLE D AND THE SUBTITLE D AREAS WILL BE A 3-INCH MINIMUM DIAMETER DUAL-CONTAINMENT PIPE (6-INCH MINIMUM OUTER CONTAINMENT PIPE).

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 11/2012
FILE: 1339-351-11
CAD: IIIC-B-104 LEACH. SYS.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
LEACHATE COLLECTION SYSTEM PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIC-B-104

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APPENDIX IIIC-D

STORAGE TANK CALCULATIONS AND FORCEMAIN CAPACITY

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8-5-16

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Includes pages IIIC-D-1 through IIIC-D-12

SOLUTION:

1. **Size the leachate forcemain collection pipes.**

   A. **Use leachate production rates provided in Appendix IIIC-A to determine the required capacity of the leachate collection forcemain pipe.**

CONDITION	AREA[1]	AVERAGE ANNUAL FLOW		TOTAL FLOW	FLOW[3]
	ac	cfy[2]	gpd/ac	gpd	cfs
Active, 10' Waste	7.00	3503.0	72	503	0.0008
Interim, 50' Waste	25.00	5066.3	104	2,596	0.0040
Interim, 100' Waste	35.00	26380.9	541	18,922	0.0293
Interim, 150' Waste	50.00	19406.4	398	19,885	0.0308
Interim, ~~188'~~ **122'** Waste	35.00	~~23103.6~~ **26973.5**	~~473~~ **553**	~~16,571~~ **19,347**	~~0.0256~~ **0.0299**
Interim 200' Waste	25.00	23199.6	475	11,886	0.0184
Interim ~~282'~~ **244'** Waste	15.00	~~1935.7~~ **1699.4**	~~40~~ **35**	~~595~~ **522**	~~0.0009~~ **0.0008**
Interim ~~287'~~ **245'** Waste	11.00	~~37815.0~~ **30597.1**	~~775~~ **627**	~~8,524~~ **6,897**	~~0.0132~~ **0.0107**
Interim, ~~298'~~ **248'** Waste	6.14	~~1661.7~~ **1405.6**	~~34~~ **29**	~~209~~ **177**	~~0.0003~~ **0.0003**
Total =	209.14				~~0.1233~~ **0.1249**

[1]Total limits of waste area of 209.14 acres is represented with different waste column thicknesses for demonstration purposes.

[2]The average annual flows in cubic feet per year (cfy) have been obtained from the HELP Model summary tables included on pages IIIC-A-27 through IIIC-A-30. The highest values for a given waste thickness have been used for demonstration purposes.

[3]There are two leachate forcemain pipes, one serving the overliner area and the other in the Subtitle D area. For each forcemain pipe the entire limits of waste area was taken into consideration to be conservative.

Total maximum leachate production = Q = ~~0.1233~~ **0.1249** cubic feet per second (cfs)
Q = ~~55~~ **56** gallons per minute (gpm)
Q = ~~79,691~~ **80,734** gallons per day (gpd)[1]

[1] Note that this leachate estimate provides for a very conservative design given that the leachate flow rate based on actual site leachate data shows an average flow rate of less than 6,000 gpd (refer to Sheet IIIC-D-2).

Required capacity of leachate forcemain pipe = ~~79,691~~ **80,734** gpd

B. Determine the capacity of the leachate collection system forcemain pipe.

Capacity of the forcemain is calculated by using the following formula from Ref. 1.

$$\Delta P_{100} = \frac{452 * Q^{1.85}}{C^{1.85} * D^{4.86}} \qquad \text{Eq. 1}$$

where:

ΔP_{100} = Friction pressure loss, pounds per square inch per 100 feet of pipe
Q = Rate of flow, gallons per minute
C = Pipe coefficient, See Chart 4 on Page IIIC-D-12
D = Pipe internal diameter, inches

Rearrange Equation 1 to solve for Q.

$$Q = \left(\frac{\Delta P_{100} * C^{1.85} * D^{4.86}}{452}\right)^{(1/1.85)} \qquad \text{Eq. 2}$$

Subtitle D Forcemain:

Elevation at the low point of forcemain =	458	ft-msl
Elevation at the high point of forcemain =	462	ft-msl
Δh =	4	ft

Convert units from feet to psi:

Note: 1 psi is equal to 2.31 feet of water column.

Δh (psi) = Δh (ft) / (2.31 ft/psi)

Δh = 1.73 psi

Pipe Strength Available for Friction Loss = P - Δh

Pipe Strength for Friction Loss = 98.27 psi

L= 3,700 ft

(Note: Forcemain length is assumed to be the total length from the existing leachate tank (refer to Figure 3-1 in Appendix IIIC for location) extending to the Subtitle D area).

ΔP_{100} = (100-1.73)/(3,700/100)

ΔP_{100} = 2.66 psi

Calculate maximum capacity of the 3-inch pipe by using Equation 2 above:

C =	155	(refer to page IIIC-D-12)
D =	3.088	inches, internal diameter of forcemain (refer to page IIIC-D-11)

$$Q = [(\Delta P_{100} C^{1.85} D^{4.86})/452]^{(1/1.85)}$$

$$Q = [(2.66*155^{1.85}*3.088^{4.86})/452]^{(1/1.85)}$$

Q =	186.56	gpm
Q =	268,645	gpd

The above calculated value reflects the maximum capacity of the Subtitle D pipe, which is greater than the required capacity (i.e., 268,645 gpd > 79,691 gpd).

C. Calculate the maximum pressure experienced by the forcemain pipe.

Calculate head loss in the 3-inch diameter forcemain using the following equation from Ref. 1:

$$\Delta P_{100} = \frac{452*Q^{1.85}}{C^{1.85}*D^{4.86}}$$

Q =	~~55~~	**56**	gpm (from Step A)
C =	155	From Chart 4 on Page IIIC-D-12.	
D =	3.088	inches, diameter of discharge pipe contained in a 6-inch diameter containment pipe	

ΔP_{100}= ~~0.28~~ **0.29** psi

Overliner Forcemain:

Total head loss ($\Sigma\Delta P$) = ΔP_{100} * (L/100) = ~~0.28 psi x (6550/100)~~
0.29 psi x (6550/100)

$\Sigma\Delta P$= ~~18.37~~ **18.82** psi

To account for local head losses (elbows, etc.) multiply the calculated total head loss with a factor of safety of 1.2.

F.S.= 1.2
$\Sigma\Delta P$ * F.S.= ~~22.04~~ **22.58** psi

Calculate total head at the pump:

$$P_{tot} = \Delta h + \Sigma\Delta P$$

where:
P_{tot} = Total head at pump, psi
Δh = Geometric head (from Step B)
$\Sigma\Delta P$ = Total head loss, psi

P_{tot} = 16.47 psi + ~~22.04~~ **22.58** psi

P= ~~38.51~~ **39.05** psi

Subtitle D Forcemain:

Total head loss ($\Sigma\Delta P$) = ΔP_{100} * (L/100) = ~~0.28 psi x (3700/100)~~
0.29 psi x (3700/100)

$\Sigma\Delta P$= ~~10.38~~ **10.63** psi

To account for local head losses (elbows, etc.) multiply the calculated total head loss with a factor of safety of 1.2.

F.S.= 1.2
$\Sigma\Delta P$ * F.S.= ~~12.45~~ **12.75** psi

Calculate total head at the pump:

$$P_{tot} = \Delta h + \Sigma\Delta P$$

where:
P_{tot} = Total head at pump, psi
Δh = Geometric head (from Step B)
$\Sigma\Delta P$ = Total head loss, psi

P_{tot} = 1.73 psi + ~~12.45~~ **12.75** psi

P= ~~14.18~~ **14.49** psi

D. Evaluate the flow velocity in the forcemain pipe.

$V = 0.408 * (Q/D^2)$ (Ref. 1)

where:

Q = Rate of flow, gpm
D = Pipe internal diameter, inches

Q =	~~55~~	**56**	gpm (from Step A)
D =	3.088	inches	

V=	~~2.37~~	**2.40**	fps

E. Conclusion.

The pipe capacity (125 gpm for the overliner forcemain and 186 gpm for the Subtitle D forcemain) is not exceeded by the expected flow of ~~55~~ **56** gpm.

The forcemain can withstand 100 psi, and the maximum pressure calculated as ~~38.51~~ **39.05** psi. Therefore, the pipe strength is acceptable.

The calculated velocity of the 3-inch forcemain for ~~55~~ **56** gpm of flow is well within acceptable flow velocity range.

2. Evaluate the capacity of the pipe connecting the tank to the metering vault.
A. Determine the maximum flow to the pipe connecting the tank to the metering vault.

According to the leachate storage tank calculations, the maximum daily leachate flow rate, Q_{max}, to the tank when the entire site is developed will be: 5,725 gpd (Refer to page IIIC-D-2).

B. Calculate the capacity of the pipe connecting the tank to the metering vault.

$$Q_{full} = \frac{1.486}{n} A R^{2/3} S^{1/2} \qquad A = \frac{\Pi \times d^2}{4} \quad R = \frac{d}{4}$$

Where:
A = Cross-sectional area of pipe, with d representing the inside diameter
R = Hydraulic radius of pipe under full flow conditions
S = Design slope of pipe
n = Manning's number

Standard Dimension Ratio (SDR) = 11.0

d =	1.943	in	: 0.162	ft
A =	0.021	sq ft		
R =	0.040	ft		
S =	0.003	ft / ft		
n =	0.015			

Q_{full} =	0.013	cfs =	8512.6	gpd

C. Conclusion.

Q_{full} =	8512.6	gpd	>>	Q_{max} =	5725 gpd

The 2-inch diameter leachate line connecting the tank to the metering vault has enough capacity to handle the maximum daily leachate flow rate determined in the storage tank calculations.

APPENDIX IIIC-E

SITE LEACHATE GENERATION INFORMATION

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION,
BIDDING, OR PERMIT PURPOSES.

Includes pages IIIC-E-1 through IIIC-E-13

LEACHATE GENERATION VOLUMES USING ACTUAL LEACHATE GENERATION INFORMATION

Required: Estimate the leachate volume generated over the life of the site and the postclosure period using leachate generation information from the Camelot Landfill and information obtained from an EPA study.

References:

1. Bonaparte, Rudolph, Daniel, David E., and Koerner, Robert M. "Assessment and Recommendations for Improving the Performance of Waste Containment Systems," U.S. EPA, EPA/600/R-02/099, Dec. 2002.
2. Leachate generation information for the Camelot Landfill obtained from Republic site personnel.

Procedure:

1. Determine the approximate cell development sequence.
2. Estimate the leachate generation volume of each stage of development.

Solution:

1. Determine the approximate sector development sequence

The approximate cell development sequence is shown on Table IIIC-E-2. Leachate generation volumes will be compared for the following years.

- 2011
- 2017
- 2023
- 2029
- 2034
- 2039**5**
- 204~~0~~**36** through 2049**5** - First 10 years of postclosure period
- 205~~0~~**46** through 2059**5** - Second 10 years of postclosure period
- 206~~0~~**56** through 2069**5** - Third 10 years of postclosure period

2. Estimate the leachate generation volume of each stage of development

This information is provided on Sheet IIIC-E-5.

TABLE IIIC-E-2
Leachate Generation Volume Over the Life of the Site

Year	Cells Developed	Lined Area (acres)	Leachate Generation Rate (gallons per acre)	Total Leachate Generated (gallons)	Source of Information
2011	Cells 1 through 3, 4A, 4B, 5, 7, 8, and 9A	72.6	9,991	725,347	Leachate generation information from Camelot Landfill (average of 2008 to 2010) was used on a per acre basis to estimate the leachate generation rate.
2017	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, and 10 through 12	116.2	9,991	1,160,954	
2023	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O2	159.4	9,991	1,592,565	
2029	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O4	186.8	9,991	1,866,319	
2034	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	9,991	2,089,118	
~~2039~~ **2035**	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	9,991	~~1,898,798~~ **1,946,746**	Leachate generation information from Camelot Landfill (average of 2008 to 2010) was used on a per acre basis to estimate the leachate generation rate. 28.5 acres of the landfill area will be closed in 2034. As noted below for years 204~~0~~**36** through 204**95**, the leachate generation rate is assumed to be 10% of the value assumed for the year 2034. Therefore for year 203~~9~~**5** (after ~~6~~ **1** years of closed condition for the 28.5-ac area), ~~30~~ **50** percent of the leachate generation rate assumed in 2034 was used.
SITE CLOSURE IN ~~2039~~ 2035					
~~2040 through 2049~~ **2036 through 2045**	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	999	208,912	As noted in Ref. 1, it is projected that the leachate generation rates are decreased by a factor of four within one year after closure and by one order of magnitude within 2 to 4 years and almost negligible after 9 years. Based on this reference, the leachate generation was assumed to be 10% of the year 203~~9~~**5** for the first 10 years and for the second and third 10 years, the leachate generation was assumed to be 2% of the leachate generation in year 203~~9~~**5**.
~~2050 through 2059~~ **2046 through 2055**	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	200	41,782	
~~2060 through 2069~~ **2056 through 2065**	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	200	41,782	

Table IIIC-E-3
Leachate Generation Value During the Life of the Site

Year	Cells Developed	Lined Area (acres)	Total Leachate Generated		Source of Information
			Average (gal/year)	Peak (gal/year)	
2011	Cells 1 through 3, 4A, 4B, 5, 7, 8, and 9A	72.6	1,517,445	5,460,264	Cell 7 assumed an active 10-foot waste column thickness HELP run, Cells 4A, 4B, and 5 assumed an interim 50-foot waste column thickness HELP run, and Cells 1-3, 8, and 9A assumed an interim 100-foot waste column thickness HELP run to determine the average and peak leachate generation rates.
2017	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, and 10 through 12	116.2	3,240,746	11,840,855	Cell 12 assumed an active 10-foot waste column thickness HELP run, Cells 6, 6A, 7, 7A, 10, and 11 assumed an interim 50-foot waste column thickness HELP run, Cells 4A, 4B, and 5 assumed an interim 100-foot waste column thickness HELP run, and Cells 1-3, 8, and 9A assumed an interim 150-foot waste column thickness HELP run to determine the average and peak leachate generation rates.
2023	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O2	159.4	9,722,647	25,457,743	Cells 13, O1, and O2 assumed an active 10-foot waste column thickness HELP run, Cell 12 assumed an interim 50-foot waste column thickness HELP run, Cells 6, 6A, 7, 7A, 10, and 11 assumed an interim 100-foot waste column thickness HELP run, Cells 4A, 4B, and 5 assumed an interim 150-foot waste column thickness HELP run, and Cells 1-3, 8, and 9A assumed an interim 200-foot waste column thickness HELP run to determine the average and peak leachate generation rates.
2029	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O4	186.8	~~12,411,442~~ **12,341,397**	~~31,587,782~~ **31,472,574**	Cells O3 and O4 assumed an active 10-foot waste column thickness HELP run, Cells 13, O1, and O2 assumed an interim 50-foot waste column thickness HELP run, Cell 12 assumed an interim 100-foot waste column thickness HELP run, Cells 6, 6A, 7, 7A, 10, and 11, 4A, 4B, and 5 assumed an interim 200-foot waste column thickness HELP run, and Cells 1-3, 8, and 9A assumed the maximum interim (282-foot) waste column thickness HELP run to determine the average and peak leachate generation rates.
2034	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	~~23,655,618~~ **23,539,908**	~~50,392,970~~ **50,281,637**	Cell O5 and O6 assumed an active 10-foot waste column thickness HELP run, Cells 13, O1-O4 assumed an interim 100-foot waste column thickness HELP run, Cells 6, 6A, 7, 7A, 10-12 assumed an interim 200-foot waste column thickness HELP run, Cells 3, 4A, 4B, and 5 assumed the maximum interim (282-foot for Cells 3 and 4A and 298-foot for Cells 4B and 5) waste column thickness HELP run, and Cells 1-3, 8, and 9A assumed a closed case HELP run to determine the average and peak leachate generation rates.
2039~~5~~	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	~~20,409,462~~ **17,562,680**	~~55,727,793~~ **53,289,029**	All cells assumed a closed case HELP run to determine the average and peak leachate generation rates.
204~~036~~ - 2049~~5~~	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	~~12,439,387~~ **12,755,026**	~~17,466,179~~ **21,348,644**	All cells assumed a closed case HELP run to determine the average and peak leachate generation rates. The final moisture content values of the waste layers calculated in the HELP run for the year ~~2039~~ **2035** were input as the initial moisture content values in the HELP run for years ~~2040 to 2049~~ **2036 to 2045**.
205~~046~~- 2059~~5~~	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	~~11,022,172~~ **11,185,236**	~~15,779,394~~ **17,962,208**	All cells assumed a closed case HELP run to determine the average and peak leachate generation rates. The final moisture content values of the waste layers calculated in the HELP run for the years ~~2040 to 2049~~ **2036 to 2045** were input as the initial moisture content values in the HELP run for years ~~2050 to 2059~~ **2046 to 2055**.
206~~056~~- 2069~~5~~	Cells 1 through 3, 4A, 4B, 5, 6, 6A, 7, 7A, 8, 9A, 10 through 13, and O1 through O6	209.1	~~9,925,756~~ **9,873,071**	~~13,556,130~~ **15,570,968**	All cells assumed a closed case HELP run to determine the average and peak leachate generation rates. The final moisture content values of the waste layers calculated in the HELP run for the year ~~2050 to 2059~~ **2046 to 2055** were input as the initial moisture content values in the HELP run for years ~~2060 to 2069~~ **2056 to 2065**.

Table IIIC-E-4[1]
Summary of Leachate Generation Rates

Developed Subtitle D Area (Cells 1 & 2)				
	Average (cf/year/acre)	Average (gal/year/acre)	Peak (cf/day/acre)	Peak (gal/day/acre)
Interim (50 ft)	1,601.6	11,981.6	32.7	244.6
Interim (100 ft)	3,862.2	28,893.1	26.7	199.7
Interim (150 ft)	2,651.2	19,833.6	15.0	112.2
Interim (200 ft)	2,484.3	18,585.0	11.5	86.0
Interim (~~282~~ **244** ft)	~~1,935.7~~ **1,669.4**	~~14,481.0~~ **12,488.8**	~~9.9~~ **8.7**	~~74.1~~ **65.1**
Closed (~~282~~ **244** ft)	~~2,035.8~~ **1,837.9**	~~15,229.8~~ **13,749.3**	~~8.9~~ **8.4**	~~66.6~~ **62.8**
Post Closure (First 10 Years)	~~1,798.6~~ **1,627.8**	~~13,455~~ **12,177.6**	~~8.4~~ **7.6**	~~62.8~~ **56.9**
Post Closure (Second 10 Years)	~~1,695.3~~ **1,588.4**	~~12,683~~ **11,882.8**	~~7.8~~ **7.3**	~~58.4~~ **54.6**
Post Closure (Third 10 Years)	~~1,660.3~~ **1,434.6**	~~12,421~~ **10,732.2**	~~7.7~~ **7.0**	~~57.6~~ **52.4**

Developed Subtitle D Area (Cells 4B & 5)				
	Average (cf/year/acre)	Average (gal/year/acre)	Peak (cf/day/acre)	Peak (gal/day/acre)
Interim (50 ft)	1,579.2	11,814.0	25.8	193.0
Interim (100 ft)	3,852.1	28,817.6	21.2	158.6
Interim (150 ft)	2,638.1	19,735.6	8.6	64.3
Interim (200 ft)	2,470.6	18,482.6	6.1	45.6
Interim (~~298~~ **248** ft)	~~1,661.7~~ **1,405.6**	~~12,431.2~~ **10,515.3**	~~6.4~~ **5.9**	~~47.9~~ **44.1**
Closed (~~298~~ **248** ft)	~~1,743.3~~ **1,470.3**	~~13,041.6~~ **10,999.3**	~~6.3~~ **5.3**	~~47.1~~ **39.6**
Post Closure (First 10 Years)	~~1,504.3~~ **1,204.7**	~~11,254~~ **9,012.4**	~~5.8~~ **4.7**	~~43.4~~ **35.2**
Post Closure (Second 10 Years)	~~1,491.1~~ **1,149.2**	~~11,155~~ **8,597.2**	~~5.6~~ **4.4**	~~41.9~~ **32.9**
Post Closure (Third 10 Years)	~~1,460.1~~ **1,141.2**	~~10,923~~ **8,537.3**	~~5.7~~ **4.4**	~~42.6~~ **32.9**

Undeveloped Area (Cells 6, 6A, 7, 7A, & 10-13)				
	Average (cf/year/acre)	Average (gal/year/acre)	Peak (cf/day/acre)	Peak (gal/day/acre)
Active (10 ft)	2,873.2	21,494.4	36.9	276.0
Interim (50 ft)	5,066.3	37,901.0	73.8	552.1
Interim (100 ft)	26,380.9	197,355.5	164.3	1229.1
Interim (200 ft)	23,199.6	173,556.2	115.6	864.8
Interim (~~287~~ **245** ft)	~~37,815.0~~ **30,597.1**	~~282,894.0~~ **228,896.9**	~~171.2~~ **117.8**	~~1280.7~~ **881.3**
Closed (~~287~~ **245** ft)	~~21,609.7~~ **18,079.6**	~~161,662.2~~ **135,253.5**	~~170.5~~ **129.6**	~~1275.5~~ **969.5**
Post Closure (First 10 Years)	~~12,328.0~~ **11,499.4**	~~92,226~~ **86,027.0**	~~47.9~~ **46.5**	~~358.3~~ **347.9**
Post Closure (Second 10 Years)	~~10,894.9~~ **10,106.1**	~~81,505~~ **75,603.7**	~~43.5~~ **40.6**	~~325.4~~ **303.7**
Post Closure (Third 10 Years)	~~9,719.6~~ **8,971.0**	~~72,712~~ **67,112.1**	~~35.7~~ **34.5**	~~267.1~~ **258.1**

Overliner Area (Cells O1-O6)				
	Average (cf/year/acre)	Average (gal/year/acre)	Peak (cf/day/acre)	Peak (gal/day/acre)
Active (10 ft)	3,503.0	26,205.9	50.0	374.1
Interim (50 ft)	4,961.5	37,117.0	72.8	544.6
Interim (100 ft)	25,113.2	187,871.8	151.8	1135.6
~~Interim (150 ft)~~	~~19,406.4~~	~~145,179.3~~	~~89.9~~	~~672.5~~
Interim (~~188~~ **122** ft)	~~23,103.6~~ **26,973.5**	~~172,838.0~~ **201,788.8**	~~104.2~~ **151.9**	~~779.5~~ **1,136.4**
Closed (~~188~~ **122** ft)	~~14,207.5~~ **12,799.1**	~~106,286.3~~ **95,750.1**	~~102.4~~ **138.0**	~~766.1~~ **1,032.4**
Post Closure (First 10 Years)	~~9,140.6~~ **10,999.1**	~~68,381~~ **82,284.3**	~~33.7~~ **58.1**	~~252.1~~ **434.6**
Post Closure (Second 10 Years)	~~8,006.1~~ **9,483.8**	~~59,894~~ **70,948.3**	~~29.9~~ **46.4**	~~223.7~~ **347.1**
Post Closure (Third 10 Years)	~~7,189.1~~ **8,238.9**	~~53,782~~ **61,635.2**	~~26.7~~ **40.4**	~~199.7~~ **302.2**

[1]Refer to Appendix IIIC-A for detailed HELP analyses results for the Active through Closed cases. Refer to pages IIIC-E-10 through IIIC-E-13 for the HELP summary sheets for the Postclosure cases.

Required: Determine the leachate depth on the liner system using the actual leachate generated information provided on Sheet IIIC-E-5.

References:

1. Giroud, J.P. et al., *Hydraulic Design of Geosynthetic and Granular Liquid Collection Layers* , Geosynthetics International, Vol 7, 2000.

2. Dana N.Humphrey, *Civil Engineering Application of Tire Shreds* , Presented at the Tire Industry Conference, Hilton Head, South Carolina, March 3, 1999.

Procedure:

1. Use the following equation to determine the head on the liner:

$$T_{max} = \frac{\sqrt{(\tan^2\beta + \frac{4q_h}{k_1})} - \tan\beta}{2\cos\beta} * L \qquad \text{(Ref. 1)}$$

where,
T_{max}= maximum head on liner, ft
β= slope, deg
q_h= inflow rate, in/s
k_1= hydraulic conductivity of geocomposite, in/s
L= slope length, ft

Developed Subtitle D Area (Cells 1 & 2)

β=	0.63 °
$\tan\beta$=	0.011
$\tan^2\beta$=	0.0001
$\cos\beta$=	1.00
L=	220.00 ft

Condition	q_h (gal/acre/year)	q_h (in/s)	k_1 (in/s)	T_{max} (in)
Interim (50 ft waste)	9,991	1.17E-08	4.66	0.0006
Interim (100 ft waste)	9,991	1.17E-08	2.22	0.0013
Interim (150 ft waste)	9,991	1.17E-08	1.82	0.0015
Interim (200 ft waste)	9,991	1.17E-08	1.55	0.0018
Interim (~~282~~ **244** ft waste)	9,991	1.17E-08	1.16	0.0024
Closed (~~282~~ **244** ft waste)	9,038	1.06E-08	1.01	0.0025
Post Closure (0-10)	999	1.17E-09	1.01	0.0003
Post Closure (10-20)	200	2.33E-10	1.01	0.0001
Post Closure (20-30)	200	2.33E-10	1.01	0.0001

Developed Subtitle D Area (Cells 4B and 5)

β= 0.63 °
$\tan\beta$= 0.011
$\tan^2\beta$= 0.0001
$\cos\beta$= 1.00
L= 855.00 ft

Condition	q_h (gal/acre/year)	q_h (in/s)	k_1 (in/s)	T_{max} (in)
Interim (50 ft waste)	9,991	1.17E-08	0.93	0.0117
Interim (100 ft waste)	9,991	1.17E-08	0.39	0.0279
Interim (150 ft waste)	9,991	1.17E-08	0.24	0.0460
Interim (200 ft waste)	9,991	1.17E-08	0.22	0.0502
Interim (~~298~~ **248** ft waste)	9,991	1.17E-08	0.20	0.0553
Closed (~~298~~ **248** ft waste)	9,038	1.06E-08	0.17	0.0568
Post Closure (0-10)	999	1.17E-09	0.16	0.0067
Post Closure (10-20)	200	2.33E-10	0.16	0.0013
Post Closure (20-30)	200	2.33E-10	0.16	0.0013

Undeveloped Area (Cells 6, 6A, 7, 7A, & 10-13)

β= 0.52 °
$\tan\beta$= 0.009
$\tan^2\beta$= 0.0001
$\cos\beta$= 1.00
L= 350.00 ft

Condition	q_h (gal/acre/year)	q_h (in/s)	k_1 (in/s)	T_{max} (in)
Active (10 ft waste)	9,991	1.17E-08	12.35	0.0004
Interim (50 ft waste)	9,991	1.17E-08	7.73	0.0007
Interim (100 ft waste)	9,991	1.17E-08	5.18	0.0011
Interim (200 ft waste)	9,991	1.17E-08	3.14	0.0017
Interim (~~287~~ **245** ft waste)	9,991	1.17E-08	2.11	0.0026
Closed (~~287~~ **245** ft waste)	9,038	1.06E-08	1.81	0.0027
Post Closure (0-10)	999	1.17E-09	1.81	0.0003
Post Closure (10-20)	200	2.33E-10	1.81	0.0001
Post Closure (20-30)	200	2.33E-10	1.81	0.0001

Overliner Area (Cells O1-O6)

β= 0.57 °
$\tan\beta$= 0.010
$\tan^2\beta$= 0.0001
$\cos\beta$= 1.00
L= 700.00 ft

Condition	q_h (gal/acre/year)	q_h (in/s)	k_1 (in/s)	T_{max} (in)
Active (10 ft waste)	9,991	1.17E-08	16.00	0.0006
Interim (50 ft waste)	9,991	1.17E-08	10.28	0.0010
Interim (100 ft waste)	9,991	1.17E-08	7.36	0.0013
~~Interim (150 ft waste)~~	~~9,991~~	~~1.17E-08~~	~~5.37~~	~~0.0018~~
Interim (~~188~~ **122** ft waste)	9,991	1.17E-08	3.63	0.0027
Closed (~~188~~ **122** ft waste)	9,038	1.06E-08	3.06	0.0029
Post Closure (0-10)	999	1.17E-09	3.06	0.0003
Post Closure (10-20)	200	2.33E-10	3.06	0.0001
Post Closure (20-30)	200	2.33E-10	3.06	0.0001

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY SHEET
DEVELOPED SUBTITLE D AREA (CELLS 1 AND 2)

		CLOSED (~~282~~ **244** FT WASTE) 204~~0~~36-2049~~5~~	CLOSED (~~282~~ **244** FT WASTE) 205~~0~~46-2059~~5~~	CLOSED (~~282~~ **244** FT WASTE) 206~~0~~56-2069~~5~~
GENERAL INFORMATION	Case No.	1	2	3
	No. of Years	30	30	30
	Ground Cover	GOOD	GOOD	GOOD
	SCS Runoff Curve No.	82.4	82.4	82.4
	Model Area (acre)	1	1	1
	Runoff Area (%)	100	100	100
	Maximum Leaf Area Index	4.5	4.5	4.5
	Evaporative Zone Depth (inch)	18	18	18
TOPSOIL LAYER (Texture = 10)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
EROSION LAYER (Texture = 10)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)	0.04	0.04	0.04
	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13
	Pinhole Density (holes/acre)	1	1	1
	Install. Defects (holes/acre)	4	4	4
	Placement Quality	GOOD	GOOD	GOOD
INFILTRATION LAYER (Texture = 0)	Thickness (in)	18	18	18
	Porosity (vol/vol)	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-05	1.0E-05	1.0E-05
INTERMEDIATE COVER (Texture = 11)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.4640	0.4640	0.4640
	Field Capacity (vol/vol)	0.3100	0.3100	0.3100
	Wilting Point (vol/vol)	0.1870	0.1870	0.1870
	Init. Moisture Content (vol/vol)	0.3100	0.3100	0.3100
	Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	6.4E-05
WASTE TOP[2] (Texture = 0)	Thickness (in)	1500	1500	1500
	Porosity (vol/vol)	0.6148	0.6148	0.6148
	Field Capacity (vol/vol)	0.5114	0.5114	0.5114
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.3850	0.3880	0.3910
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03
WASTE BOTTOM[2] (Texture = 0)	Thickness (in)	~~1884~~ **1428**	~~1884~~ **1428**	~~1884~~ **1428**
	Porosity (vol/vol)	~~0.5007~~ **0.5159**	~~0.5007~~ **0.5159**	~~0.5007~~ **0.5159**
	Field Capacity (vol/vol)	~~0.4793~~ **0.4838**	~~0.4793~~ **0.4838**	~~0.4793~~ **0.4838**
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.3710	0.3680	0.3650
	Hyd. Conductivity (cm/s)	1.0E-04	1.0E-04	1.0E-04
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	5.5E-06	5.5E-06	5.5E-06
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	~~0.119~~ **0.122**	~~0.119~~ **0.122**	~~0.119~~ **0.122**
	Porosity (vol/vol)	0.8500	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	~~2.56~~ **2.94**	~~2.56~~ **2.94**	~~2.56~~ **2.94**
	Slope[1] (%)	1.1	1.1	1.1
	Slope Length (ft)	220	220	220
FLEXIBLE MEMBRANE LINER (Texture = 35)	Thickness (in)	0.06	0.06	0.06
	Hyd. Conductivity (cm/s)	2.0E-13	2.0E-13	2.0E-13
	Pinhole Density (holes/acre)	0	0	0
	Install. Defects (holes/acre)	0	0	0
	Placement Quality	GOOD	GOOD	GOOD
COMPACTED CLAY LINER (Texture = 16)	Thickness (in)	24	24	24
	Porosity (vol/vol)	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-07	1.0E-07	1.0E-07
PRECIPITATION	Average Annual (in)	36.80	36.80	36.80
RUNOFF	Average Annual (in)	5.59	5.59	5.59
EVAPOTRANSPIRATION	Average Annual (in)	30.63	30.63	30.63
LATERAL DRAINAGE COLLECTED	Average Annual (cf/year)	~~1,798.6~~ **1,627.8**	~~1,695.3~~ **1,588.4**	~~1660.3~~ **1,434.6**
	Peak Daily (cf/day)	~~8.4~~ **7.6**	~~7.8~~ **7.3**	~~7.7~~ **7.0**
HEAD ON LINER	Average Annual (in)	~~0.002~~ **0.001**	~~0.002~~ **0.001**	~~0.002~~ **0.001**
	Peak Daily (in)	~~0.006~~ **0.005**	0.005	~~0.006~~ **0.004**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the developed area presented in Appendix IIIJ-B.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. al, *Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-594.

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY SHEET
DEVELOPED SUBTITLE D AREA (CELLS 4B, 5)

		CLOSED (~~298~~ **248** FT WASTE) 204~~036~~-204~~95~~	CLOSED (~~298~~ **248** FT WASTE) 205~~046~~-205~~95~~	CLOSED (~~298~~ **248** FT WASTE) 206~~056~~-206~~95~~
GENERAL INFORMATION	Case No.	1	2	3
	No. of Years	30	30	30
	Ground Cover	GOOD	GOOD	GOOD
	SCS Runoff Curve No.	80.1	80.1	80.1
	Model Area (acre)	1	1	1
	Runoff Area (%)	100	100	100
	Maximum Leaf Area Index	4.5	4.5	4.5
	Evaporative Zone Depth (inch)	18	18	18
TOPSOIL LAYER (Texture = 10)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
EROSION LAYER (Texture = 10)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)	0.04	0.04	0.04
	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13
	Pinhole Density (holes/acre)	1	1	1
	Install. Defects (holes/acre)	4	4	4
	Placement Quality	GOOD	GOOD	GOOD
INFILTRATION LAYER (Texture = 0)	Thickness (in)	18	18	18
	Porosity (vol/vol)	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-05	1.0E-05	1.0E-05
INTERMEDIATE COVER (Texture = 11)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.4640	0.4640	0.4640
	Field Capacity (vol/vol)	0.3100	0.3100	0.3100
	Wilting Point (vol/vol)	0.1870	0.1870	0.1870
	Init. Moisture Content (vol/vol)	0.3100	0.3100	0.3100
	Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	6.4E-05
WASTE TOP[2] (Texture = 0)	Thickness (in)	1500	1500	1500
	Porosity (vol/vol)	0.6148	0.6148	0.6148
	Field Capacity (vol/vol)	0.5114	0.5114	0.5114
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.3850	0.3880	0.3910
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03
WASTE BOTTOM[2] (Texture = 0)	Thickness (in)	~~2076~~ **1476**	~~2076~~ **1476**	~~2076~~ **1476**
	Porosity (vol/vol)	~~0.4941~~ **0.5255**	~~0.4941~~ **0.5255**	~~0.4941~~ **0.5255**
	Field Capacity (vol/vol)	~~0.4775~~ **0.4856**	~~0.4775~~ **0.4856**	~~0.4775~~ **0.4856**
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.3710	0.3690	0.3670
	Hyd. Conductivity (cm/s)	1.0E-04	1.0E-04	1.0E-04
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	4.6E-06	4.6E-06	4.6E-06
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	~~0.118~~ **0.122**	~~0.118~~ **0.122**	~~0.118~~ **0.122**
	Porosity (vol/vol)	0.8500	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	~~0.43~~ **0.44**	~~0.43~~ **0.44**	~~0.43~~ **0.44**
	Slope[1] (%)	1.1	1.1	1.1
	Slope Length (ft)	855	855	855
FLEXIBLE MEMBRANE LINER (Texture = 35)	Thickness (in)	0.06	0.06	0.06
	Hyd. Conductivity (cm/s)	2.0E-13	2.0E-13	2.0E-13
	Pinhole Density (holes/acre)	0	0	0
	Install. Defects (holes/acre)	0	0	0
	Placement Quality	GOOD	GOOD	GOOD
COMPACTED CLAY LINER (Texture = 16)	Thickness (in)	24	24	24
	Porosity (vol/vol)	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-07	1.0E-07	1.0E-07
PRECIPITATION	Average Annual (in)	36.80	36.80	36.80
RUNOFF	Average Annual (in)	5.50	5.50	5.50
EVAPOTRANSPIRATION	Average Annual (in)	30.73	30.73	30.73
LATERAL DRAINAGE COLLECTED	Average Annual (cf/year)	~~1,504.3~~ **1,204.7**	~~1,491.1~~ **1,149.2**	~~1,460.1~~ **1,141.2**
	Peak Daily (cf/day)	~~5.8~~ **4.7**	~~5.6~~ **4.4**	~~5.7~~ **4.4**
HEAD ON LINER	Average Annual (in)	~~0.035~~ **0.028**	~~0.035~~ **0.027**	~~0.034~~ **0.027**
	Peak Daily (in)	~~0.099~~ **0.081**	~~0.097~~ **0.075**	~~0.097~~ **0.076**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the developed a presented in Appendix IIIJ-B.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. a*Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-59.

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY
UNDEVELOPED AREA

		CLOSED (~~287~~ **245** FT WASTE) 204~~036~~-204~~95~~	CLOSED (~~287~~ **245** FT WASTE) 205~~046~~-205~~95~~	CLOSED (~~287~~ **245** FT WASTE) 206~~056~~-206~~95~~
GENERAL INFORMATION	Case No.	1	2	3
	No. of Years	30	30	30
	Ground Cover	GOOD	GOOD	GOOD
	SCS Runoff Curve No.	80.1	80.1	80.1
	Model Area (acre)	1	1	1
	Runoff Area (%)	100	100	100
	Maximum Leaf Area Index	4.5	4.5	4.5
	Evaporative Zone Depth (inch)	18	18	18
TOPSOIL LAYER (Texture = 10)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
EROSION LAYER (Texture = 10)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)	0.04	0.04	0.04
	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13
	Pinhole Density (holes/acre)	1	1	1
	Install. Defects (holes/acre)	4	4	4
	Placement Quality	GOOD	GOOD	GOOD
INFILTRATION LAYER (Texture = 0)	Thickness (in)	18	18	18
	Porosity (vol/vol)	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-05	1.0E-05	1.0E-05
INTERMEDIATE COVER (Texture = 11)	Thickness (in)	12	12	12
	Porosity (vol/vol)	0.4640	0.4640	0.4640
	Field Capacity (vol/vol)	0.3100	0.3100	0.3100
	Wilting Point (vol/vol)	0.1870	0.1870	0.1870
	Init. Moisture Content (vol/vol)	0.3100	0.3100	0.3100
	Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	6.4E-05
WASTE TOP[2] (Texture = 0)	Thickness (in)	1500	1500	1500
	Porosity (vol/vol)	0.6148	0.6148	0.6148
	Field Capacity (vol/vol)	0.5114	0.5114	0.5114
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.3650	0.3550	0.3460
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03
WASTE BOTTOM[2] (Texture = 0)	Thickness (in)	~~1944~~ **1440**	~~1944~~ **1440**	~~1944~~ **1440**
	Porosity (vol/vol)	~~0.4985~~ **0.5155**	~~0.4985~~ **0.5155**	~~0.4985~~ **0.5155**
	Field Capacity (vol/vol)	~~0.479~~ **0.4834**	~~0.479~~ **0.4834**	~~0.479~~ **0.4834**
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.3030	0.2950	0.2880
	Hyd. Conductivity (cm/s)	1.0E-04	1.0E-04	1.0E-04
PROTECTIVE COVER (Texture = 10)	Thickness (in)	24	24	24
	Porosity (vol/vol)	0.3980	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
LEACHATE COLLECTION LAYER (Texture = 0)	Thickness (in)	~~0.149~~ **0.152**	~~0.149~~ **0.152**	~~0.149~~ **0.152**
	Porosity (vol/vol)	0.8500	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	~~4.59~~ **5.80**	~~4.59~~ **5.80**	~~4.59~~ **5.80**
	Slope[1] (%)	0.9	0.9	0.9
	Slope Length (ft)	350	350	350
FLEXIBLE MEMBRANE LINER (Texture = 35)	Thickness (in)	0.06	0.06	0.06
	Hyd. Conductivity (cm/s)	2.0E-13	2.0E-13	2.0E-13
	Pinhole Density (holes/acre)	0	0	0
	Install. Defects (holes/acre)	0	0	0
	Placement Quality	GOOD	GOOD	GOOD
COMPACTED CLAY LINER (Texture = 16)	Thickness (in)	24	24	24
	Porosity (vol/vol)	0.4270	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-07	1.0E-07	1.0E-07
PRECIPITATION	Average Annual (in)	36.80	36.80	36.80
RUNOFF	Average Annual (in)	5.50	5.50	5.50
EVAPOTRANSPIRATION	Average Annual (in)	30.73	30.73	30.73
LATERAL DRAINAGE COLLECTED	Average Annual (cf/year)	~~12,328.0~~ **11,499.4**	~~10,894.9~~ **10,106.1**	~~9,719.6~~ **8,971.0**
	Peak Daily (cf/day)	~~47.9~~ **46.5**	~~43.5~~ **40.6**	~~35.7~~ **34.5**
HEAD ON LINER	Average Annual (in)	~~0.014~~ **0.010**	~~0.012~~ **0.009**	~~0.011~~ **0.008**
	Peak Daily (in)	~~0.039~~ **0.030**	~~0.036~~ **0.026**	~~0.029~~ **0.023**

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the developed a presented in Appendix IIIJ-B.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. a*Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-59.

Prep By: JLG
Date: 2/19/2016

Chkd By: MDM
Date: 2/19/2016

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY SHEET
OVERLINER DESIGN

		CLOSED (~~188~~ **122** FT WASTE) 204~~0~~36-204~~9~~95	CLOSED (~~188~~ **122** FT WASTE) 205~~0~~46-205~~9~~5	CLOSED (~~188~~ **122** FT WASTE) 206~~0~~56-206~~9~~5
GENERAL	Case No.	1	2	3
INFORMATION	No. of Years	30	30	30
	Ground Cover	GOOD	GOOD	GOOD
	SCS Runoff Curve No.	80.1	80.1	80.1
	Model Area (acre)	1	1	1
	Runoff Area (%)	100	100	100
	Maximum Leaf Area Index	4.5	4.5	4.5
	Evaporative Zone Depth (inch)	18	18	18
TOPSOIL	Thickness (in)	12	12	12
LAYER	Porosity (vol/vol)	0.3980	0.3980	0.3980
(Texture = 10)	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
EROSION	Thickness (in)	12	12	12
LAYER	Porosity (vol/vol)	0.3980	0.3980	0.3980
(Texture = 10)	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
FLEXIBLE	Thickness (in)	0.04	0.04	0.04
MEMBRANE	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13
LINER	Pinhole Density (holes/acre)	1	1	1
(Texture = 36)	Install. Defects (holes/acre)	4	4	4
	Placement Quality	GOOD	GOOD	GOOD
INFILTRATION	Thickness (in)	18	18	18
LAYER	Porosity (vol/vol)	0.4270	0.4270	0.4270
(Texture = 0)	Field Capacity (vol/vol)	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-05	1.0E-05	1.0E-05
INTERMEDIATE	Thickness (in)	12	12	12
COVER	Porosity (vol/vol)	0.4640	0.4640	0.4640
(Texture = 11)	Field Capacity (vol/vol)	0.3100	0.3100	0.3100
	Wilting Point (vol/vol)	0.1870	0.1870	0.1870
	Init. Moisture Content (vol/vol)	0.3100	0.3100	0.3100
	Hyd. Conductivity (cm/s)	6.4E-05	6.4E-05	6.4E-05
WASTE ~~TOP~~[2]	Thickness (in)	~~1500~~ **1464**	~~1500~~ **1464**	~~1500~~ **1464**
(Texture = 0)	Porosity (vol/vol)	~~0.6148~~ **0.6159**	~~0.6148~~ **0.6159**	~~0.6148~~ **0.6159**
	Field Capacity (vol/vol)	~~0.5114~~ **0.5118**	~~0.5114~~ **0.5118**	~~0.5114~~ **0.5118**
	Wilting Point (vol/vol)	0.0770	0.0770	0.0770
	Init. Moisture Content (vol/vol)	0.3440	0.3340	0.3260
	Hyd. Conductivity (cm/s)	1.0E-03	1.0E-03	1.0E-03
~~WASTE BOTTOM~~[2]	~~Thickness (in)~~	~~756~~	~~756~~	~~756~~
~~(Texture = 0)~~	~~Porosity (vol/vol)~~	~~0.5387~~	~~0.5387~~	~~0.5387~~
	~~Field Capacity (vol/vol)~~	~~0.4900~~	~~0.4900~~	~~0.4900~~
	~~Wilting Point (vol/vol)~~	~~0.0770~~	~~0.0770~~	~~0.0770~~
	~~Init. Moisture Content (vol/vol)~~	~~0.3060~~	~~0.2980~~	~~0.2910~~
	~~Hyd. Conductivity (cm/s)~~	~~1.0E-04~~	~~1.0E-04~~	~~1.0E-04~~
PROTECTIVE	Thickness (in)	24	24	24
COVER	Porosity (vol/vol)	0.3980	0.3980	0.3980
(Texture = 10)	Field Capacity (vol/vol)	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04
LEACHATE	Thickness (in)	~~0.246~~ **0.270**	~~0.246~~ **0.270**	~~0.246~~ **0.270**
COLLECTION	Porosity (vol/vol)	0.8500	0.8500	0.8500
LAYER	Field Capacity (vol/vol)	0.0100	0.0100	0.0100
(Texture = 0)	Wilting Point (vol/vol)	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	~~7.77~~ **12.08**	~~7.77~~ **12.08**	~~7.77~~ **12.08**
	Slope[1] (%)	1	1	1
	Slope Length (ft)	700	700	700
FLEXIBLE	Thickness (in)	0.04	0.04	0.04
MEMBRANE	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13
LINER	Pinhole Density (holes/acre)	0	0	0
(Texture = 36)	Install. Defects (holes/acre)	0	0	0
	Placement Quality	GOOD	GOOD	GOOD
GEOSYNTHETIC	Thickness (in)	0.25	0.25	0.25
CLAY LINER	Porosity (vol/vol)	0.7500	0.7500	0.7500
(Texture = 0)	Field Capacity (vol/vol)	0.7470	0.7470	0.7470
	Wilting Point (vol/vol)	0.4000	0.4000	0.4000
	Init. Moisture Content (vol/vol)	0.7500	0.7500	0.7500
	Hyd. Conductivity (cm/s)	5.0E-09	5.0E-09	5.0E-09
PRECIPITATION	Average Annual (in)	36.80	36.80	36.80
RUNOFF	Average Annual (in)	5.50	5.50	5.50
EVAPOTRANSPIRATION	Average Annual (in)	30.73	30.73	30.73
LATERAL	Average Annual (cf/year)	~~9,140.6~~ **10,999.1**	~~8,006.1~~ **9,483.8**	~~7,189.1~~ **8,238.9**
DRAINAGE COLLECTED	Peak Daily (cf/day)	~~33.7~~ **58.1**	~~29.9~~ **46.4**	~~26.7~~ **40.4**
HEAD ON LINER	Average Annual (in)	~~0.011~~ **0.008**	~~0.010~~ **0.007**	~~0.009~~ **0.006**
	Peak Daily (in)	~~0.031~~ **0.033**	~~0.025~~ **0.026**	0.023

[1] The slope of the leachate collection layer is conservatively selected considering the after settlement contours of the developed a presented in Appendix IIIJ-B.

[2] The field capacity and porosity values for the waste layer were obtained from: Zornberg, Jorge G. et. a*Retention of Free Liquids in Landfills Undergoing Vertical Expansion.* Journal of Geotechnical and Geoenvironmental Engineering, July 1999, pp. 583-59

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIID
LINER QUALITY CONTROL PLAN

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised June 2014
Revised October 2014

Revised August 2016

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8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, TX 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B.4

Table 3-5
Geotextile and Drainage Geocomposite Required Testing and Properties

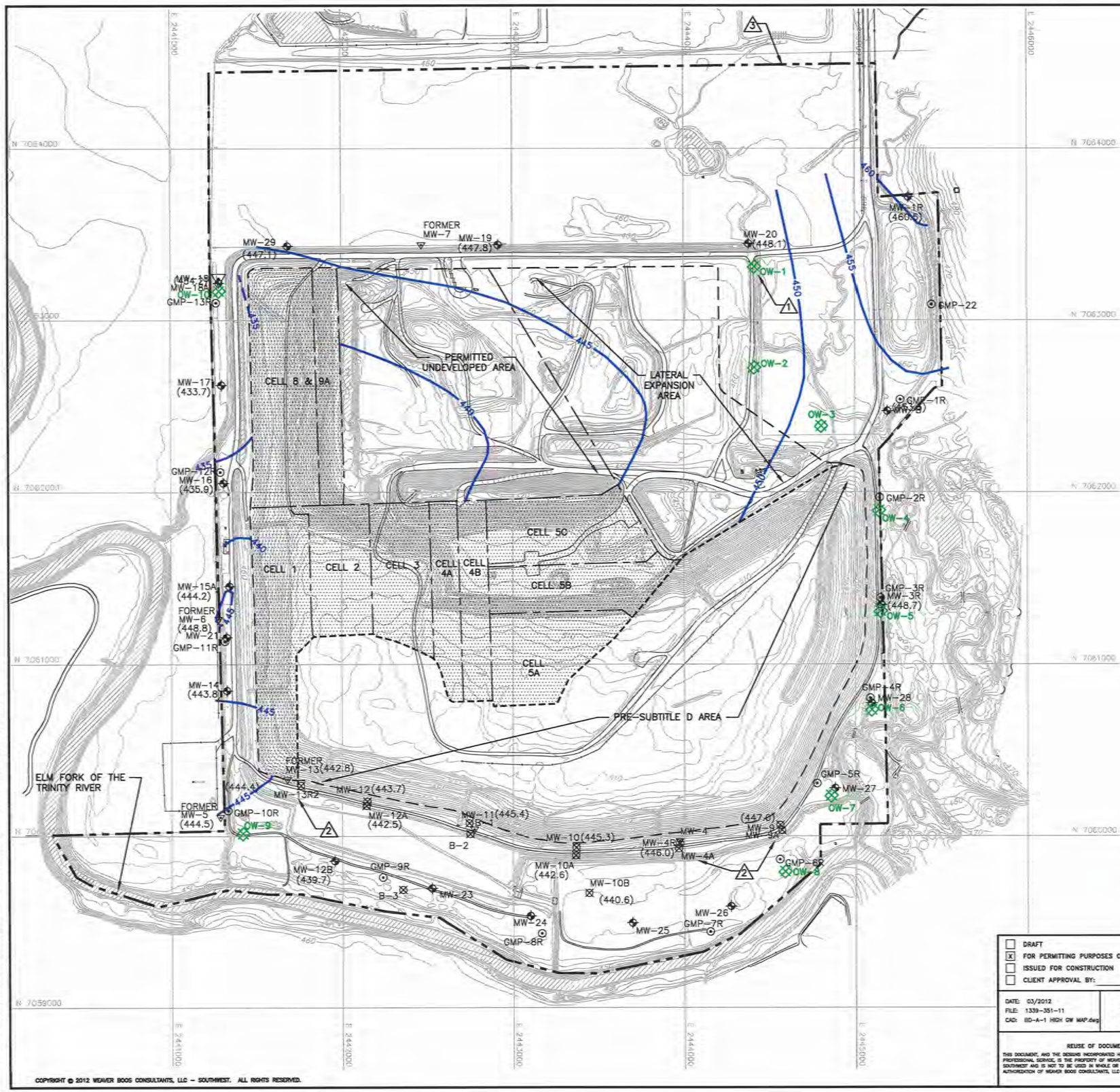
Responsible Party	Material	Test	Standard	Required Property[4]
Manufacturer	Geotextile	Unit Weight	ASTM D 5261	6 oz/sy
		Apparent Opening Size	ASTM D 4751	80 sieve
		Grab Strength	ASTM D 4632	157 lbs
		Tear Strength	ASTM D 4533	56 lbs
		Puncture Strength	ASTM D 4833	56 lbs
		Permeability	ASTM D 4491	0.2 cm/s
Manufacturer	HDPE Geonet	Specific Gravity	ASTM D 1505	0.939 g/cm^3
		Thickness	ASTM D 5199	0.25 inch (bottom liner); 0.30 inch (overliner)
		Carbon Black	ASTM D 1603	2%
		Tensile Strength	ASTM D 5035	45 lb/in (peak)
Third Party Laboratory	Drainage Geocomposite	Transmissivity	ASTM D 4716	See Notes 2 and 3
		Strength	ASTM D 5321	See Table 3-6
Manufacturer		Peel Adhesion	ASTM D 7005	1.0 lb/in

1 The minimum testing frequency will be one test sample per 100,000 square feet. The drainage geocomposite is single sided for the floor grades of the bottom liner. The drainage geocomposite will be double sided for the sideslopes of the bottom liner and overliner areas.

2 Liner: As noted in Appendix IIIC, Appendices IIIC-A and IIIC-B, the transmissivity of the single-sided geocomposite will be measured at a gradient of 0.009 under normal pressures of 1,000, 15,000 and ~~23,421~~ 19,368 (or higher) psf, boundary conditions consisting of soil/geocomposite/geomembrane with minimum seating time of 100 hours and will be performed for the first 100,000 square feet of liner construction. For each additional 100,000 square feet of single-sided geocomposite placement area, one additional transmissivity test will be performed under the maximum normal stress (i.e., ~~23,421~~ 19,368 psf) or higher with all the same assumptions as the first three tests. The minimum transmissivity will be ~~9.94×10^{-4}~~ 1.28x10-3 m^2/s. The transmissivity of the double-sided geocomposite will be measured at a gradient of 0.33 under a minimum normal pressure of 1,000, 10,000, and 18,748 (or higher) psf, boundary conditions consisting of soil/geocomposite/geomembrane with a minimum seating time of 100 hours and will be performed for the first 100,000 square feet of liner construction. For each additional 100,000 square feet of double-sided geocomposite placement area, one additional transmissivity test will be performed under the maximum normal stress (i.e., 18,748 psf) or higher with all the same assumptions as the first three tests. The minimum transmissivity will be 6.24×10^{-5} m^2/s.

3 Overliner: As noted in Appendix IIIC, Appendix IIIC-A and IIIC-B, the transmissivity of the overliner double-sided geocomposite will be measured at a minimum gradient of 0.01 under a minimum normal pressure of 1,000, 10,000, and ~~13,720~~ 8,068 (or higher) psf, boundary conditions consisting of soil/geocomposite/geomembrane with minimum seating time of 100 hours and will be performed for the first 100,000 square feet of liner construction. The minimum transmissivity will be ~~2.77~~ 4.74×10^{-3} m^2/s. For each additional 100,000 square feet single-sided geocomposite placement area, one additional transmissivity test will be performed under the minimum normal stress of ~~13,720~~ 8,068 psf with all the same assumptions as the first three tests.

4 Minimum required property values are based on engineering judgment and experience with similar materials. However, each material will be tested prior to construction to verify that it meets the minimum required properties.



LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- STATE PLANE COORDINATE SYSTEM
- EXISTING CONTOUR
- SECTOR BOUNDARY
- MW-8 (453.3) — GROUNDWATER MONITORING WELL (SEE NOTE 4)
- 2 MW-12 (443.0) — OBSERVATION/MONITORING WELL (SEE NOTE 4)
- FORMER MW-5 (444.5) — FORMER MONITORING WELL (SEE NOTE 4)
- 1 OW-1 — PROPOSED WOODBINE MONITOR WELL
- CONSTRUCTED SUBTITLE D LINED AREA
- 450 — GROUNDWATER ELEVATION CONTOUR IN FT-MSL (SEE NOTE 3)
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
2. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
3. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. GROUNDWATER CONTOURS WERE PRODUCED USING EACH WELL'S HIGHEST RECORDED GROUNDWATER ELEVATION AND DO NOT REPRESENT A SINGLE GROUNDWATER MONITORING EVENT OR ACTUAL GROUNDWATER SURFACE.
4. VALUES SHOWN ARE THE HIGHEST MEASURED GROUNDWATER ELEVATIONS IN FT-MSL.

DRAFT

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IID-A-1 HIGH GW MAP.dwg

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
HIGHEST MEASURED GROUNDWATER MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL · NAPERVILLE, IL · COLUMBUS, OH · DENVER, CO · FORT WORTH, TX (817) 735-9770 · GRIFFITH, IN · SOUTH BEND, IN · SPRINGFIELD, IL · ST. LOUIS, MO

DRAWING IIID-A-1

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G:\1339\351\EXPANSION 2009\PART III-SDP\IIID\IID-A-1 HIGHEST GW MAP.dwg, afor4, 1:2

APPENDIX IIID-B

EXAMPLE BALLAST THICKNESS CALCULATIONS

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
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Includes pages IIID-B-1 through IIID-B-11

Prep By: CAM
Date: 3/9/2016

Chkd By: _____
Date: _____

CAMELOT LANDFILL
1339-351-11
EXAMPLE BALLAST THICKNESS CALCULATIONS
EVALUATION OF SIDEWALL LINER

Unit Weight of Water =	62.4	pcf	Thickness of Protective Cover - Vertical =	2.1	ft
Unit Weight of Protective Cover =	115	pcf	Thickness of Protective Cover - Normal =	2.0	ft
Unit Weight of Waste =	1200	pcy			

Evaluation Point	Highest Potentiometric Surface Elevation[2] E_{H2O} (ft-msl)	Elevation of Top of Clay Liner E_{liner} (ft-msl)	Maximum Groundwater Head Above Top of Clay Liner[3] H (ft)	Maximum Uplift Pressure Created by Groundwater Head P_{H2O} (psf)	Elevation of Top of Protective Cover - Vertical $E_{pc,\,v}$ (ft-msl)	Elevation of Top of Protective Cover - Normal $E_{pc,\,n}$ (ft-msl)	Counteracting Ballast Pressure from Protective Cover - Vertical $R_{pc,\,v}$ (psf)	Counteracting Ballast Pressure from Protective Cover - Normal $R_{pc,\,n}$ (psf)	Calculated Factor of Safety with Protective Cover Installed - Vertical	Calculated Factor of Safety with Protective Cover Installed - Normal	Factor of Safety - Vertical > 1.2?	Factor of Safety - Normal > 1.2?	Required Waste Thickness Needed for Ballast - Vertical[1] $T_{waste,\,v}$ (ft)	Required Waste Thickness Needed for Ballast - Normal[1] $T_{waste,\,n}$ (ft)	Required Top of Waste Elevation Needed for Ballast - Vertical $E_{waste,\,v}$ (ft-msl)	Required Top of Waste Elevation Needed for Ballast - Normal $E_{waste,\,n}$ (ft-msl)	Design Top of Waste Elevation - Vertical $E_{top\ waste,\,v}$ (ft-msl)	Design Top of Waste Elevation - Normal $E_{top\ waste,\,n}$ (ft-msl)	Required Waste Needed for Ballast Elevation < Design Top of Waste Elevation - Vertical?	Required Waste Needed for Ballast Elevation < Design Top of Waste Elevation - Normal?
1	441.6	423.8	17.8	1110.7	425.9	425.8	242	230	0.2	0.2	NO	NO	32.1	32.3	458.0	458.1	492.5	499.1	YES	YES
2	434.2	421.1	13.1	817.4	423.2	423.1	242	230	0.3	0.3	NO	NO	22.2	22.4	445.4	445.5	501.5	509.1	YES	YES
3	437.0	434.8	2.2	137.3	436.9	436.8	242	230	1.8	1.7	YES	YES	-	-	-	-	-	-	-	-
4	435.0	435.3	N/A	N/A	437.4	437.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	435.4	428.1	7.3	457.4	430.2	430.1	242	230	0.5	0.5	NO	NO	10.0	10.3	440.2	440.4	487.8	493.5	YES	YES
6	439.1	428.9	10.2	639.0	431.0	430.9	242	230	0.4	0.4	NO	NO	16.1	16.4	447.1	447.3	494.3	500.6	YES	YES
7	443.9	431.6	12.3	767.0	433.7	433.6	242	230	0.3	0.3	NO	NO	20.5	20.7	454.2	454.3	488.5	494.0	YES	YES
8	444.1	430.0	14.1	880.0	432.1	432.0	242	230	0.3	0.3	NO	NO	24.3	24.5	456.4	456.5	489.3	495.0	YES	YES
9	444.4	433.3	11.1	691.5	435.4	435.3	242	230	0.3	0.3	NO	NO	17.9	18.2	453.3	453.5	487.1	492.3	YES	YES
10	444.6	435.5	9.1	566.7	437.6	437.5	242	230	0.4	0.4	NO	NO	13.7	14.0	451.3	451.5	485.5	490.4	YES	YES
11	445.7	442.9	2.8	176.1	445.0	444.9	242	230	1.4	1.3	YES	YES	-	-	-	-	-	-	-	-
12	446.8	442.5	4.3	265.9	444.6	444.5	242	230	0.9	0.9	NO	NO	3.5	3.8	448.1	448.3	480.3	484.2	YES	YES
13	447.2	441.0	6.2	387.6	443.1	443.0	242	230	0.6	0.6	NO	NO	7.6	7.9	450.8	450.9	481.4	485.4	YES	YES
14	448.0	453.6	N/A	N/A	455.7	455.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	447.3	440.9	6.4	398.8	443.0	442.9	242	230	0.6	0.6	NO	NO	8.0	8.3	451.0	451.2	484.5	489.0	YES	YES
16	447.1	441.9	5.2	324.0	444.0	443.9	242	230	0.7	0.7	NO	NO	5.5	5.8	449.5	449.7	~~484.9~~ 485.2	~~489.1~~ 488.3	YES	YES
17	452.5	456.6	N/A	N/A	458.7	458.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	443.8	409.8	34.0	2,121.6	411.9	411.8	242	230	0.1	0.1	NO	NO	66.2	66.4	478.1	478.2	503.2	511.8	YES	YES
19	444.3	408.8	35.5	2,215.2	410.9	410.8	242	230	0.1	0.1	NO	NO	69.3	69.6	480.2	480.4	503.1	511.8	YES	YES
20	444.7	409.0	35.7	2,227.7	411.1	411.0	242	230	0.1	0.1	NO	NO	69.8	70.0	480.9	481.0	503.1	511.8	YES	YES
21	445.3	389.0	56.3	3,513.1	391.1	391.0	242	230	0.1	0.1	NO	NO	113.1	113.4	504.2	504.4	518.0	529.9	YES	YES
22	446.3	389.0	57.3	3,575.5	391.1	391.0	242	230	0.1	0.1	NO	NO	115.2	115.5	506.3	506.5	518.0	529.9	YES	YES
23	447.3	398.8	48.5	3,026.4	400.9	400.8	242	230	0.1	0.1	NO	NO	96.7	97.0	497.6	497.8	509.9	517.0	YES	YES
24	446.8	399.9	46.9	2,926.6	402.0	401.9	242	230	0.1	0.1	NO	NO	93.3	93.6	495.3	495.5	515.2	525.8	YES	YES
25	446.5	401.4	45.1	2,814.2	403.5	403.4	242	230	0.1	0.1	NO	NO	89.5	89.8	493.0	493.2	~~515.4~~ 514.1	~~526.0~~ 522.1	YES	YES
26	450.7	411.1	39.6	2,471.0	413.2	413.1	242	230	0.1	0.1	NO	NO	78.0	78.2	491.2	491.3	~~502.3~~ 500.9	~~506.9~~ 507.3	YES	YES
28	440.8	419.5	21.3	1,329.6	421.6	421.5	242	230	0.2	0.2	NO	NO	39.4	39.7	461.0	461.2	559.9	559.9	YES	YES
36	437.4	419.6	17.8	1,112.7	421.7	421.6	242	230	0.2	0.2	NO	NO	32.1	32.4	453.8	453.9	598.7	615.1	YES	YES
44	437.0	419.2	17.8	1,110.7	421.3	421.2	242	230	0.2	0.2	NO	NO	32.1	32.3	453.4	453.5	596.5	612.8	YES	YES
52	449.0	428.1	20.9	1,304.2	430.2	430.1	242	230	0.2	0.2	NO	NO	38.6	38.8	468.8	468.9	492.4	~~498.4~~ 497.0	YES	YES
59	444.5	414.3	30.2	1,884.5	416.4	416.3	242	230	0.1	0.1	NO	NO	58.2	58.4	474.6	474.7	~~694.3~~ 647.0	~~681.3~~ 644.5	YES	YES
60	446.3	417.1	29.2	1,822.1	419.2	419.1	242	230	0.1	0.1	NO	NO	56.1	56.3	475.3	475.4	~~641.2~~ 612.8	~~625.8~~ 601.5	YES	YES
62	449.9	421.5	28.4	1,772.2	423.6	423.5	242	230	0.1	0.1	NO	NO	54.4	54.6	478.0	478.1	~~553.3~~ 541.5	~~550.3~~ 538.9	YES	YES
70	449.3	456.0	N/A	N/A	458.1	458.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
82	450.0	443.5	6.5	405.6	445.6	445.5	242	230	0.6	0.6	NO	NO	8.3	8.5	453.9	454.0	~~663.4~~ 614.6	~~678.6~~ 623.5	YES	YES

[1] The required waste thickness needed for ballast in the vertical and normal direction, $T_{waste,\,v}$ and $T_{waste,\,n}$, was calculated using the minimum required factor of safety of 1.5 for waste and protective cover as ballast. See page IIID-B-6 for formula used for this calculation. In addition, ballast calculations will be adjusted for updated highest measured potentiometric surface. The highest measured potentiometric surface can only be adjusted upward.

[2] Refer to Section 6.2 for discussion on highest measured groundwater. Also see Drawing IIID-A-1 in Appendix IIID-A.

[3] The highest measured groundwater contours are compared to excavation contours to verify the impact of groundwater. The ballast evaluation has been performed for the geomembrane liner elevations (i.e., top of compacted clay liner); therefore if the groundwater head is below the geomembrane elevation ballast is not applicable.

Prep By: CAM
Date: 3/9/2016

Chkd By: _____
Date: _____

CAMELOT LANDFILL
1339-351-11
EXAMPLE BALLAST THICKNESS CALCULATIONS
EVALUATION OF FLOOR LINER

Unit Weight of Water = 62.4 pcf
Unit Weight of Protective Cover = 115 pcf
Unit Weight of Waste = 1200 pcy

Thickness of Protective Cover = 2.0 ft

Evaluation Point	Highest Potentiometric Surface Elevation[2] E_{H20} (ft-msl)	Elevation of Top of Clay E_{liner} (ft-msl)	Maximum Groundwater Head Above Top of Clay Liner H (ft)	Maximum Uplift Pressure Created by Groundwater Head P_{H20} (psf)	Elevation of Top of Protective Cover E_{pc} (ft-msl)	Counteracting Ballast Pressure from Protective Cover R_{pc} (psf)	Calculated Factor of Safety with Protective Cover Installed FS_{pc}	Factor of Safety > 1.2?	Required Waste Thickness Needed for Ballast T_{waste} (ft)[1]	Required Top of Waste Elevation Needed for Ballast E_{waste} (ft-msl)	Design Top of Waste Elevation $E_{top\ waste}$ (ft-msl)	Required Waste Needed for Ballast Elevation < Design Top of Waste Elevation?
27	438.5	426.3	12.2	761.3	428.3	230	0.3	NO	20.5	448.8	525.8	YES
29	441.7	413.5	28.2	1,760.7	415.5	230	0.1	NO	54.2	469.7	558.0	YES
30	442.6	413.9	28.7	1,792.3	415.9	230	0.1	NO	55.3	471.2	558.7	YES
31	443.6	414.2	29.4	1,836.0	416.2	230	0.1	NO	56.8	473.0	559.4	YES
32	444.7	394.6	50.1	3,126.5	396.6	230	0.1	NO	100.3	496.9	560.1	YES
33	445.4	397.7	47.7	2,975.5	399.7	230	0.1	NO	95.2	495.0	560.8	YES
34	446.2	395.1	51.1	3,188.9	397.1	230	0.1	NO	102.4	499.5	559.4	YES
35	436.6	423.3	13.3	829.9	425.3	230	0.3	NO	22.8	448.1	523.7	YES
37	438.9	414.9	24.0	1,496.9	416.9	230	0.2	NO	45.3	462.3	633.0	YES
38	440.3	415.3	25.0	1,559.9	417.3	230	0.1	NO	47.5	464.8	633.7	YES
39	441.7	414.9	26.8	1,672.6	416.9	230	0.1	NO	51.3	468.2	634.4	YES
40	442.9	400.1	42.8	2,669.2	402.1	230	0.1	NO	84.9	487.0	635.1	YES
41	444.3	399.1	45.2	2,817.6	401.1	230	0.1	NO	89.9	491.1	634.5	YES
42	445.5	397.4	48.1	2,999.3	399.4	230	0.1	NO	96.1	495.5	567.2	YES
43	435.9	420.3	15.6	973.4	422.3	230	0.2	NO	27.7	450.0	521.6	YES
45	438.0	416.3	21.7	1,351.6	418.3	230	0.2	NO	40.4	458.8	~~671.5~~ 649.7	YES
46	439.1	416.6	22.5	1,401.2	418.6	230	0.2	NO	42.1	460.8	~~699.3~~ 655.6	YES
47	440.4	416.4	24.0	1,495.1	418.4	230	0.2	NO	45.3	463.7	~~699.4~~ 655.7	YES
48	442.2	418.1	24.1	1,505.5	420.1	230	0.2	NO	45.6	465.7	~~699.3~~ 655.8	YES
49	444.0	401.9	42.1	2,629.9	403.9	230	0.1	NO	83.6	487.4	~~656.7~~ 643.9	YES
50	445.3	402.0	43.3	2,699.7	404.0	230	0.1	NO	85.9	490.0	~~589.6~~ 572.6	YES
51	447.2	403.0	44.2	2,760.5	405.0	230	0.1	NO	88.0	493.0	~~536.2~~ 528.8	YES
53	437.1	417.2	19.9	1,241.8	419.2	230	0.2	NO	36.7	455.9	522.5	YES
54	437.9	418.0	19.9	1,241.8	420.0	230	0.2	NO	36.7	456.7	598.0	YES
55	438.5	417.8	20.7	1,293.7	419.8	230	0.2	NO	38.5	458.3	~~671.0~~ 649.6	YES
56	439.5	418.0	21.5	1,342.3	420.0	230	0.2	NO	40.1	460.1	~~705.1~~ 661.5	YES
57	441.0	418.8	22.2	1,385.3	420.8	230	0.2	NO	41.6	462.4	~~711.4~~ 667.6	YES
58	442.8	418.8	24.0	1,498.6	420.8	230	0.2	NO	45.4	466.2	~~707.0~~ 658.2	YES
61	448.1	405.5	42.6	2,657.2	407.5	230	0.1	NO	84.5	492.0	~~597.1~~ 577.1	YES
63	439.1	418.7	20.4	1,273.0	420.7	230	0.2	NO	37.8	458.5	525.1	YES
64	439.3	418.3	21.0	1,310.4	420.3	230	0.2	NO	39.1	459.4	599.9	YES
65	440.0	419.9	20.1	1,254.2	421.9	230	0.2	NO	37.2	459.1	~~674.7~~ 650.2	YES
66	440.6	421.5	19.1	1,191.8	423.5	230	0.2	NO	35.0	458.5	~~705.8~~ 661.3	YES
67	442.2	422.3	19.9	1,241.8	424.3	230	0.2	NO	36.7	461.0	~~717.9~~ 668.9	YES
68	444.0	421.6	22.4	1,397.8	423.6	230	0.2	NO	42.0	465.6	~~713.9~~ 663.7	YES
69	445.8	423.8	22.0	1,372.8	425.8	230	0.2	NO	41.2	467.0	~~705.3~~ 652.3	YES
71	441.4	419.5	21.9	1,366.6	421.5	230	0.2	NO	40.9	462.4	520.9	YES
72	441.1	420.6	20.5	1,279.2	422.6	230	0.2	NO	38.0	460.6	595.9	YES
73	441.7	422.5	19.2	1,198.1	424.5	230	0.2	NO	35.3	459.8	~~670.8~~ 646.8	YES
74	442.5	424.4	18.1	1,129.4	426.4	230	0.2	NO	32.9	459.3	~~705.2~~ 653.0	YES
75	443.9	425.3	18.6	1,160.6	427.3	230	0.2	NO	34.0	461.3	~~712.5~~ 659.0	YES
76	445.6	424.6	21.0	1,310.4	426.6	230	0.2	NO	39.1	465.7	~~715.3~~ 657.5	YES
77	447.6	426.4	21.2	1,322.9	428.4	230	0.2	NO	39.5	467.9	~~714.4~~ 649.6	YES
78	444.4	427.4	17.0	1,060.8	429.4	230	0.2	NO	30.6	460.0	~~698.0~~ 628.7	YES
79	446.0	428.5	17.5	1,092.0	430.5	230	0.2	NO	31.7	462.2	~~700.8~~ 649.4	YES
80	447.8	427.4	20.4	1,273.0	429.4	230	0.2	NO	37.8	467.2	~~703.6~~ 647.6	YES
81	449.0	432.0	17.0	1,060.8	434.0	230	0.2	NO	30.6	464.6	~~645.6~~ 606.5	YES

[1] The required waste thickness needed for ballast, T_{waste}, was calculated using the minimum required factor of safety of 1.5 for waste and protective cover as ballast. See page IIID-B-6 for formula used in this calculation. In addition, ballast calculations will be adjusted for updated highest measured potentiometric surface. The highest measured potentiometric surface can only be adjusted upward.

[2] Refer to Section 5.2 for discussion on highest measured groundwater. The highest measured groundwater contours used for the calculations are shown on Sheet IIID-B-8.

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7063000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- MW-8 — GROUNDWATER MONITORING WELL
- GMP-1 — GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL
- 1 OW-1 — PROPOSED WOODBINE MONITOR WELL
- 420 — EXISTING TOP OF LINER
- 394 — PROPOSED EXCAVATION CONTOUR
- 450 — GROUNDWATER ELEVATION CONTOUR IN FT-MSL (SEE NOTE 3)
- 440 — TOP OF SHALE ELEVATION CONTOUR IN FT-MSL (SEE NOTE 6)
- 3 443.1 — BALLAST EVALUATION POINT (SEE NOTE 4)
- GROUNDWATER SEEPAGE SURFACE (SEE NOTE 7)
- EXTENT OF EXISTING GEOCOMPOSITE UNDERDRAIN
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
2. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
3. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
4. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. GROUNDWATER CONTOURS WERE PRODUCED USING EACH WELL'S HIGHEST RECORDED GROUNDWATER ELEVATION AND DO NOT REPRESENT A SINGLE GROUNDWATER MONITORING EVENT OR ACTUAL GROUNDWATER SURFACE.
4. BALLAST EVALUATION POINT IS SHOWN WITH CALCULATED TOP OF WASTE ELEVATION REQUIRED FOR BALLAST IN THE VERTICAL DIRECTION (IN FT-MSL). N/A INDICATES THAT PROTECTIVE COVER IS SUFFICIENT BALLAST.
5. REFER TO APPENDIX IIID-C FOR DEWATERING SYSTEM INFORMATION.
6. TOP OF UNWEATHERED SHALE CONTOURS HAVE BEEN REPRODUCED FROM TOP OF SHALE MAP INCLUDED IN APPENDIX IIIG-C.
7. THE SHADED AREA INDICATES THE AREA FROM THE TOP OF HIGHEST MEASURED GROUNDWATER TO THE TOP OF THE UNWEATHERED SHALE AS DEFINED IN APPENDIX IIIG.

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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIID-B-8 BALLAST ELEV.dwg

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
3	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT BALLAST ELEVATION SITE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIID-B-8

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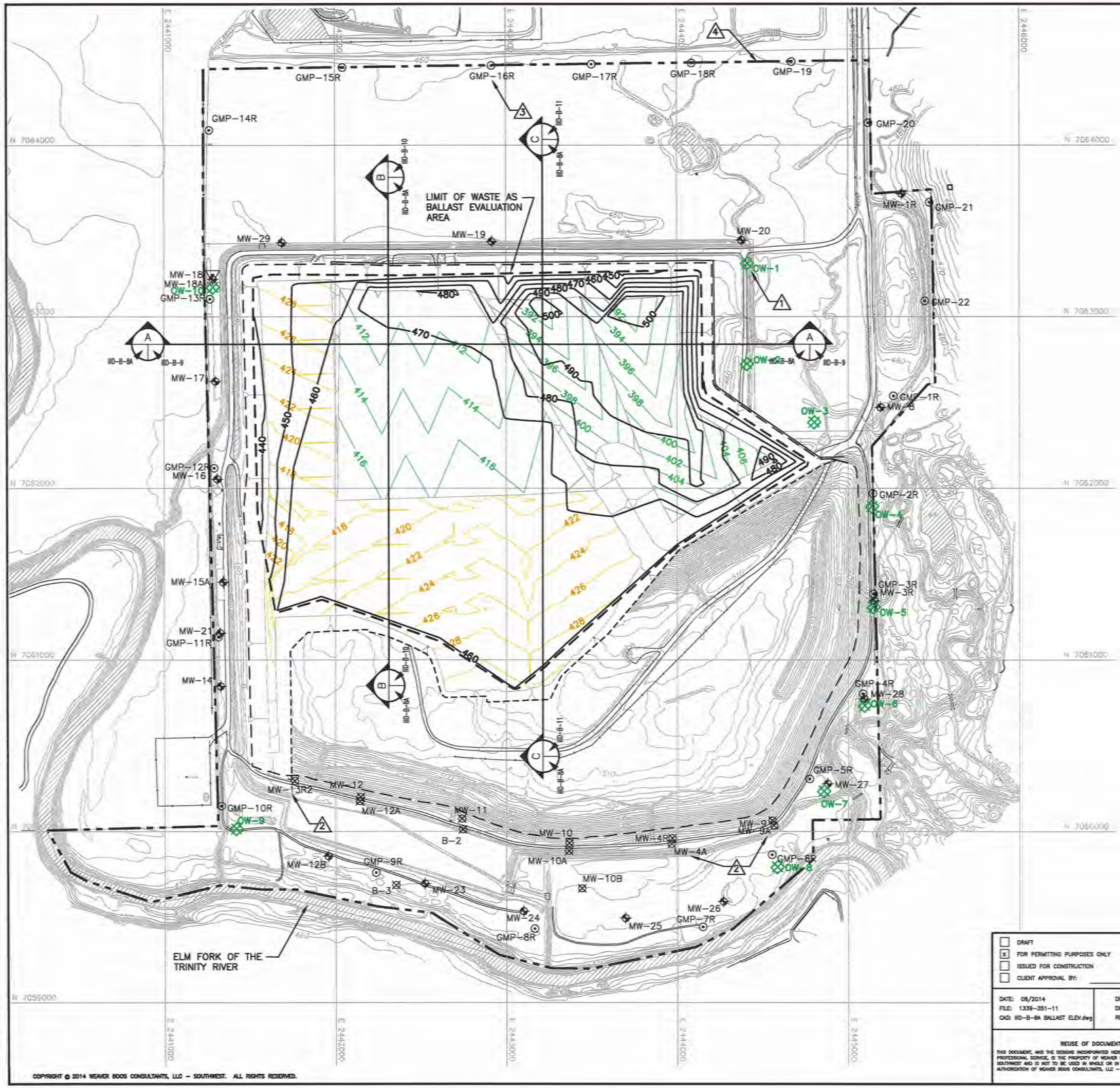
O:\1339\351\EXPANSION 2009\PART III-SDP\IIID\IIID-B-8 BALLAST ELEVATION.dwg, sfor4, 1:2



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- STATE PLANE COORDINATE SYSTEM
- EXISTING CONTOUR
- MW-8 GROUNDWATER MONITORING WELL
- GMP-1 GAS MONITORING PROBE
- MW-12 OBSERVATION/MONITORING WELL
- OW-1 PROPOSED WOODBINE MONITOR WELL
- 420 EXISTING TOP OF LINER
- 394 PROPOSED EXCAVATION CONTOUR
- 500 REQUIRED WASTE-AS-BALLAST ELEVATION (FT-MSL)
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
2. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
3. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
4. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. VALUE SHOWN IS THE REQUIRED WASTE THICKNESS FOR BALLAST IN THE VERTICAL DIRECTION AND IS CALCULATED FROM THE TOP OF PROTECTIVE COVER SURFACE.

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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 08/2014
FILE: 1339-351-11
CAD: IIID-B-8A BALLAST ELEV.dwg

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	10/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT BALLAST THICKNESS MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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SHEET IIID-B-8A

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APPENDIX IIID-C

TEMPORARY DEWATERING SYSTEM DESIGN

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON
8-5-16
IT IS NOT TO BE USED FOR CONSTRUCTION,
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Includes pages IIID-C-1 through IIID-C-82

As shown on Sheets IIID-C-48 through IIID-C-50, the dewatering geocomposite installed on the lower sideslope will convey any potential groundwater to trenches located at the toe of excavation. The trench located at the toe of the excavation will be lined with a geotextile and contain a 4-inch-diameter perforated pipe enveloped with gravel. Groundwater collected by trenches will drain to underdrain sumps that will be located underneath the leachate collection sumps. Any groundwater collected in the sump will be pumped to the perimeter stormwater system and discharged from the site consistent with TPDES Stormwater Permit.

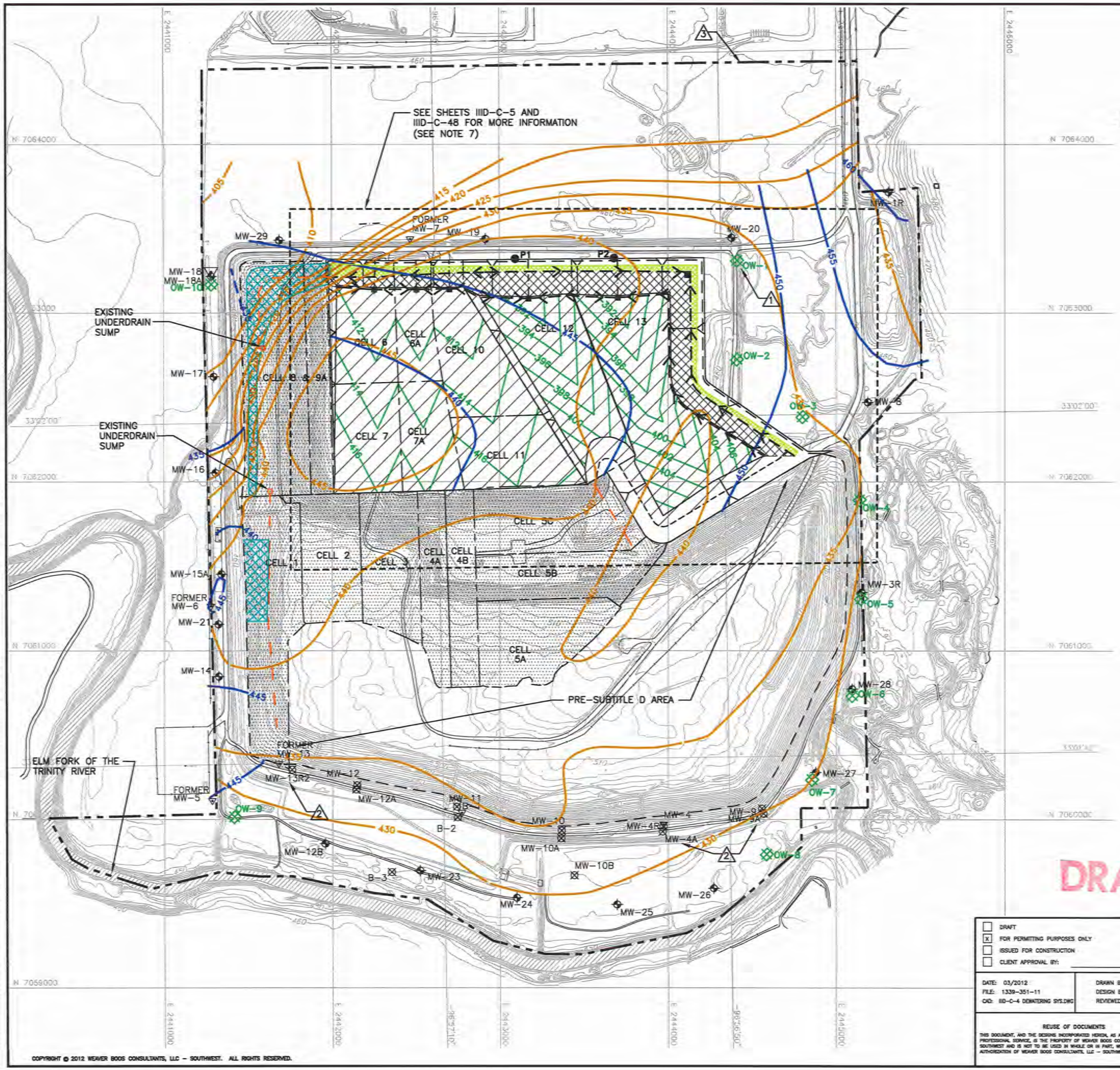
Calculations and design information for the dewatering system design is presented on page IIID-C-47.

Woodbine Water Level Verification Procedure

The temporary dewatering system design discussed above has been developed to collect groundwater in the Alluvial Strata (Lower Sand Zone discussed in Appendix IIIG, Section 2.1.1.2 – Lower Sand Zone). Below the uppermost groundwater zone, the Shale Strata provides a bottom layer (or aquiclude) to the groundwater in the Woodbine Strata (refer to Appendix IIIG, Section 2.1.3 – Woodbine Strata). The top of Woodbine is discussed in Appendix IIIG and depicted on Figure IIIG-C-12. A section that shows the top of Woodbine Strata is shown on Figure IIIG-C-2. The Shale Strata acts as the barrier layer between the bottom of the landfill and the Woodbine Strata. As shown on Sheet IIID-C-5, the bottom of future excavation areas extend below the top of the Shale Strata. Cells 12 and 13 are significantly deeper than the other undeveloped cells and the EDE for these cells is 387 ft-msl. The top of Woodbine elevation in the Cell 12 and 13 area ranges from about 340 ft-msl to 350 ft-msl.

As part of site exploration, borehole WB-4 was drilled to the Woodbine Formation (refer to Figure IIIG-C-2 in Appendix IIIG). The water level in the Woodbine Formation was observed to be about 2.5 feet below the bottom of the Shale Strata. Based on this information, the Woodbine is unconfined below the Cell 12 and 13 area. However, two piezometers will be installed within one year of the issuance of TCEQ Permit No. 1312B to verify that hydrostatic head on the Woodbine Strata does not adversely impact the overlying Shale Strata. In addition, ten Woodbine wells (OW-1 through OW-10), discussed in Appendix G, Section 2.1.5, will also be used to define the potentiometric surface of the Woodbine Formation. The locations of the piezometers are shown on Sheet IIID-C-5.

The POR will ensure that the piezometers are properly installed in the Woodbine Strata and sealed to prevent any interference from the groundwater found in the upper Alluvial



LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- EXISTING CONTOUR
- SECTOR BOUNDARY
- EXCAVATION CONTOUR
- MW-8 GROUNDWATER MONITORING WELL
- MW-12 OBSERVATION/MONITORING WELL
- FORMER MW-5 FORMER MONITORING WELL
- OW-1 PROPOSED WOODBINE MONITOR WELL
- CONSTRUCTED SUBTITLE D LINED AREA
- TOP OF SHALE ELEVATION CONTOUR IN FT-MSL
- GROUNDWATER ELEVATION CONTOUR IN FT-MSL (SEE NOTE 4)
- DEWATERING SUMP
- P1 OBSERVATION PIEZOMETER
- PROPOSED 4-INCH HDPE SDR-17 DEWATERING PIPE
- UPPER SIDESLOPE GEOCOMPOSITE UNDERDRAIN (SEE NOTE 5)
- EXTENT OF EXISTING GEOCOMPOSITE UNDERDRAIN
- LOWER SIDESLOPE GEOCOMPOSITE UNDERDRAIN (SEE NOTE 7)
- APPROXIMATE AREA OF EXCAVATION FOUNDED IN THE UNWEATHERED SHALE
- LOCATION OF EXISTING DEWATERING TRENCH
- INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
2. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
3. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. TOP OF UNWEATHERED SHALE CONTOURS HAVE BEEN REPRODUCED FROM TOP OF SHALE MAP INCLUDED IN APPENDIX IIIG-C.
4. GROUNDWATER CONTOURS WERE PRODUCED USING EACH WELL'S HIGHEST RECORDED GROUNDWATER ELEVATION AND DO NOT REPRESENT A SINGLE GROUNDWATER MONITORING EVENT OR ACTUAL GROUNDWATER SURFACE.
5. THE SHADED AREA INDICATES THE AREA FROM THE TOP OF HIGHEST MEASURED GROUNDWATER TO THE TOP OF THE UNWEATHERED SHALE AS DEFINED IN APPENDIX IIIG.
6. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G., CHANNELS) ARE TYPICALLY 3(H):1(V).
7. SHEET IIID-C-5 SHOWS UPPER SIDESLOPE TEMPORARY DEWATERING SYSTEM. REFER TO SHEET IIID-C-48 FOR THE LOWER SIDESLOPE TEMPORARY DEWATERING SYSTEM LAYOUT.

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DATE: 03/2012
FILE: 1339-351-11
CAD: IID-C-4 DEWATERING SYS.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
3	10/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT DEWATERING SYSTEM LAYOUT

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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SHEET IIID-C-4

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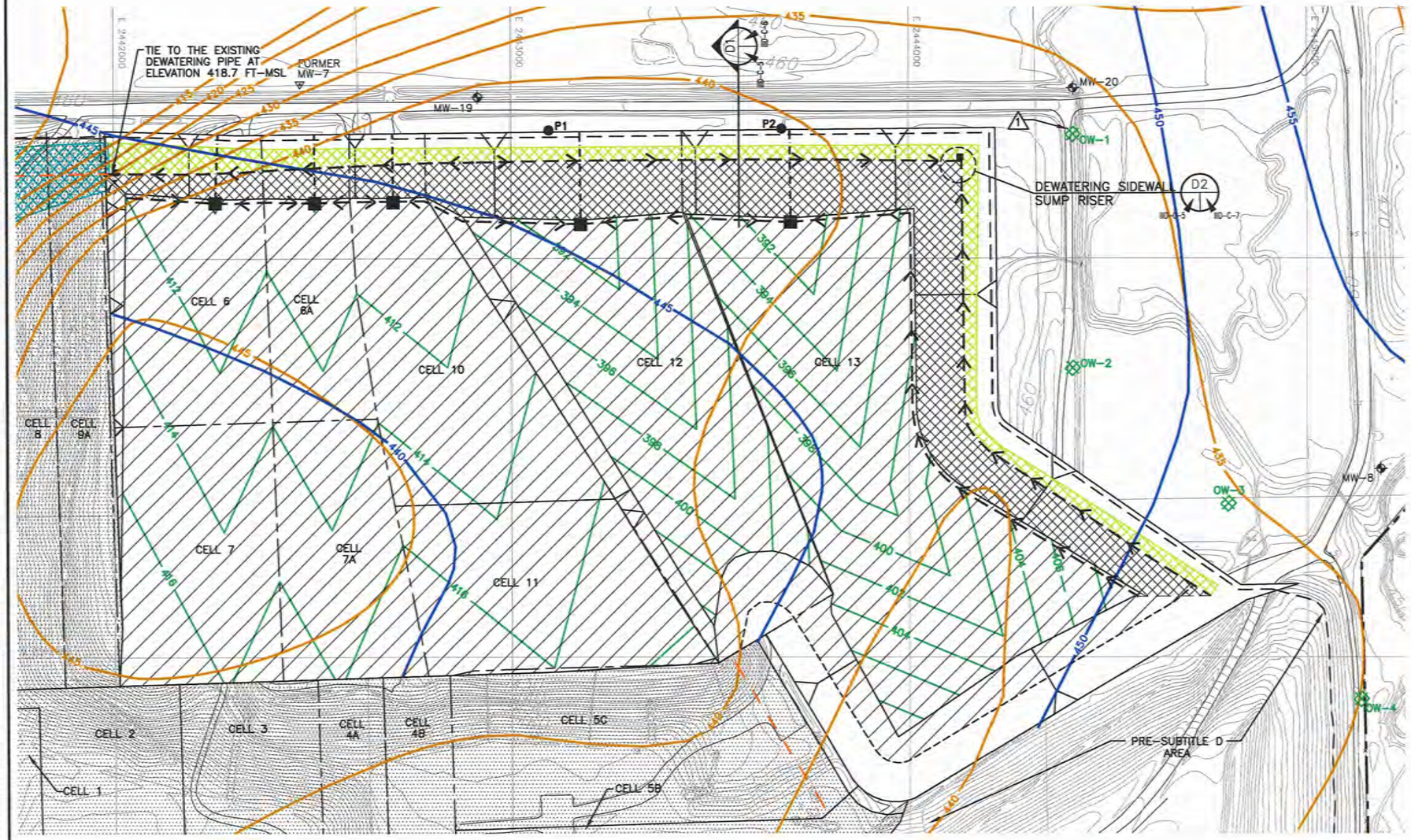
G:\1339\351\EXPANSION 2009\PART III-SDP\IID\SUPPLEMENTAL SUBMITTAL\IID-C-4 DEWATERING SYSTEM LAYOUT.dwg, sford, 1:2



LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- N 7063000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- SECTOR BOUNDARY
- 398 — EXCAVATION CONTOUR
- MW-3R — EXISTING GROUNDWATER MONITORING WELL
- MW-10 — EXISTING OBSERVATION/MONITORING WELL
- FORMER MW-7 — FORMER MONITORING WELL
- 1 OW-1 — PROPOSED WOODBINE MONITOR WELL
- CONSTRUCTED SUBTITLE D LINED AREA
- 440 — TOP OF SHALE ELEVATION CONTOUR IN FT-MSL (SEE NOTE 2)
- 450 — GROUNDWATER ELEVATION CONTOUR IN FT-MSL (SEE NOTE 3)
- DEWATERING SUMP
- P1 — OBSERVATION PIEZOMETER (SEE NOTE 6)
- PROPOSED 4-INCH HDPE SDR-17 DEWATERING PIPE
- UPPER SIDESLOPE GEOCOMPOSITE UNDERDRAIN (SEE NOTE 4)
- EXTENT OF EXISTING GEOCOMPOSITE UNDERDRAIN
- LOWER SIDESLOPE GEOCOMPOSITE UNDERDRAIN
- APPROXIMATE AREA OF EXCAVATION FOUNDED IN THE UNWEATHERED SHALE
- LOCATION OF EXISTING DEWATERING TRENCH
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983.
2. TOP OF UNWEATHERED SHALE CONTOURS HAVE BEEN REPRODUCED FROM TOP OF SHALE MAP INCLUDED IN APPENDIX IIIG-C.
3. GROUNDWATER CONTOURS WERE PRODUCED USING EACH WELL'S HIGHEST RECORDED GROUNDWATER ELEVATION AND DO NOT REPRESENT A SINGLE GROUNDWATER MONITORING EVENT OR ACTUAL GROUNDWATER SURFACE.
4. THE SHADED AREA INDICATES THE AREA FROM THE TOP OF HIGHEST MEASURED GROUNDWATER TO THE TOP OF THE UNWEATHERED SHALE AS DEFINED IN APPENDIX IIIG.
5. EXCAVATION SLOPES AND SLOPES OUTSIDE THE LIMIT OF WASTE (E.G., CHANNELS) ARE TYPICALLY 3(H):1(V).
6. P1 AND P2 OBSERVATION PIEZOMETERS WILL BE INSTALLED TO MONITOR GROUNDWATER LEVELS IN THE WOODBINE FORMATION WITHIN ONE YEAR OF ISSUANCE OF PERMIT NUMBER 1312B, AND WILL BE DECOMMISONED UPON APPROVAL FOR THE DEWATERING SYSTEM INSTALLED FOR THE ALLUVIAL SAND LAYER. P2 WILL BE INSTALLED TWO MONTHS PRIOR TO COMMENCEMENT OF LINER CONSTRUCTION FOR THE SUMP AREA OF CELL 13 AND WILL BE DECOMMISSIONED UPON APPROVAL OF CELL 13 SLER BY TCEQ. REFER TO PAGE IIID-C-1 FOR ADDITIONAL DISCUSSION.

DRAFT

LIST OF REVISIONS:

1. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.

N

0 150 300
SCALE IN FEET

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IID-C-5 UNDEV. AREA.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	10/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT DEWATERING SYSTEM LAYOUT

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL
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SHEET IIID-C-5

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIID\SUPPLEMENTAL SUBMITTAL\IIID-C-5 DEWAT. UNDEV.AREA.dwg, sfordi, 1:2

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIE
FINAL COVER SYSTEM QUALITY CONTROL PLAN

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised June 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, TX 76109
817-735-9770

Project No. 1339-351-11-02-6B.5

4 CONSTRUCTION QUALITY ASSURANCE FOR EROSION LAYER

The erosion layer will consist of a minimum of 24 inches of earthen material. The erosion layer will be capable of sustaining native and introduced vegetative growth and must be seeded immediately after completion of the final cover. The erosion layer will be seeded with a mixture that will include Bermuda, vetch, rye, wheat grass, wild flowers, and flowering plants. Temporary or permanent erosion control materials may be used to minimize erosion and aid establishment of vegetation. The physical characteristics of the erosion layer will be evaluated through visual observation (and laboratory testing if deemed necessary by the POR) before construction and visual observation during construction. Additional testing during construction will be at the discretion of the POR.

The erosion layer may be placed using any appropriate equipment capable of completing the work and should only receive minimal compaction required for stability. Under no circumstances will the construction equipment come in direct contact with the installed geosynthetics. Equipment used to install the erosion layer must meet the requirement of Section 3.5.

The thickness of the erosion layer will be verified with surveying procedures at a minimum of one survey point per 10,000 square feet of constructed area by a licensed Texas surveyor with a minimum of one reference point. The survey results for the erosion layer will be included in the FCSER.

During construction the CQA monitor will:

- Verify that grade control is performed prior to work.
- Verify that underlying geosynthetic installations are not damaged during placement operations or by survey grade controls. Mark damaged geosynthetics and verify that damage is repaired.
- Monitor haul-road thickness over installed geosynthetics and verify that equipment hauling and material placement meet equipment specifications. (See Section 3.5).
- The POR will coordinate with the project surveyor to perform a thickness verification survey of the erosion layer materials upon completion of placement operations. Verify corrective action measures as determined by the verification survey. Thickness surveying to determine the minimum erosion layer thickness will be performed similar to the infiltration layer thickness verification shown in Table 2-1.

APPENDIX IIIE-A

COMPOSITE FINAL COVER DRAINAGE LAYER DESIGN

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Includes pages IIIE-A-1 through IIIE-A-40

Solution:

1. Sideslope

1.1 Estimate the percolation into the drainage geocomposite from the erosion layer.

Calculate the flow entering the geocomposite from unit area of erosion layer (q_f):

k_{cover} = 1.2E-04 cm/s

$q_f = k_{cover} * i$ (i is the gradient of water percolating within the drainage layer, and it is equal to 1 for vertical percolation.)

q_f = 1.2E-4 cm/s * 1 / (30.48 cm/ 1 ft)

q_f = 3.94E-06 cfs/sf

Calculate the maximum flow in drainage geocomposite on sideslope:

L = ~~120~~ **150** ft, longest flow length between two drain pipes on sideslope.

$q_p = q_f * L$

q_p = ~~0.00047~~ **0.00059** sf/s

1.2 Determine the transmissivity of the specified drainage geocomposite.

Final Cover Drainage Layer Thickness:

Specified Design:
Drainage layer consists of geocomposite drainage layer - double-sided 250 mil geonet with 6 oz/sy geotextiles.

Assume the final cover drainage layer will undergo compression due to the weight of soil (erosion layer).

Unloaded Geocomposite Drainage Layer Thickness =	0.250	in
Unit Weight of Erosion Layer Soil =	116	pcf
Thickness of Erosion Layer =	2	ft

Table 1.1 - Final Cover Drainage Layer Thickness

Fill Condition	Slope[4] %	d_s[1] (ft)	P[2] (psf)	t[3] (in)	t[3] (m)
Closed (sideslope)	25	2.064	239	0.245	0.006

[1] d_s is the vertical thickness of soil above the final cover drainage layer.

[2] P is the pressure on the final cover drainage layer due to the weight of the erosion layer soil.

[3] t is the thickness of the final cover drainage layer after being subjected to compression based on the chart in the next page adapted from Reference 7.

[4] **This calculation also conservatively represents the portions of the final cover designed with 20% sideslopes.**

Calculate the Design Transmissivity (T_{DES}):

Table 1.3 - Transmissivity of the Specified Geocomposite Material

Fill Condition	P[1] (psf)	t[2] (in)	T[3] (m^2/s)	ORF[4]	T_{DES}[5] (m^2/s)	T_{DES} (sf/s)
Closed (sideslope)	239	0.245	5.69E-04	5.28	1.08E-04	1.16E-03

[1] P is the pressure on the final cover drainage layer due to the weight of erosion layer from Table 1.1.

[2] t is the drainage layer thickness from Table 1.1.

[3] T is obtained from the specified transmissivity values for a representative geocomposite drainage layer (250-mil-thick geonet with 6 oz/sy geotextiles) as shown on Sheet IIIE-A-18.

[4] ORF is the Overall Reduction Factor obtained from Table 1.2.

[5] T_{DES} is the design transmissivity value calculated using the following equation:

$$T_{DES} = T / ORF$$

Determine the capacity of the drainage geocomposite based on the estimated transmissivity and compare to the estimated flow rate that occurs due to infiltration.

T_{DES}	>	q_p
(flow capacity of the drainage geocomposite per unit width)		(estimated flow in the drainage geocomposite per unit width)
0.00116 sf/s	>	~~0.00047~~ **0.00059** sf/s

Since the capacity of the drainage geocomposite is greater than the estimated flow in the geocomposite, the actual flow depth is contained within the geocomposite and the design is acceptable. Therefore, the maximum spacing between the drain pipes located on the sideslopes may be up to ~~120~~ **150** feet. The distance between the pipes is no more than ~~120~~ **150** feet as shown on Sheet IIIE-A-20.

1.3 Determine pipe size required to convey the design flow for the specified pipe length and pipe outlet spacing.

Maximum Flow to Collection Pipe for Various Pipe Lengths:

$$Q_{max} = L_{p\text{-}max} \times q_p$$

Pipe Length, $L_{p\text{-}max}$ (ft)	Flow per Unit Length of Pipe, q_p (cfs/ft)	Maximum Pipe Flow, Q_{max}[1] (cfs)
< ~~350~~ **275**	~~0.00047~~ **0.00059**	~~0.165~~ **0.162**
~~350~~**275**-~~1050~~**850**	~~0.00047~~ **0.00059**	~~0.496~~ **0.502**
~~1050~~**850**-~~1100~~**1100**	~~0.00047~~ **0.00059**	~~0.520~~ **0.650**

[1] Maximum pipe flow is calculated using the maximum pipe length in each range.

Capacity of collection pipe:

Use Manning Equation to determine the pipe capacity.

Pipe Capacity (Q_{pc}):

$$Q_{pc} = \frac{1.49AR^{2/3}S^{1/2}}{n}$$ (from Chapter 10 of Ref 2)

where:

Q_{pc}: Full flow pipe capacity (cfs)
d: Diameter (inches), HDPE ADS collection pipe
A: Flow area (sf), Cross section of pipe
P: Perimeter (ft)
R: Hydraulic radius (ft) = Cross section (A) / Perimeter (P)
S: Pipe slope (ft/ft)
n: Manning roughness coefficient

Pipe Capacity for Different Pipe Sizes						
d (inches)	A (sf)	P (ft)	R (ft)	S (ft/ft)	n	Q_{pc} (cfs)
4	0.09	1.05	0.08	0.005	0.010	0.175
6	0.20	1.57	0.13	0.005	0.010	0.517
8	0.35	2.09	0.17	0.005	0.010	1.114

Fullness Ratio of Pipe (f):

$f = Q_{max}/Q_{pc}$

Fullness Ratio of Pipe (f)					
Fill Condition	Pipe Length (ft)	d (inches)	Q_{max} (cfs)	Q_{pc} (cfs)	f
Closed (sideslope)	< ~~350~~ **275**	4	~~0.165~~ **0.162**	0.175	~~0.94~~ **0.93**
	~~350~~**275**~~-1050~~**850**	6	~~0.496~~ **0.502**	0.517	~~0.96~~ **0.97**
	~~1050~~**850**~~-1100~~**1100**	8	~~0.520~~ **0.650**	1.114	~~0.47~~ **0.58**

Conclusion: A pipe size of 4, 6 or 8 inches is acceptable for the sideslope area when the flow length is between 0 - 120 feet.

2. Topslope

2.1 Determine the transmissivity of the specified drainage geocomposite.

Final Cover Drainage Layer Thickness:

Specified Design:
Drainage layer consists of geocomposite drainage layer - single-sided 250 mil geonet with 6 oz/sy geotextile.

Assume the final cover drainage layer will undergo compression due to the weight of soil (erosion layer).

Unloaded Geocomposite Drainage Layer Thickness =	0.250	in
Unit Weight of Erosion Layer Soil =	116	pcf
Thickness of Erosion Layer =	2	ft

Table 2.1 - Final Cover Drainage Layer Thickness

Fill Condition	Slope[4] %	d_S[1] (ft)	P[2] (psf)	t[3] (in)	t[3] (m)
Closed (topslope)	4	2.002	232	0.245	0.006

[1] d_S is the vertical thickness of soil above the final cover drainage layer.

[2] P is the pressure on the final cover drainage layer due to the weight of the erosion layer soil.

[3] t is the thickness of the final cover drainage layer after being subjected to compression based on the chart shown above in Step 1.2 adapted from Reference 7.

[4] **This calculation also conservatively represents the portions of the final cover designed with 20% sideslopes.**

Reduction Factors for Strength and Environmental Conditions:

Table 2.2 - Factors of Safety

Reduction Factors		Closed Condition
RF_{IN}	Delayed Intrusion	1.1
RF_{CC}	Chemical Clogging	1.2
RF_{BC}	Biological Clogging	2.0
Total Reduction Factor[2]		2.64

Overall Factor of Safety to Account For Uncertainties	2.0
Overall Reduction Factor (ORF)[3]	5.28

[1] Values are obtained from References 1, 5, and 6.

[2] The Total Reduction Factor is the product of all the reduction factors.

[3] The Overall Reduction Factor is the product of the Total Reduction Factor and Overall Factor of Safety to Account For Uncertainties.

Required Transmissivity Data:

The required minimum transmissivity for the 250-mil-thick single-sided geocomposite is shown on Sheet IIIE-A-19.

Calculate the Design Transmissivity (T_{DES}):

Table 2.3 - Required Transmissivity

Fill Condition	P[1] (psf)	t[2] (in)	T[3] (m^2/s)	ORF[4]	T_{DES}[5] (m^2/s)	k[6] (cm/s)
Closed (topslope)	232	0.245	2.20E-03	5.28	4.17E-04	6.70

[1] P is the pressure on the final cover drainage layer due to the weight of erosion layer from Table 2.1.

[2] t is the drainage layer thickness from Table 2.1.

[3] T is obtained from the specified transmissivity values for a representative geocomposite drainage layer (250-mil-thick geonet with 6 oz/sy polypropylene geotextile) as shown on Sheet IIIE-A-19.

[4] ORF is the Overall Reduction Factor obtained from Table 2.2.

[5] T_{DES} is the design transmissivity value calculated using the following equation:

$$T_{DES} = T / (\text{FS Factor})$$

[6] k is the hydraulic conductivity and calculated using the following equation:

$$k = T_{DES} / t$$

2.2 Use HELP to demonstrate that the proposed pipe spacing and single-sided drainage geocomposite are adequate to prevent the erosion layer from becoming completely saturated. The maximum pipe spacing ($L_{s\text{-}max}$) for the closed 4% topslope scenario is 330 feet. The scenario analyzed in the HELP model used a model area of ~~4.6~~ 4.7 acres which represents the largest estimated area that would contribute to a particular drainage collection pipe. Additionally, based on this maximum spacing and as shown in the HELP model results, the maximum head on the final cover geomembrane is 22.24 inches. In this situation, the 24-inch erosion layer above the geocomposite/liner does not become entirely saturated. Final cover stability calculations are provided in Appendix IIIJ.

Verify that the Erosion Layer will not be impacted by uplift.

Uplift may occur if the depth of water in the geocomposite exceeds the thickness of the geocomposite. As noted above, the maximum water depth on the geomembrane is 22.24 inches. If this occurs, the potential for uplift exists. Therefore to prevent uplift, the weight of erosion layer must be higher than the uplift exerted by the maximum head in drainage geocomposite.

Maximum Head Estimated by HELP Model, h_{max}=	22.24	inches (refer to page IIIE-A-27)
Unit Weight of Erosion Layer, γ_{EL}=	116	pcf
Unit Weight of Water, γ_W=	62.4	pcf
Thickness of Erosion Layer, h_{EL}=	24	inches

Uplift Force, UF=	h_{max} x γ_W	psf
Weight of Erosion Layer, W_{EL}=	h_{EL} x γ_{EL}	psf
UF=	(22.24/12)*62.4	psf
W_{EL}=	2 ft x 116 pcf	psf
UF=	115.6	psf
W_{EL}=	232	psf
Factor of Safety, FS=	W_{EL} / UF	
FS=	232 / 115.6	
FS=	2.0	

Conclusion:
A factor of safety of more than one indicates that the erosion layer will not be impacted by uplift force caused by the maximum head in the geocomposite estimated by the HELP Model. Therefore, the erosion layer is stable as designed. As shown on page IIIE-A-26, under normal conditions the head in the geocomposite is 0.023 inches, which is less than the thickness of the geocomposite. Therefore, the thickness of the water on the geomembrane will not exceed the thickness of the geocomposite under normal conditions.

2.3 Verify that a 6-inch diameter pipe will convey the design flow for the specified spacing.

Maximum flow to a collection pipe has been estimated by using the HELP model. From the HELP model, the lateral drainage collected from the geocomposite is:

HELP Model Area=	~~4.6~~ **4.7**	acres, Largest area draining to a pipe
Maximum Daily Flow=	~~18825~~ **19,234**	cf/day
Q_{max}=	~~0.218~~ **0.223**	cfs

Capacity of 6-inch Collection Pipe:

Use Manning Equation to determine the pipe size.

Pipe Capacity (Q_{pc}):

$$Q_{pc} = \frac{1.49AR^{2/3}S^{1/2}}{n}$$ (from Chapter 10 of Ref 2)

where:

Q_{pc}: Full Flow Pipe Capacity (cfs)
d: Diameter (inches), HDPE ADS collection pipe diameter
A: Flow area (sf), Cross section of pipe
P: Perimeter (ft)
R: Hydraulic radius (ft) = Cross Section (A) / Perimeter (P)
S: Pipe slope (ft/ft)
n: Manning roughness coefficient

Pipe Capacity for Different Pipe Sizes						
d (inches)	A (sf)	P (ft)	R (ft)	S (ft/ft)	n	Q_{pc} (cfs)
6	0.20	1.57	0.13	0.005	0.010	0.517

Fullness Ratio of Pipe (f):

$$f = Q_{max}/Q_{pc}$$

Fullness ratio of pipe (f)				
Fill Condition	d (inches)	Q_{max} (cfs)	Q_{pc} (cfs)	f
Closed (topslope)	6	~~0.218~~ **0.223**	0.517	~~0.42~~ **0.43**

Conclusion: A pipe size of 6 inches is acceptable for the topslope area.

3. Topslope/Sideslope Transition

3.1 Estimate the percolation into the drainage geocomposite from the erosion layer.

Calculate the flow entering the geocomposite from unit area of erosion layer (q_f):

k_{cover} = 1.2E-04 cm/s

q_f = k_{cover} * i (i is the gradient of water percolating within the drainage layer, and it is equal to 1 for vertical percolation.)

q_f = 1.2E-4 cm/s * 1 / (30.48 cm/ 1 ft)

q_f = 3.94E-06 cfs/sf

Calculate the maximum flow in drainage geocomposite on 4H:1V sideslope.
Consider the flow coming from the topdeck:

L (4H:1V)= ~~10~~ **85** ft

L (4%)= ~~100~~ **65** ft, length between the topdeck drain pipe and the grade break.

L (total)= ~~110~~ **150** ft

q_p = q_f * L (total)

q_p = ~~0.00043~~ **0.00059** sf/s

3.2 Determine the transmissivity of the specified drainage geocomposite.

Final Cover Drainage Layer Thickness:

Specified Design:
Drainage layer consists of geocomposite drainage layer - double-sided 250 mil geonet with 6 oz/sy geotextiles.

Assume the final cover drainage layer will undergo compression due to the weight of soil (erosion layer).

Unloaded Geocomposite Drainage Layer Thickness =	0.250	in
Unit Weight of Erosion Layer Soil =	116	pcf
Thickness of Erosion Layer =	2	ft

Table 3.1 - Final Cover Drainage Layer Thickness

Fill Condition	Slope[4] %	d_s[1] (ft)	P[2] (psf)	t[3] (in)	t[3] (m)
Closed (sideslope)	25	2.06	239	0.245	0.006

[1] d_s is the vertical thickness of soil above the final cover drainage layer.

[2] P is the pressure on the final cover drainage layer due to the weight of the erosion layer soil.

[3] t is the thickness of the final cover drainage layer after being subjected to compression based on the chart shown above in Step 1.2 adapted from Reference 7.

[4] **This calculation also conservatively represents the portions of the final cover designed with 20% sideslopes.**

Reduction Factors for Strength and Environmental Conditions:

Table 3.2 - Reduction Factors

Reduction Factors		Closed Condition
RF_{IN}	Delayed Intrusion	1.1
RF_{CC}	Chemical Clogging	1.2
RF_{BC}	Biological Clogging	2.0
Total Reduction Factor[2]		2.64

Overall Factor of Safety to Account For Uncertainties	2.0
Overall Reduction Factor (ORF)[3]	5.28

[1] Values are obtained from References 1, 5, and 6.

[2] The Total Reduction Factor is the product of all the reduction factors.

[3] The Overall Reduction Factor is the product of the Total Reduction Factor and Overall Factor of Safety to Account For Uncertainties.

Required Transmissivity Data:

The required minimum transmissivity for the 250-mil-thick double-sided geocomposite is shown on Sheet IIIE-A-18.

Calculate the Design Transmissivity (T_{DES}):

Table 3.3 - Transmissivity of the Specified Geocomposite Material

Fill Condition	P[1] (psf)	t[2] (in)	T[3] (m^2/s)	FS Factor[4]	T_{DES}[5] (m^2/s)	T_{DES} (sf/s)
Closed (sideslope)	239	0.245	5.69E-04	5.28	1.08E-04	1.16E-03

[1] P is the pressure on the final cover drainage layer due to the weight of erosion layer from Table 3.1.

[2] t is the drainage layer thickness from Table 3.1.

[3] T is obtained from the specified transmissivity values for a representative geocomposite drainage layer (250-mil-thick geonet with 6 oz/sy polypropylene geotextiles) as shown on Sheet IIIE-A-18 .

[4] ORF is the Overall Reduction Factor obtained from Table 3.2.

[5] T_{DES} is the design transmissivity value calculated using the following equation:

$$T_{DES} = T / (\text{FS Factor})$$

Determine the capacity of the drainage geocomposite based on the estimated transmissivity and compare to the estimated flow rate that occurs due to infiltration.

T_{DES}	>	q_p
(flow capacity of the drainage geocomposite per unit width)		(estimated flow in the drainage geocomposite per unit width)
0.00116 sf/s	>	~~0.00043~~ **0.00059** sf/s

Since the capacity of the drainage geocomposite is greater than the estimated flow in the geocomposite, the actual flow depth is contained within the geocomposite and the design is acceptable. Therefore, the maximum spacing between the pipe located just below the grade break on the ~~4~~ 5H:1V slope and the pipe located just above the grade break on the topdeck is 110 feet. As shown on Sheet IIIE-A-20, the distance between these two pipes is no more than 110 feet.

3.3 Verify that a ~~6~~ 8-inch diameter pipe will convey the design flow for the specified spacing.

Maximum Flow to Collection Pipe:

Maximum pipe length ($L_{p\text{-}max}$) specified = 1135 ft
Flow per unit length of collection pipe (q_p) = ~~0.00043~~ **0.00059** cfs/ft
Maximum pipe flow (Q_{max}):

$Q_{max} = L_{p\text{-}max} \times q_p =$ ~~0.492~~ **0.670** cfs

Capacity of ~~6~~ 8-inch Collection Pipe:

Use Manning Equation to determine the pipe capacity.

Pipe Capacity (Q_{pc}):

$$Q_{pc} = \frac{1.49AR^{2/3}S^{1/2}}{n}$$ (from Chapter 10 of Ref 2)

where:
Q_{pc}: Full flow pipe capacity (cfs)
d: Diameter (inches), HDPE ADS collection pipe
A: Flow area (sf), Cross section of pipe
P: Perimeter (ft)
R: Hydraulic radius (ft) = Cross section (A) / Perimeter (P)
S: Pipe slope (ft/ft)
n: Manning roughness coefficient

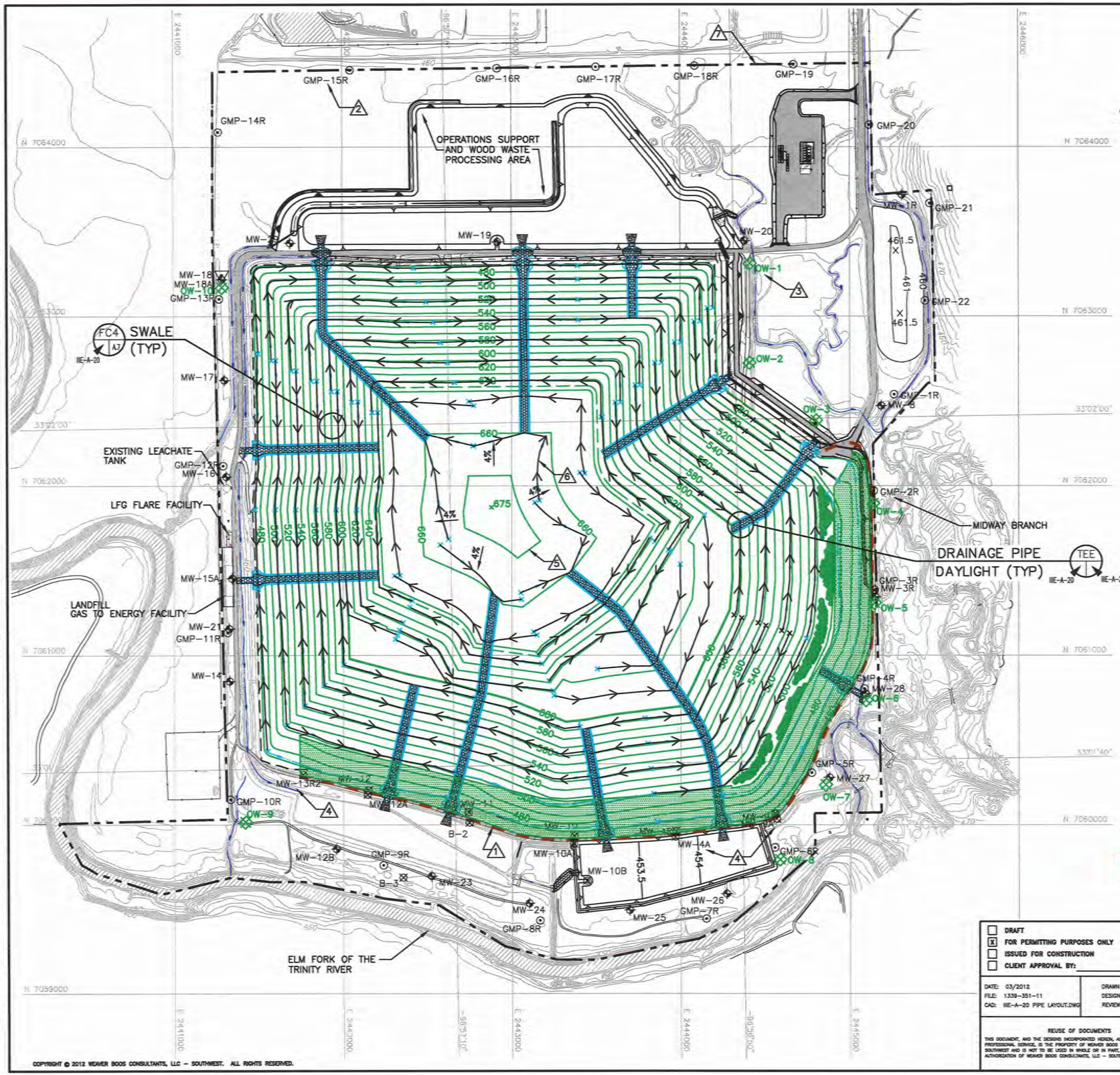
Pipe Capacity for Different Pipe Sizes						
d (inches)	A (sf)	P (ft)	R (ft)	S (ft/ft)	n	Q_{pc} (cfs)
~~6~~ **8**	~~0.20~~ **0.35**	~~1.57~~ **2.09**	~~0.13~~ **0.17**	0.005	0.010	~~0.517~~ **1.114**

Fullness Ratio of Pipe (f):

$f = Q_{max}/Q_{pc}$

Fullness Ratio of Pipe (f)					
Fill Condition	Pipe Length (ft)	d (inches)	Q_{max} (cfs)	Q_{pc} (cfs)	f
Closed (sideslope)	1135	~~6~~ **8**	~~0.492~~ **0.760**	~~0.517~~ **1.114**	~~0.95~~ **0.68**

Conclusion: A pipe size of ~~6~~ **8** inches is acceptable.



LEGEND

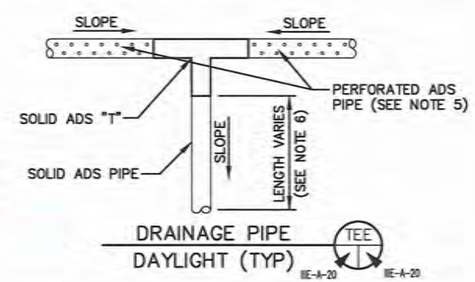
- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 600 — FINAL COVER CONTOUR
- (5) 600 — REGRADED BUFFER ZONE AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — GROUNDWATER MONITORING WELL
- (2) GMP-1 — GAS MONITORING PROBE
- (2) MW-12 — OBSERVATION/MONITORING WELL
- (3) OW-1 — PROPOSED WOODBINE MONITOR WELL
- PERFORATED DRAINAGE PIPE
- CONSTRUCTED FINAL COVER
- LANDSCAPE BENCH
- (1) EXISTING SLURRY WALL
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. REVISED FINAL COVER CONTOURS.
6. REVISED DRAINAGE PIPE LAYOUT.
7. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. (7) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIF-SURFACE WATER DRAINAGE PLAN FOR DRAINAGE DESIGN INFORMATION.
4. TYPICAL TOPSLOPE IS 4.0%.
5. DRAINAGE PIPE WILL BE PLACED WITH A 0.5% FLOW LINE SLOPE PARALLEL TO THE SWALES ON THE TOPSLOPES AND SIDESLOPES OF THE FILL. THE PIPE WILL BE PLACED WITH A 0.5% FLOW SLOPE AT THE TOE OF THE FINAL COVER AND DAYLIGHTED AS NECESSARY WITH A SOLID PIPE TEE CONNECTION TO THE PERIMETER DRAINAGE STRUCTURES. THE TWO PIPES DOWN GRADIENT OF FINAL COVER BENCH WILL BE PLACED AT A 0.2% SLOPE. PERFORATED PIPE AT THE TOE OF THE FINAL COVER WILL BE WRAPPED WITH GEOCOMPOSITE AS SHOWN IN APPENDIX IIIA-A – LINER, OVERLINER, AND FINAL COVER SYSTEM DETAILS.



DRAFT

☐ DRAFT
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: IIE-A-20 PIPE LAYOUT.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FINAL COVER DRAINAGE PIPE LAYOUT

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL · NAPERVILLE, IL · COLUMBUS, OH · DENVER, CO · FORT WORTH, TX (817) 735-9770 · GRIFFITH, IN · SOUTH BEND, IN · SPRINGFIELD, IL · ST. LOUIS, MO

SHEET IIIE-A-20

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIE\IIIE-A-20 DRAINAGE PIPE LAYOUT.dwg, sford, 1:2

Prep By: CAM
Date: 3/9/2016

CAMELOT LANDFILL
1339-351-11-02
HELP VERSION 3.07 SUMMARY SHEET

Chkd By: _____
Date: _____

		CLOSED 4% TOPSLOPE	CLOSED SOUTHEAST BENCH
GENERAL INFORMATION	Case No.	1	2
	No. of Years	30	30
	Ground Cover	GOOD	GOOD
	SCS Runoff Curve No.	80.6	81.7
	Model Area (acre)	~~4.6~~ **4.7**	2.9
	Runoff Area (%)	100	100
	Maximum Leaf Area Index	4.5	4.5
	Evaporative Zone Depth (inch)	18	18
EROSION LAYER (Texture = 10)	Thickness (in)	24	48
	Porosity (vol/vol)	0.3980	0.3980
	Field Capacity (vol/vol)	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04
DRAINAGE LAYER (Texture = 0)	Thickness (in)	0.245	0.239
	Porosity (vol/vol)	0.8500	0.8500
	Field Capacity (vol/vol)	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100
	Hyd. Conductivity (cm/s)	6.70	3.31
	Slope (%)	4	4
	Slope Length (ft)	330	115
FLEXIBLE MEMBRANE LINER (Texture = 36)	Thickness (in)	0.04	0.04
	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13
	Pinhole Density (holes/acre)	0	0
	Install. Defects (holes/acre)	0	0
	Placement Quality	GOOD	GOOD
INFILTRATION LAYER (Texture = 16)	Thickness (in)	18	18
	Porosity (vol/vol)	0.4270	0.4270
	Field Capacity (vol/vol)	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-05	1.0E-05
PRECIPITATION	Average Annual (in)	34.26	34.26
RUNOFF	Average Annual (in)	1.14	1.36
EVAPOTRANSPIRATION	Average Annual (in)	27.40	27.40
LATERAL DRAINAGE COLLECTED[1]	Average Annual (cf/year)	~~95,891~~ **97,975**	58,116
	Peak Daily (cf/day)	~~18,825~~ **19,234**	12,547
HEAD ON FINAL COVER GEOMEMBRANE	Average Annual (in)	0.023	0.003
	Peak Daily (in)	22.24	6.86

[1] This is the lateral drainage collected in the drainage geocomposite in the final cover system.

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************



PRECIPITATION DATA FILE:     C:\camelot\topdeck\new\DATA4.D4
TEMPERATURE DATA FILE:       C:\Camelot\topdeck\new\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\Camelot\topdeck\new\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\Camelot\topdeck\new\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\Camelot\topdeck\new\DATA10.D10
OUTPUT DATA FILE:            C:\Camelot\topdeck\new\CLOSED.OUT


TIME:  11:34     DATE:   3/ 9/2016


******************************************************************************

     TITLE:  CAMELOT LANDFILL-FINAL COVER DRAINAGE DESIGN-4% TOPSLOPE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER  10
          THICKNESS                    =     24.00   INCHES
          POROSITY                     =      0.3980 VOL/VOL
          FIELD CAPACITY               =      0.2440 VOL/VOL
          WILTING POINT                =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC
```

```
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
         FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                        LAYER  2
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.25   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   6.69999981000     CM/SEC
SLOPE                        =      4.00   PERCENT
DRAINAGE LENGTH              =    330.0    FEET


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.4270 VOL/VOL
FIELD CAPACITY               =      0.4180 VOL/VOL
WILTING POINT                =      0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 330. FEET.

SCS RUNOFF CURVE NUMBER	=	80.60	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	4.700	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.392	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.164	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.448	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	13.544	INCHES
TOTAL INITIAL WATER	=	13.544	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.90	2.37	3.06	3.20	5.15	3.23
2.12	2.03	2.42	4.11	2.57	2.57

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.10	49.40	57.40	65.00	73.10	80.90
85.00	84.40	77.50	67.20	55.10	46.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.49	2.20	2.80	3.08	4.59	3.29
	2.94	1.93	2.75	4.15	2.36	2.71
STD. DEVIATIONS	1.02	1.27	1.67	1.89	2.17	2.13
	2.33	1.43	1.52	3.45	1.80	1.93
RUNOFF						
TOTALS	0.002	0.020	0.046	0.085	0.203	0.118
	0.131	0.019	0.026	0.375	0.069	0.049
STD. DEVIATIONS	0.007	0.051	0.122	0.202	0.463	0.218
	0.301	0.045	0.055	0.681	0.188	0.112
EVAPOTRANSPIRATION						
TOTALS	1.677	1.740	2.606	2.942	3.946	3.146
	2.678	1.859	2.367	1.840	1.127	1.470
STD. DEVIATIONS	0.438	0.641	1.041	1.162	1.363	1.659
	1.666	1.396	1.332	0.939	0.439	0.439
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.5377	0.2218	0.4575	0.2268	0.4664	0.3194

	0.2517	0.0245	0.0489	1.1664	0.8374	1.1842
STD. DEVIATIONS	0.6302	0.3786	0.8213	0.3872	0.7571	0.4749
	0.5275	0.0666	0.1866	1.7327	1.2051	1.3866

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0075	0.0025	0.0102	0.0030	0.0301	0.0051
	0.0080	0.0002	0.0004	0.1160	0.0568	0.0418
STD. DEVIATIONS	0.0138	0.0066	0.0358	0.0073	0.0838	0.0141
	0.0267	0.0005	0.0014	0.2307	0.1783	0.0904

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.26	(6.276)	584544.1	100.00
RUNOFF	1.142	(0.8500)	19484.04	3.333
EVAPOTRANSPIRATION	27.398	(3.6138)	467435.00	79.966
LATERAL DRAINAGE COLLECTED FROM LAYER 2	5.74265	(3.20534)	97975.391	16.76099
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000	(0.00000)	0.073	0.00001
AVERAGE HEAD ON TOP OF LAYER 3	0.023	(0.026)		
CHANGE IN WATER STORAGE	-0.021	(0.9785)	-350.52	-0.060

```
*******************************************************************************

              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
  ------------------------------------------------------------------------
                                              (INCHES)      (CU. FT.)
                                             ----------   -------------
     PRECIPITATION                             6.00        102365.992

     RUNOFF                                    2.087        35608.8359

     DRAINAGE COLLECTED FROM LAYER  2          1.12736      19233.89650

     PERCOLATION/LEAKAGE THROUGH LAYER  4      0.000005         0.08343

     AVERAGE HEAD ON TOP OF LAYER  3          14.377

     MAXIMUM HEAD ON TOP OF LAYER  3          22.243

     LOCATION OF MAXIMUM HEAD IN LAYER  2
           (DISTANCE FROM DRAIN)              74.3 FEET

     SNOW WATER                                2.40         40951.7734


     MAXIMUM VEG. SOIL WATER (VOL/VOL)                 0.3416

     MINIMUM VEG. SOIL WATER (VOL/VOL)                 0.1360

      ***  Maximum heads are computed using McEnroe's equations.  ***

           Reference:  Maximum Saturated Depth over Landfill Liner
                       by Bruce M. McEnroe, University of Kansas
                       ASCE Journal of Environmental Engineering
                       Vol. 119, No. 2, March 1993, pp. 262-270.

*******************************************************************************
```

****

FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	5.2381	0.2183
2	0.0039	0.0159
3	0.0000	0.0000
4	7.6860	0.4270
SNOW WATER	0.000	

****
****

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

VOLUME 3 OF 6

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised June 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-16

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Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B

This document is intended for permitting purposes only.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIF
SURFACE WATER DRAINAGE PLAN

Prepared for

City of Farmers Branch

February 2012
Revised December 2012
Revised June 2014

Revised August 2016

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8-5-16

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Prepared by

Weaver Boos Consultants, LLC–Southwest
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6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B.6

This document is intended for permitting purposes only.

4 DRAINAGE PATTERNS

Consistent with Title 30 TAC §330.63(c)(1)(C), §330.63(c)(1)(D)(iii), and §330.305(a), this section provides a demonstration showing that the proposed landfill development will not adversely alter the existing permitted landfill completion condition drainage patterns. The appendices containing the two drainage conditions analyzed are listed below.

- Appendix IIIF-A (Post-Development Condition Hydrologic Calculations) – This appendix contains analysis and supporting calculations for the proposed configuration of the site after development of the expanded landfill is complete.
- Appendix IIIF-E (Permitted Condition Hydrologic Calculations) – This appendix contains analysis and supporting calculations for the updated permitted configuration of the site and excerpts from the currently permitted drainage analysis. Section 4.3.1 includes a discussion of how the existing permitted drainage analysis has been updated to provide an equivalent comparison with the post-development condition.

The following three sections discuss: (1) regional drainage associated with the site; (2) site drainage patterns; (3) effect of the proposed development on peak flows, volumes, and velocities discharged from the site.

4.1 Regional Drainage Information

As shown on Figure 4.1, the ~~469.6~~ 459.76-acre Camelot Landfill permit boundary is located approximately 2 miles south of Lake Lewisville. The Elm Fork Trinity River forms the southern boundary of the site. Midway Branch, a tributary of the Elm Fork, flows along the east side of the permit boundary.

Lake Lewisville is one of the largest man made surface water impoundments in Texas with a 46.24 square mile (25,592 acres) surface area at the crest elevation of the Lake Lewisville Dam. As shown on Figure 4.2, the Lake Lewisville watershed encompasses approximately 1,660 square miles. The total drainage area of the Elm Fork (which includes Prairie Creek and Stewart Creek) between Lake Lewisville Dam and the downstream end of the permit boundary is approximately 17 square miles. The permit boundary drainage area, which is comprised of the permit boundary and offsite areas discharging onto or directly receiving flow from the permit boundary, is 2.82 square miles (0.17 percent of the Elm Fork's drainage area upstream of the site).

The main influence on regional drainage patterns is the Lake Lewisville Dam. For example, the USACE operates the dam outlet structures, and their standard operating procedure is to close the outlet structures, during the 50-year and higher frequency storm events. As discussed in Section 4.3.5 and Appendix IIIO, the peak flow rates in the Elm Fork have been determined by the USACE for the Trinity River hydrologic model as a part of the development of the CDC permit application for the year 2050 (refer to Appendix IIIO for more information). A discussion of the effect of the continued development of the landfill on the 100-year floodplain is provided in the Section 4.3.5.

Figure 4.3 – Offsite Drainage Area Map shows the watershed associated with flows entering and leaving the permit boundary. The majority of the area within the permit boundary discharges south or west into the Elm Fork. A smaller portion of the area within the permit boundary drains east into Midway Branch and ultimately discharges into the Elm Fork approximately 200 feet southeast of the permit boundary.

4.2 Site Drainage Patterns

The permitted and proposed site drainage patterns are shown on Figure 4.4 – Site Drainage Patterns. As shown on Figure 4.4, the proposed drainage patterns are consistent with the currently permitted and updated permitted drainage patterns. The entire permit boundary drains directly into Elm Fork or through the Midway Branch into the Elm Fork of the Trinity River. The drainage patterns that include the individual outfalls at the permit boundary and individual runon locations (locations where upstream offsite areas flow onto the permit boundary) for both the permitted and proposed conditions are the same. Run-on and runoff locations have been added or removed due to the expansion of the permit boundary relative to the existing permitted condition (i.e., removal of DCPN2O and addition of run-on Point DCPO1). Runoff and run-on locations of the expanded permit boundary are the same for the updated permitted condition and the post-development condition. Also, the onsite drainage areas draining to Midway Branch and the Elm Fork under the proposed landfill completion conditions are consistent with the permitted conditions.

As shown on Figure 4.4, the total drainage area of the permit boundary is increased by 114.92 acres from the permitted condition to the updated permitted condition. This increase in the permit boundary allows for a direct comparison to be made between the two conditions. As shown in the onsite drainage area information on Figure 4-4, the updated permitted and proposed onsite drainage delineations are consistent.

Areas drain directly to the Elm Fork from discharge locations DCP3, DCP4, and DCP5 as shown on 4.4 for the permitted and proposed conditions. Discharge from DCP6, DCP7, and DCP8 traverses offsite Drainage Area O5 before discharging into the Elm Fork. The total drainage area to these six outfalls is comparable for the updated permitted (~~230.79~~ 229.16 acres) and post-developed conditions (~~245.35~~ 245.88 acres). Slight changes among the areas draining to these six outfall locations are shown on Figure 4.4. The difference in total drainage areas is due to changes in landfill final cover drainage areas (i.e., Areas 1, 2, and

3). In the proposed condition approximately ~~14~~ 17 acres that were draining into Midway Branch have been diverted to drain into the Elm Fork.

As shown on Figure 4.4, discharge locations DCP1 and DCP2 discharge directly into Midway Branch. The Midway Branch converges with the Elm Fork approximately 200 feet south of discharge location DCP2. The total drainage area to the Midway Branch is ~~1,445.76~~ 1,445.23 acres and ~~1,460.32~~ 1,461.95 acres for the post-development and updated permitted conditions, respectively. The difference of ~~14.55~~ 16.72 acres is the same difference in the total area flowing into the Elm Fork for the updated permitted and post-development conditions. In total, runoff from the same area, 1,691.11 acres, is discharged from the permit boundary for the updated permitted and post-development conditions. Note that Area O5 does not drain onto the permit boundary and is not included in the 1,691.11 acres discharging from the permit boundary. As mentioned above, changes to the design of the landfill final cover areas (i.e., Areas 1, 2, and 3) result in ~~14~~ 17 acres of Midway Branch Drainage Area being diverted to drain to the Elm Fork.

4.3 Effect of Site Development on Drainage from the Site

The purpose of this section is to evaluate the peak flow rates, runoff volumes, and peak flow velocities of the existing permitted, updated permitted, and post-development hydrologic conditions. A summary of peak flow rates, runoff volumes, and peak flow velocities entering and exiting the permit boundary is provided in Table 4.1 and Figure 4.5 – Site Drainage Patterns, Runon/Runoff. Section 4.3.1 discusses the updates made to the currently permitted landfill completion condition drainage analysis to facilitate a complete and relevant comparison to be made between permitted and post-development landfill completion conditions.

Sections 4.3.2 through 4.3.5 discuss the impact of the proposed landfill conditions on peak flow rates, runoff volumes, and peak flow velocities entering and exiting the permit boundary.

4.3.1 Comparison of Existing Permitted and Updated Permitted Conditions

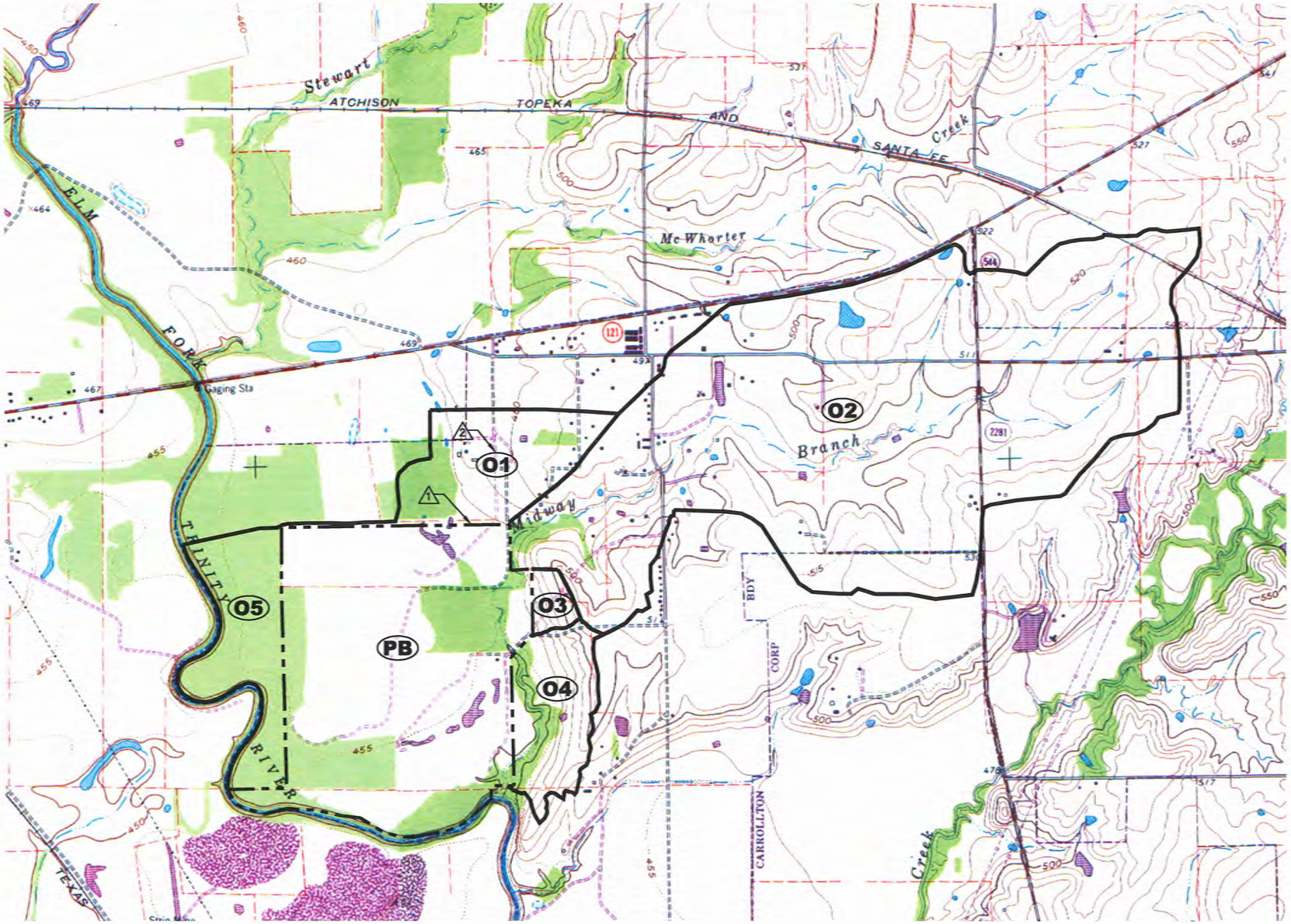
4.3.1.1 Purpose of the Updated Permitted Condition

As shown in Drawing 4.4, the drainage analysis included in TCEQ Permit No. 1312A (for the purpose of this appendix, this case will be designated the "existing permitted condition") developed by Reed Engineering Group, Inc. in November 2000 utilizes a different landfill permit boundary and offsite drainage areas than those used in the post-development condition. An update to the existing permitted condition was necessary to allow an accurate comparison to be made with the results from the post-development condition. As noted in Section 1.2, to comply with Title 30 TAC §330.63(c)(1)(C), the proposed landfill completion condition is compared to the existing permitted condition of the landfill to demonstrate that the continued development of the landfill will not adversely alter the existing permitted drainage patterns. This comparison is only

Table 4-1
Flow Rates, Drainage Areas, Hydrograph Time to Peak Values, Runoff Volumes, and Velocities for the 25-Year Design Storm Event

Stormwater Discharge Point[1]	Existing Permitted Condition						Updated Permitted Condition					Post-Development Condition				
	Existing Permitted Location HEC-1 ID	Flow Rate (cfs)	Drainage Area (acres)	Time to Peak (hrs)	Runoff Volume (ac-ft)	Velocity at Permit Boundary (fps)	Flow Rate (cfs)	Drainage Area (acres)	Time to Peak (hrs)	Runoff Volume[1] (ac-ft)	Velocity at Permit Boundary[3] (fps)	Flow Rate (cfs)	Drainage Area (acres)	Time to Peak (hrs)	Runoff Volume[1] (ac-ft)	Velocity at Permit Boundary[3] (fps)
Flow onto the Site																
DCPO1	---	---	---	---	---	---	~~298~~ 394	~~87~~ 121	12.42	~~43~~ 60	~~1.38~~ 1.48	~~298~~ 394	~~87~~ 121	12.42	~~43~~ 60	~~1.38~~ 1.48
~~DCPO1A~~	~~---~~	~~---~~	~~---~~	~~---~~	~~---~~	~~---~~	~~70~~	~~23~~	~~12.58~~	~~11~~	~~3.27~~	~~70~~	~~23~~	~~12.58~~	~~11~~	~~3.27~~
DCPO2	---	---	---	---	---	---	2,171	1,008	12.75	476	8.08	2,171	1,008	12.75	476	8.08
DCPO3	APF1	71	16	12.25	7	---	62	16	12.33	7	4.38	62	16	12.33	7	4.38
DCPO4[4]	C4MWY	293	198	12.25	61	---	~~2,887~~ 3,103	~~1,433~~ 1,434	~~12.75~~ 12.67	~~677~~ 678	~~8.29~~ 8.44	~~2,881~~ 2,884	~~1,425~~ 1,424	12.67	~~676~~ 675	8.28
Discharge from the Site																
DCP1 (Southeast-Midway)[5]	MWY@RD	254	181	12.17	54	---	~~2,674~~ 2,884	~~1,347~~ 1,348	12.75	~~637~~ 638	~~7.64~~ 7.79	~~2,664~~ 2,663	~~1,339~~ 1,338	12.75	~~636~~ 636	7.63
DCP2 (South-Midway)[6]	CABELM	416	225	12.25	74	---	~~2,933~~ 3,155	~~1,460~~ 1,462	~~12.75~~ 12.67	~~689~~ 690	~~12.64~~ 12.88	~~2,919~~ 2,921	~~1,446~~ 1,445	12.67	~~686~~ 689	12.63
DCP3 (South-Elm Fork)[7]	PD2OUT	160	134	13.17	61	---	201	133	13.00	64	11.00	~~173~~ 175	160	12.75	~~80~~ 81	~~10.60~~ 10.63
DCP4 (Southeast-Elm Fork)[8]	AN15	90	21	12.25	9	---	61	20	12.50	9	2.89	44	11	12.33	5	2.67
DCP5 (Southwest-Elm Fork)[9]	APN14	151	29	12.17	12	---	88	26	12.42	12	10.64	80	23	12.42	11	10.39
DCP6 (Southwest-O5)[10]	APN17	22	3	12.08	1	---	24	4	12.17	2	3.76	17	5	12.42	2	3.44
DCP7 (West-O5)[11]	C2D1	133	54	12.67	23	---	~~78~~ 75	~~37~~ 36	13.00	17	~~1.91~~ 1.88	~~57~~ 56	~~37~~ 36	13.33	17	~~1.72~~ 1.71
DCP8 (Northwest)[12]	---	---	---	---	---	---	~~25~~ 24	10	12.75	5	~~0.70~~ 0.69	~~24~~ 23	10	12.83	5	0.69

1 Stormwater discharge points are shown on Figure 4.4. The volume shown is the total volume of runoff for the hydrograph duration.
2 Existing permitted location HEC-1 ID is included for certain areas, as some locations were not included in the previously developed drainage analysis. Only available information is shown for the existing permitted conditions (e.g., if velocities are not already estimated in the currently approved documents, they are not listed).
3 Runoff volume and velocity calculations are provided in Appendix IIIF-A and IIIF-E.
4 Discharge Point DCPO4 includes all of Discharge Point DCP1 and offsite Drainage Area O4.
5 Discharge Point DCP1 includes several drainage areas within the permit boundary and DCPO1, DCPO2, and DCPO3 for the post-development and updated permitted cases. For the existing permitted case, DCP1 includes onsite drainage areas and DCPO3.
6 Discharge point DCP2 includes all of discharge point DCPO4 and DCP1 and onsite drainage areas.
7 Discharge Point DCP3 contains only onsite drainage areas.
8 Discharge Point DCP4 contains only onsite Drainage Area N15 for the existing and updated permitted conditions and only S10 for the post-development condition.
9 Discharge Point DCP5 contains only onsite Drainage Area N14 for the existing and updated permitted conditions and only S9 for the post-development condition.
10 Discharge Point DCP6 contains only onsite Drainage Area N17 for the existing and updated permitted conditions and only S3 for the post-development condition.
11 Discharge Point DCP7 contains onsite Drainage Areas F4, N18, and N19 for the existing permit condition, onsite Drainage Areas S2, N18, and N19 for the updated permitted condition, and onsite Drainage Areas S2 and CH1 for the post-development condition.
12 Discharge Point DCP8 contains only onsite Drainage Area S1.



N

0 1000 2000
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- DRAINAGE AREA BOUNDARY
- (02) DRAINAGE AREA LABEL
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

(2)

DRAINAGE AREA NO.	AREA (ACRES)
01	120.7
02	1,008.4
03	16.2
04	86.0
05	116.5
PB	459.8
TOTAL	1,807.6

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — U.S. Route — State Route

LEWISVILLE EAST, TEX.
SW/4 FRISCO 15' QUADRANGLE
N3300—W9652.5/7.5
1960
PHOTOREVISED 1968
AMS 6650 III SW-SERIES V882

DRAFT

NOTES:

1. DRAINAGE AREA DELINEATION WITHIN THE PERMIT BOUNDARY IS INCLUDED IN APPENDICES IIIF-A AND IIIF-E.
2. TOPOGRAPHY PROVIDED BY USGS 7.5 MINUTE QUADRANGLE TOPOGRAPHIC MAP (LEWISVILLE EAST, TX, PHOTO REVISED 1981).

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED DRAINAGE INFORMATION.

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
CAD: 4.3 OFFSITE DRAINAGE.DWG

DRAWN BY: VRS
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OFFSITE DRAINAGE AREA MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 4.3

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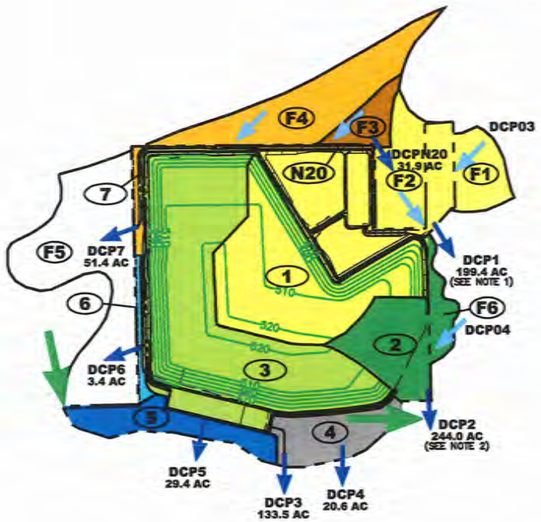
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIF\4.3-OFFSITE DRAINAGE.dwg, jwilson, 1:2



EXISTING PERMITTED CONDITION

ON-SITE AREAS (SEE NOTE 5)

1 = 131.3 ACRES
2 = 27.5 ACRES
3 = 133.5 ACRES
4 = 20.6 ACRES
5 = 29.4 ACRES
6 = 3.4 ACRES
7 = 6.5 ACRES
N20 = 2.5 ACRES

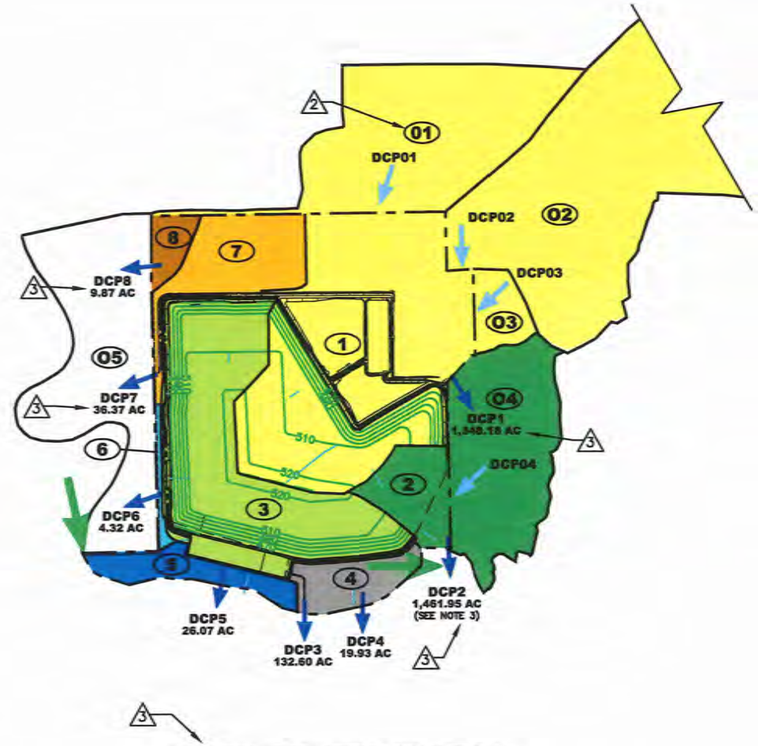
PERMIT BOUNDARY TOTAL = 354.7 ACRES

OFF-SITE AREAS (SEE NOTE 5)

F1 = 16.0 ACRES
F2 = 20.2 ACRES
F3 = 29.4 ACRES
F4 = 44.9 ACRES
F5 = 81.0 ACRES
F6 = 17.1 ACRES

OFF-SITE TOTAL = 208.6 ACRES

GRAND TOTAL = 563.3 ACRES



UPDATED PERMITTED CONDITION

ON-SITE AREAS

1 = 202.87 ACRES
2 = 27.73 ACRES
3 = 132.60 ACRES
4 = 19.93 ACRES
5 = 26.07 ACRES
6 = 4.32 ACRES
7 = 36.37 ACRES
8 = 9.87 ACRES

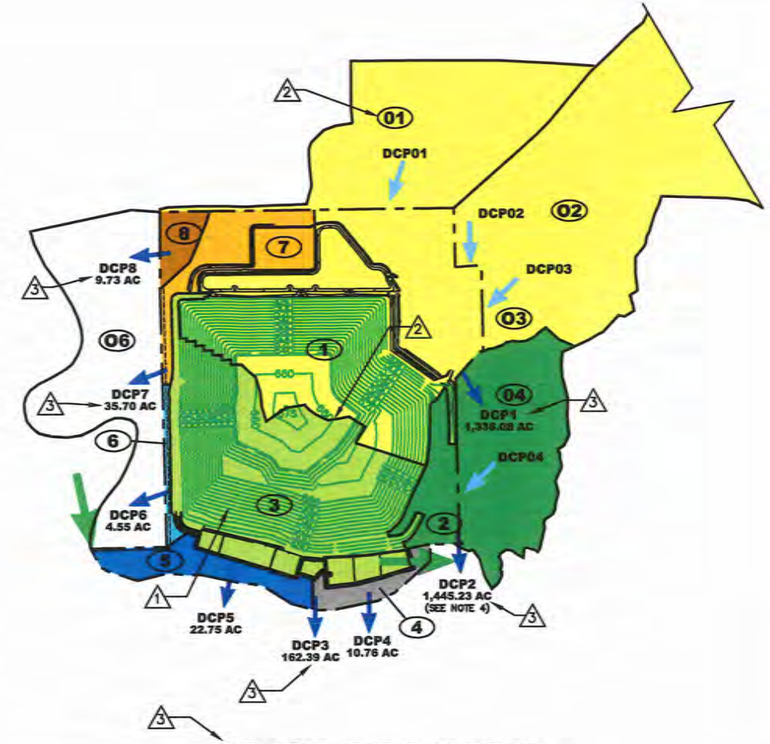
PERMIT BOUNDARY TOTAL = 459.76 ACRES

OFF-SITE AREAS

01 = 120.75 ACRES
02 = 1,008.38 ACRES
03 = 16.18 ACRES
04 = 86.04 ACRES
05 = 116.47 ACRES

OFF-SITE TOTAL = 1,347.82 ACRES

GRAND TOTAL = 1,807.58 ACRES



POST-DEVELOPMENT CONDITION

ON-SITE AREAS

1 = 192.77 ACRES
2 = 21.11 ACRES
3 = 162.39 ACRES
4 = 10.76 ACRES
5 = 22.75 ACRES
6 = 4.55 ACRES
7 = 35.70 ACRES
8 = 9.73 ACRES

PERMIT BOUNDARY TOTAL = 459.76 ACRES

OFF-SITE AREAS

01 = 120.75 ACRES
02 = 1,008.38 ACRES
03 = 16.18 ACRES
04 = 86.04 ACRES
05 = 116.47 ACRES

OFF-SITE TOTAL = 1,347.82 ACRES

GRAND TOTAL = 1,807.58 ACRES

△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. REVISED DRAINAGE AREA BOUNDARIES.
3. UPDATED AREA CALCULATIONS.

LEGEND

- PERMIT BOUNDARY
- 520 PERMITTED / PROPOSED FINAL COVER CONTOUR
- (1) DRAINAGE AREA DESIGNATION
- DRAINAGE AREA BOUNDARY
- UPLAND DRAINAGE ENTERING THE SITE
- DCP3 132.60 AC STORMWATER DISCHARGE POINT
- FLOW IN THE ELM FORK ENTERING/EXITING THE SITE

N

0 1000 2000
SCALE IN FEET

NOTES:

1. DCP1 AREA INCLUDES THE 31.9 ACRES DRAINING FROM DCPN20.
2. DCP2 AREA INCLUDES THE 199.4 ACRES DRAINING FROM DCP1.
3. DCP2 AREA INCLUDES THE 1,348.18 ACRES DRAINING FROM DCP1.
4. DCP2 AREA INCLUDES THE 1,338.08 ACRES DRAINING FROM DCP1.
5. AREAS SHOWN ARE OBTAINED FROM ATTACHMENT 6B-2 AND THE HEC-1 MODEL INCLUDED IN THE SDP FOR TCEQ PERMIT NO. MSW-1312A.

DRAFT

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☒ FOR PERMITTING PURPOSES ONLY
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☐ CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
CAD: 4.4-DRAINAGE PATTERNS.DWG

DRAWN BY: VRS
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SITE DRAINAGE PATTERNS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 4.4

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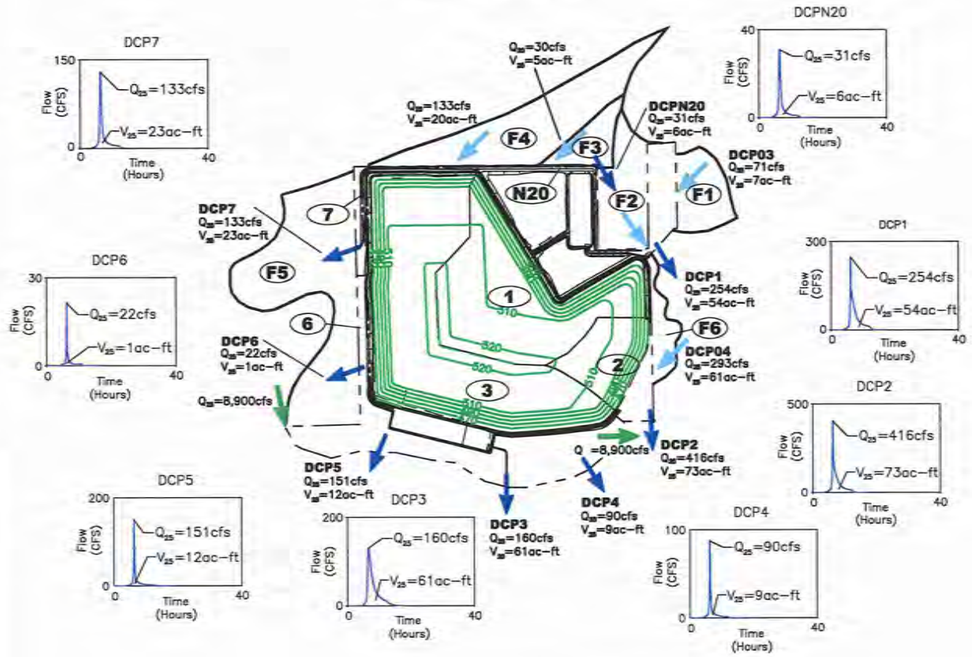
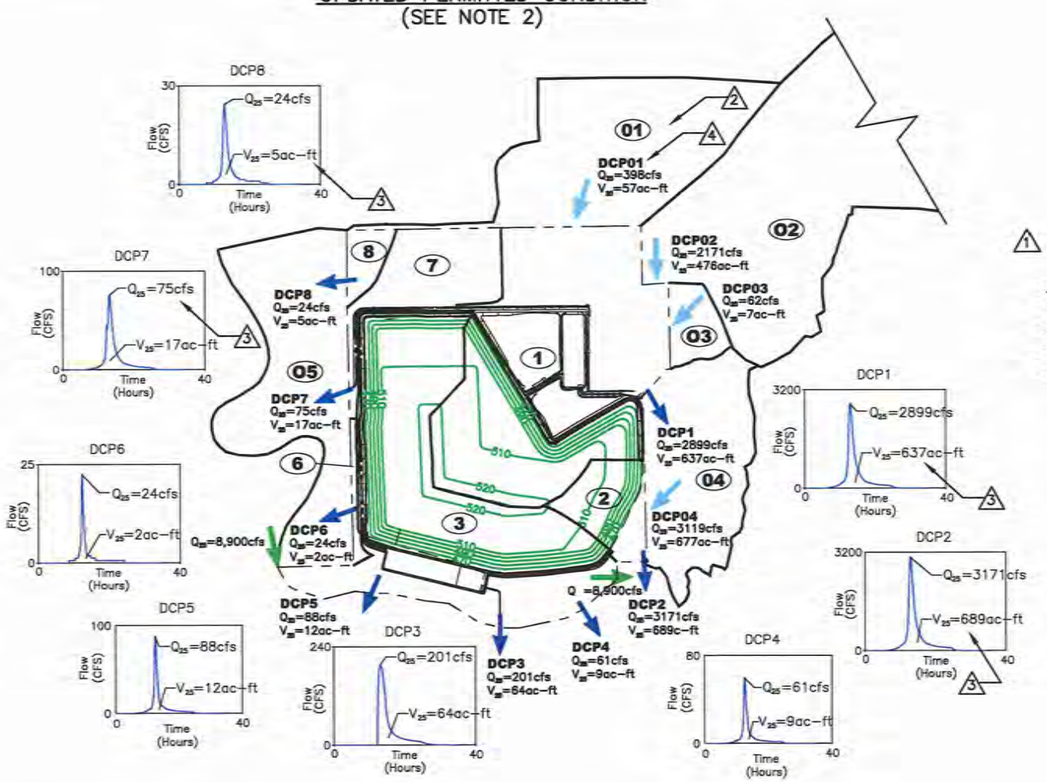
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIF\4.4-SITE DRAINAGE PATTERNS.dwg, jwilson, 1:2

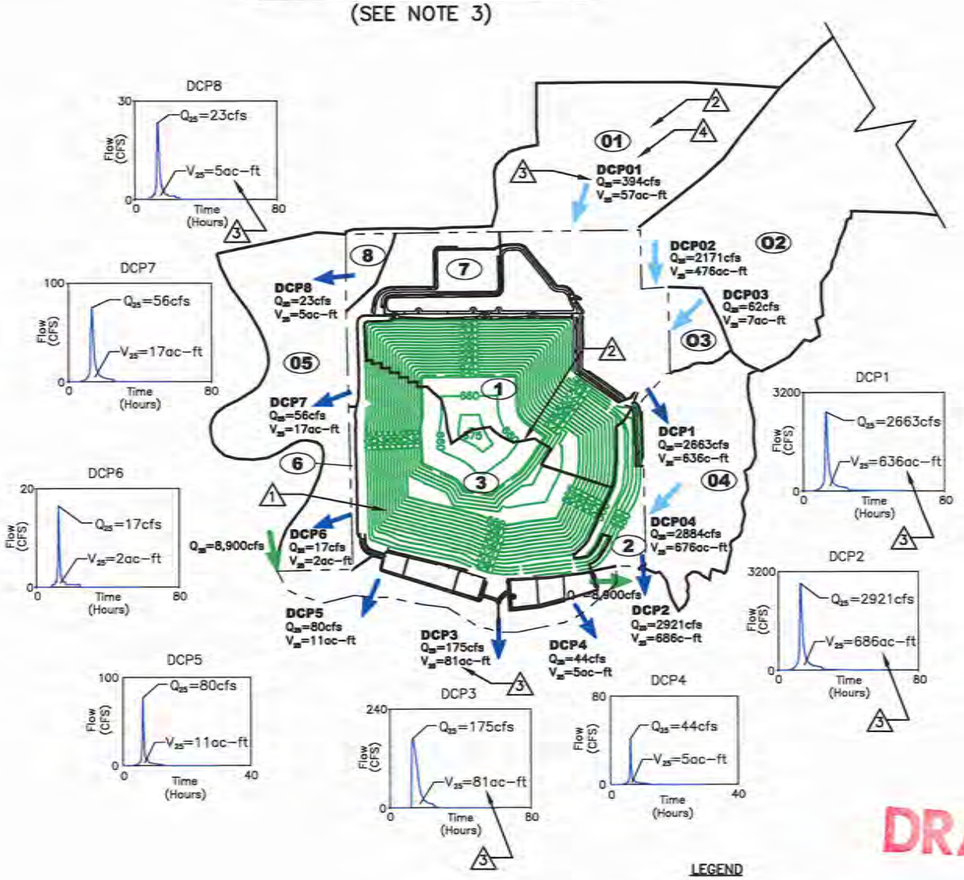
EXISTING PERMITTED CONDITION
(SEE NOTE 1)



UPDATED PERMITTED CONDITION
(SEE NOTE 2)



POST-DEVELOPMENT CONDITION
(SEE NOTE 3)



DRAFT

△1 INDICATES REVISION
(SEE LIST OF REVISIONS)

LIST OF REVISIONS:
1. REVISED FINAL COVER CONTOURS.
2. REVISED DRAINAGE AREA BOUNDARIES.
3. UPDATED HYDROLOGIC CALCULATIONS.
4. UPDATED PERMIT BOUNDARY.

N

0 1000 2000
SCALE IN FEET

LEGEND

— — —	PERMIT BOUNDARY
520	PERMITTED / PROPOSED FINAL COVER CONTOUR
1	DRAINAGE AREA DESIGNATION
	UPLAND DRAINAGE ENTERING THE SITE
	STORMWATER DISCHARGE POINT
DCP3	
Q_{25}=201cfs	25-YEAR 24-HOUR STORM EVENT FLOW RATE
V_{25}=64ac-ft	25-YEAR 24-HOUR STORM EVENT VOLUME
	FLOW IN THE ELM FORK ENTERING/EXITING THE SITE (SEE NOTE 4)

NOTES:
1. PEAK FLOW RATES AND VOLUMES SHOWN ARE OBTAINED FROM ATTACHMENT 6B-2 AND THE HEC-1 MODEL INCLUDED IN THE SDP FOR TCEQ PERMIT NO. MSW-1312A.
2. HYDROLOGIC INFORMATION FOR THE 25-YEAR LANDFILL UPDATED PERMITTED CONDITION IS PROVIDED IN APPENDIX IIIF-E.
3. HYDROLOGIC INFORMATION FOR THE 25-YEAR LANDFILL POST-DEVELOPMENT CONDITION IS PROVIDED IN APPENDIX IIIF-A.
4. FLOW RATES WITHIN THE ELM FORK ARE REPRODUCED FROM THE CDC HYDRAULIC MODEL FOR ELM FORK TRINITY RIVER. REFER TO APPENDIX IIIO FOR MORE INFORMATION.

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☐ CLIENT APPROVAL BY: _____

DATE: 02/2012
FILE: 1339-351-11
CAD: 4.5-RUNON-RUNOFF.DWG

DRAWN BY: VRS
DESIGN BY: CRM
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SITE DRAINAGE PATTERNS
RUNON/RUNOFF
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 4.5

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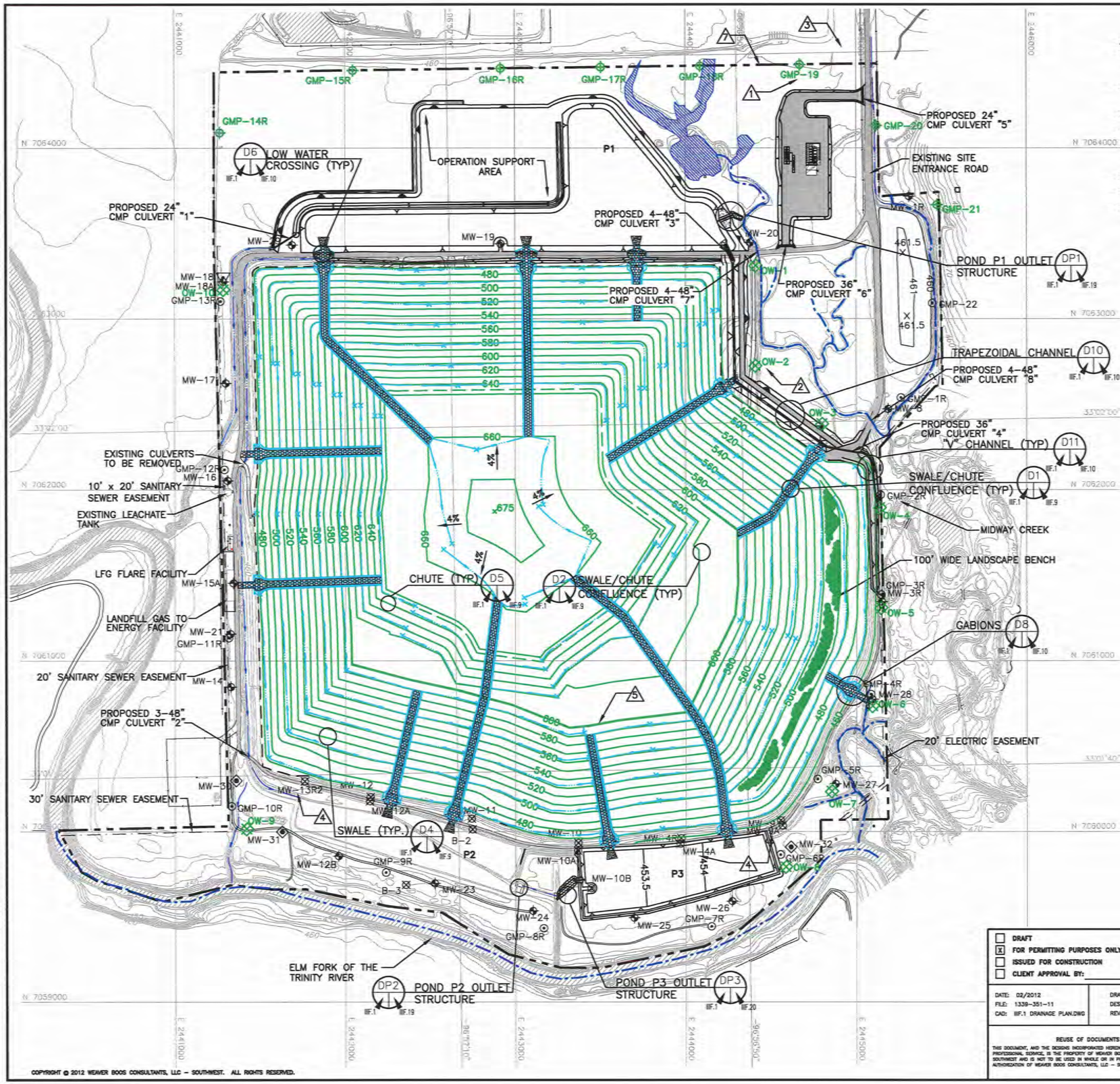

LIST OF REVISIONS:

1. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. REMOVED EASEMENTS.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. REVISED FINAL COVER CONTOURS.
6. REVISED NOTE 3.
7. UPDATED PERMIT BOUNDARY INFORMATION.

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 33°02'00" GEODETIC COORDINATE SYSTEM
- 500 EXISTING CONTOUR (SEE NOTE 1)
- 5 — 600 FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EASEMENT BOUNDARY
- MW-8 GROUNDWATER MONITORING WELL
- MW-30 PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R EXISTING LANDFILL GAS MONITORING PROBE
- 1 — GMP-20 PROPOSED LANDFILL GAS MONITORING PROBE
- 4 — MW-12 OBSERVATION/MONITORING WELL
- 2 — OW-1 PROPOSED WOODBINE MONITOR WELL
- USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 4)
- USACE JURISDICTIONAL WETLANDS
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
4. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM THE GOSHAWK ENVIRONMENTAL CONSULTANTS, INC. SEPTEMBER 2010 REPORT WHICH IS INCLUDED IN PARTS I/II, APPENDIX I/IIB.
5. FINAL COVER DETAILS ARE PROVIDED IN APPENDIX IIIA-A LINER, OVERLINER, AND FINAL COVER SYSTEM DETAILS.

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DATE: 02/2012
FILE: 1339-351-11
CAD: IIF.1 DRAINAGE PLAN.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR
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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT DRAINAGE STRUCTURE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING IIIF.1

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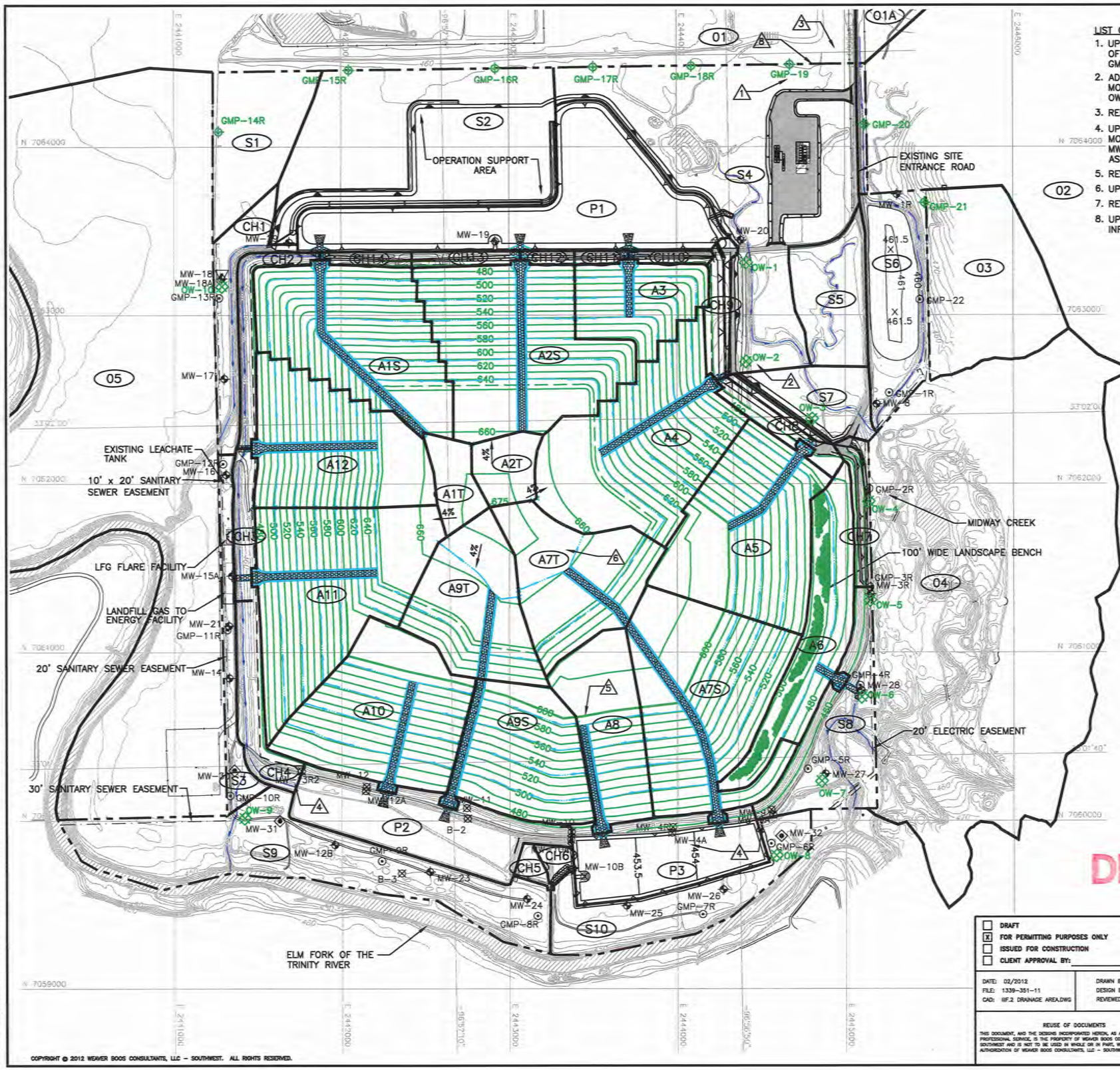
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIF\IIIF.1-DRAINAGE PLAN.dwg, jwilson, 1:2



LIST OF REVISIONS:

1. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. REMOVED EASEMENTS.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. REVISED FINAL COVER CONTOURS.
6. UPDATED DRAINAGE AREAS.
7. REVISED NOTE 3.
8. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR (SEE NOTE 1)
- 600 — REGRADED BUFFER ZONE AREA
- 5 — 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EASEMENT BOUNDARY
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- 6 — GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- 6 — MW-12 — OBSERVATION/MONITORING WELL
- 2 — OW-1 — PROPOSED WOODBINE MONITOR WELL
- 6 — DRAINAGE AREA BOUNDARY
- A7T — DRAINAGE AREA DESIGNATION
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

N

0 300 600
SCALE IN FEET

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
4. REFER TO DRAWING IIIF.3 FOR COMPLETE OFFSITE DRAINAGE AREA DELINEATIONS.

DRAINAGE AREA NO.	AREA (ACRES)	DRAINAGE AREA NO.	AREA (ACRES)
S1	9.72	AT	12.33
S2	29.76	A10	17.87
S3	4.55	A11	21.60
S4	37.25	A12	16.48
S5	7.34	CH1	5.94
S6	13.92	CH2	3.29
S7	5.39	CH3	2.64
S8	10.12	CH4	4.55
S9	22.75	CH5	0.76
S10	10.76	CH6	0.83
A1T	3.07	CH7	2.33
A1S	18.86	CH8	3.02
A2T	3.35	CH9	2.57
A2S	22.03	CH10	0.85
A3	8.06	CH11	0.56
A4	24.68	CH12	0.59
A5	18.65	CH13	1.29
A6	10.99	CH14	1.01
A7T	13.02	P1	23.10
A7S	22.24	P2	12.60
A8	10.29	P3	10.83
A9S	13.06		

DRAFT

- ☐ DRAFT
- ☒ FOR PERMITTING PURPOSES ONLY
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- ☐ CLIENT APPROVAL BY: _____

DATE: 02/2012
FILE: 1339-351-11
CAD: IIF.2 DRAINAGE AREA.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
POST DEVELOPMENT DRAINAGE
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING IIIF.2

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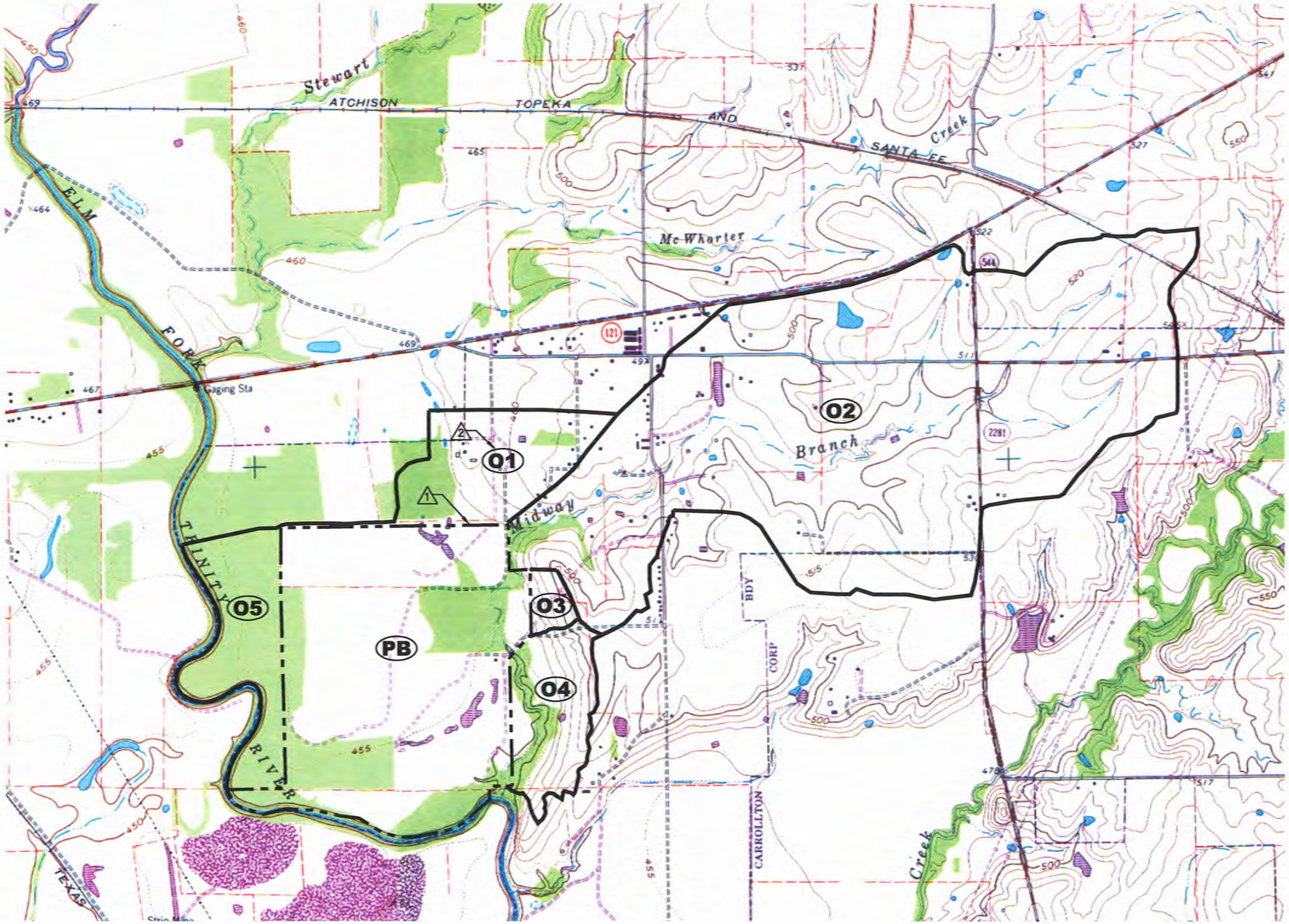

0 1000 2000
SCALE IN FEET

LEGEND

PERMIT BOUNDARY

DRAINAGE AREA BOUNDARY

02 DRAINAGE AREA LABEL

DRAINAGE AREA NO.	AREA (ACRES)
01	120.7
02	1,008.4
03	16.2
04	86.0
05	116.5
PB	459.8
TOTAL	1,807.6

ROAD CLASSIFICATION

Heavy-duty — Light-duty

Medium-duty — Unimproved dirt

Interstate Route — U.S. Route — State Route

LEWISVILLE EAST, TEX.
SW/4 FRISCO IS QUADRANGLE
N3300—W9652.5/7.5
1960
PHOTOREVISED 1968
AMS 6650 III SW-SERIES V882

DRAFT

NOTES:

1. REFER TO DRAWING IIIF.2 DRAINAGE AREA DELINEATION WITHIN THE PERMIT BOUNDARY.
2. TOPOGRAPHY IS REPRODUCED FROM USGS 7.5 MINUTE QUADRANGLE TOPOGRAPHIC MAP (LEWISVILLE EAST, TX, PHOTO REVISED 1981).

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED DRAINAGE INFORMATION.

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☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 02/2012
FILE: 1339-351-11
CAD: IIF.3 OFFSITE DRAINAGE.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OFFSITE DRAINAGE AREA MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

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GRIFFITH, IN
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ST. LOUIS, MO

DRAWING IIIF.3

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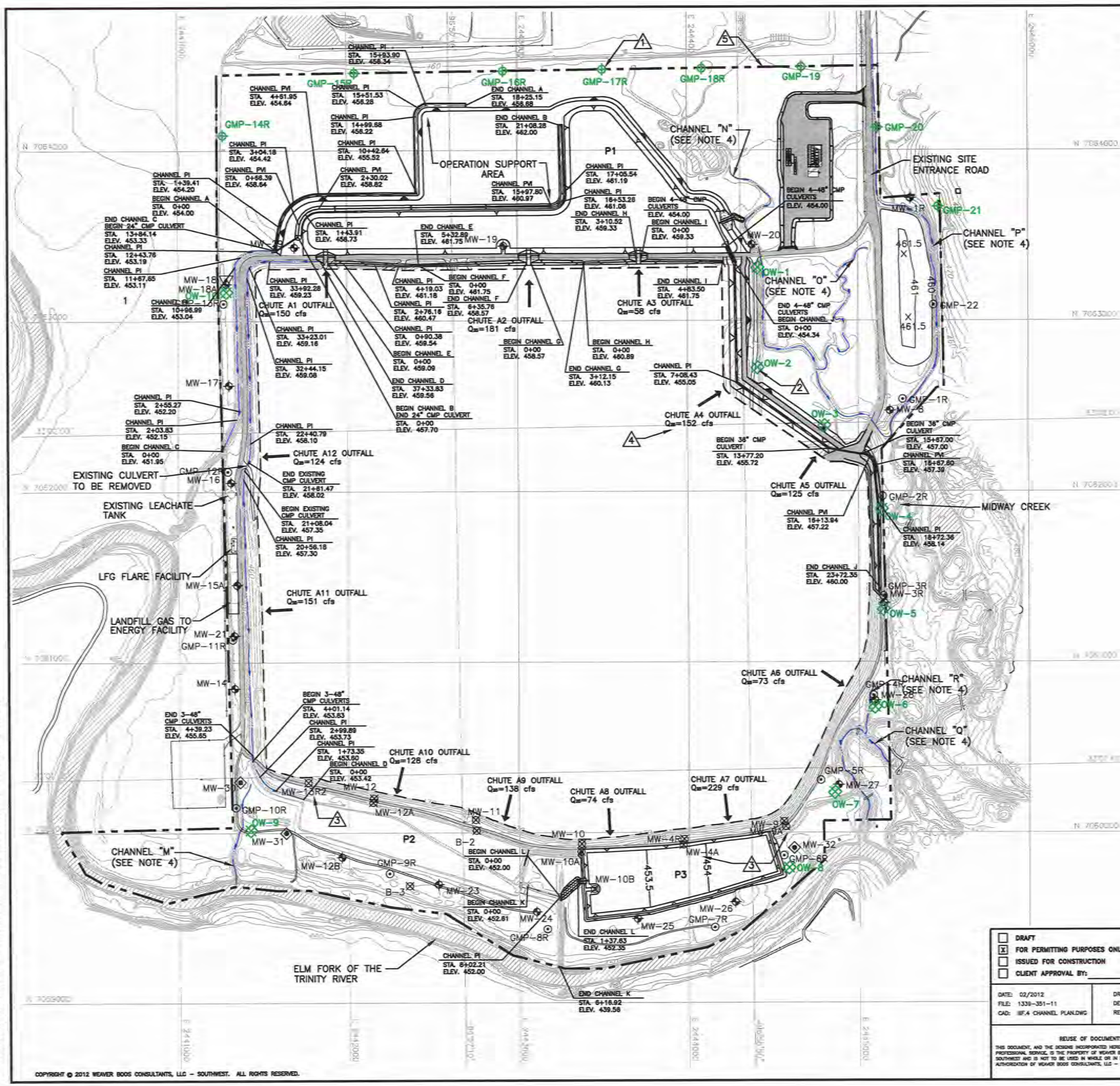

LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
4. UPDATED FLOW RATES.
5. UPDATED PERMIT BOUNDARY INFORMATION.

N

0 300 600
SCALE IN FEET

LEGEND

— — —	PERMIT BOUNDARY
— — —	LIMIT OF WASTE
7064000	STATE PLANE COORDINATE SYSTEM
32°32'00"	GEODETIC COORDINATE SYSTEM
500	EXISTING CONTOUR (SEE NOTE 1)
STA.	STATION (FT)
ELEV.	ELEVATION (FT-MSL)
Q_{25}=60 cfs	25-YEAR PEAK FLOW RATE (CUBIC FEET/SECOND)
MW-8	EXISTING GROUNDWATER MONITORING WELL
MW-30	PROPOSED GROUNDWATER MONITORING WELL
GMP-1R	EXISTING LANDFILL GAS MONITORING PROBE
GMP-20	PROPOSED LANDFILL GAS MONITORING PROBE
MW-12	OBSERVATION/MONITORING WELL
2 OW-1	PROPOSED WOODBINE MONITOR WELL (SEE NOTE 14)
	PROPOSED CHANNEL CENTERLINE
	EXISTING CHANNEL CENTERLINE
	GABIONS
600	REGRADED BUFFER ZONE AREA
1	INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PROPOSED PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. CHANNEL PROFILE INFORMATION BASED ON THE STATIONS SHOWN IS PROVIDED ON DRAWINGS IIIF.5 THROUGH IIIF.8.
4. ANALYSIS OF CHANNELS K,M,N,O,P,Q, AND R IS INCLUDED IN APPENDIX IIIF.B.

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
CAD: IIIF.4 CHANNEL PLAN.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	2nd TCEQ COMMENT RESPONSE
3	02/2016	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT PERIMETER DRAINAGE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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DRAWING IIIF.4

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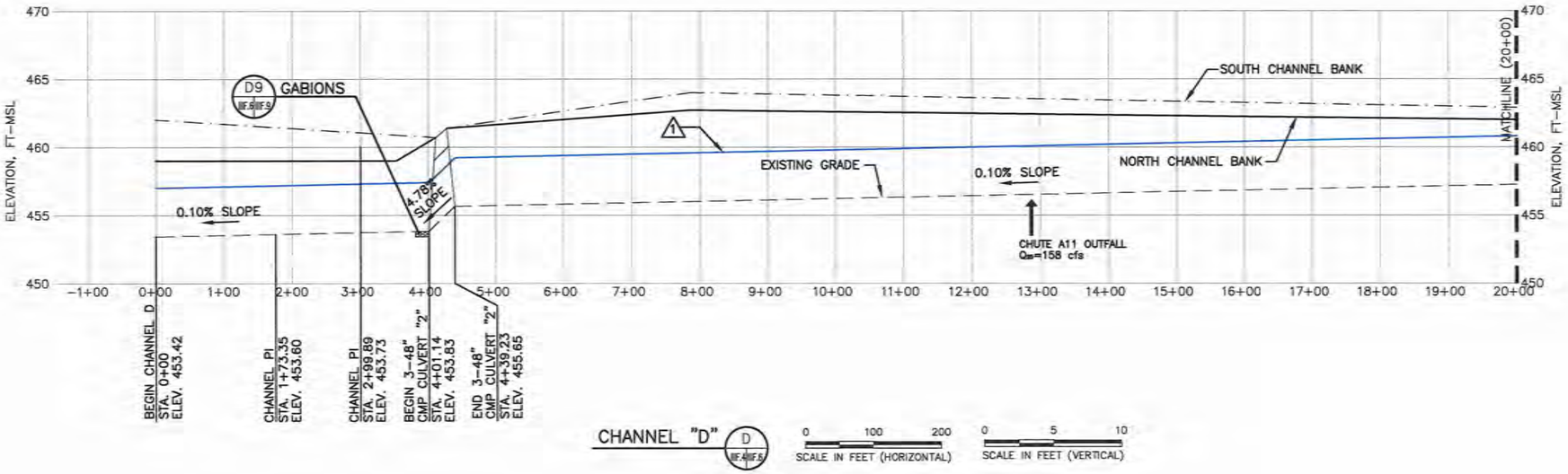

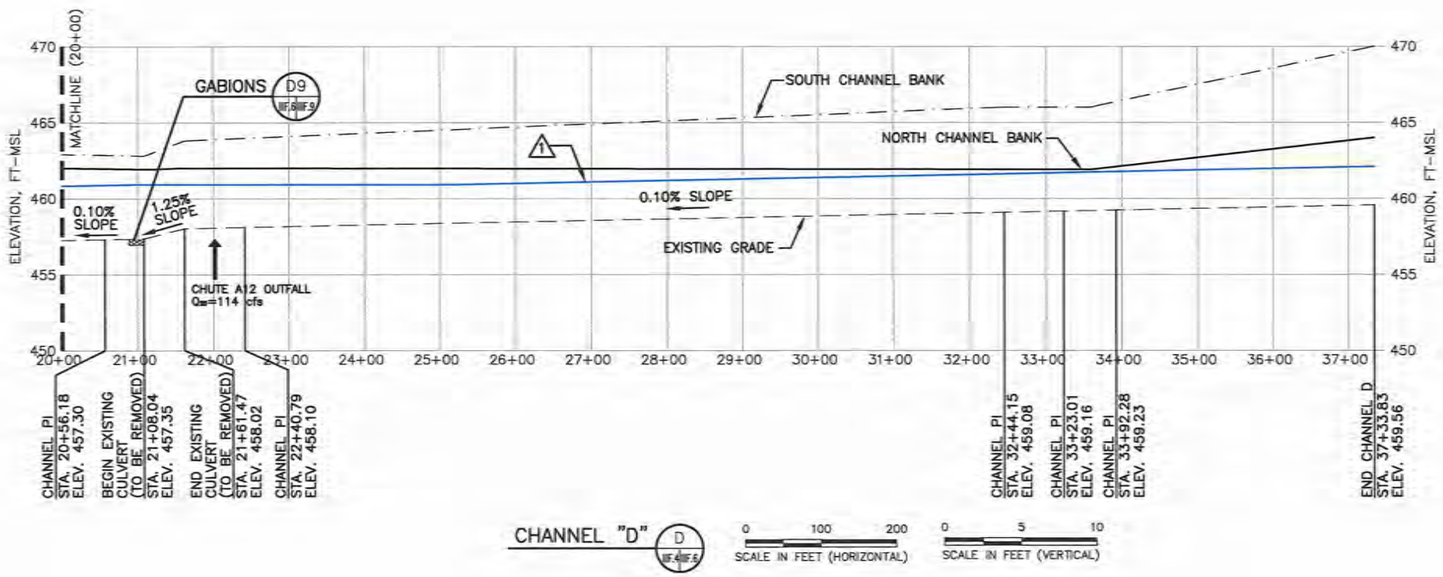

2

25-YEAR CHANNEL "D" INFORMATION

CHANNEL STATION FROM	CHANNEL STATION TO	BOTTOM WIDTH (FT)	PEAK INFLOW (CFS)	SLOPE (%)	FLOW DEPTH (FT.)	VELOCITY (FT/S)
0+00	4+01.14	15	258	0.10	3.55	2.83
4+01.14	4+39.23	3-48" CMP CULVERTS				
4+39.23	21+08.04	15	258	0.10	3.55	2.83
21+08.04	21+61.47	15	136	1.25	1.27	5.68
21+61.47	37+33.83	15	136	0.10	2.54	2.36

NOTE: NORMAL DEPTH CALCULATION DOES NOT ACCOUNT FOR BACK WATER WHICH WILL INCREASE FLOW DEPTH (SEE PROFILE) AND DECREASE VELOCITY.

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED 25-YEAR FLOOD PROFILE.
2. UPDATED HYDRAULIC CALCULATIONS.

DRAFT

NOTES:

1. REFER TO DRAWING IIIF.4 FOR PROFILE LOCATIONS.
2. EXISTING GROUND CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
3. HYDRAULIC CALCULATIONS INCLUDED IN APPENDIX IIIF-B.
4. GABIONS SHALL BE USED FOR VELOCITIES OF 13 FT/SEC OR HIGHER.
5. CULVERT CALCULATIONS INCLUDED IN APPENDIX IIIF-B.

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DATE: 02/2012
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DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2015	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
PERIMETER CHANNEL PROFILE

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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DRAWING IIIF.6

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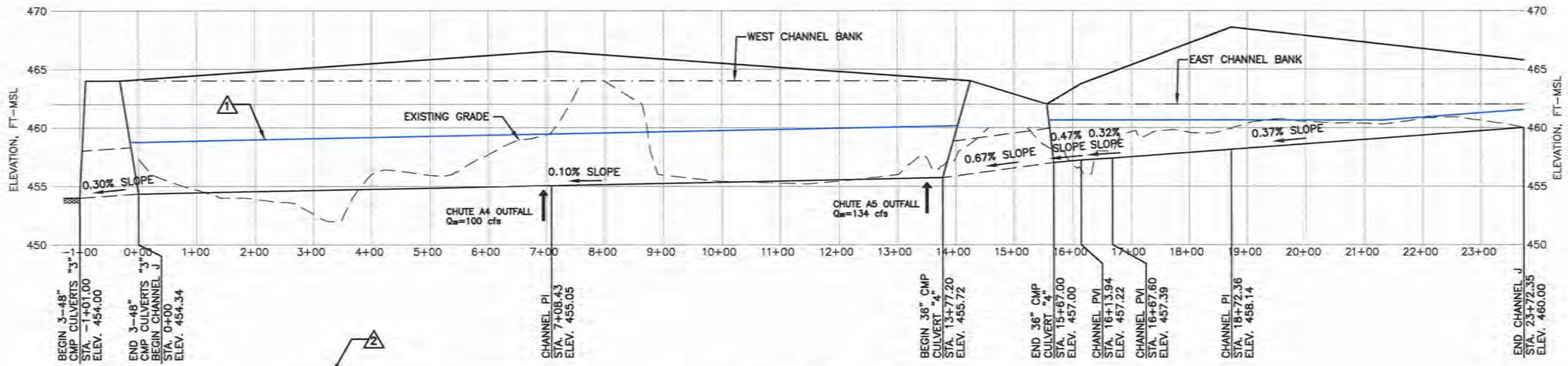


CHANNEL "J" (J, IIF.4/IIF.5)

SCALE IN FEET (HORIZONTAL) 0 100 200

SCALE IN FEET (VERTICAL) 0 5 10

25-YEAR CHANNEL "J" INFORMATION

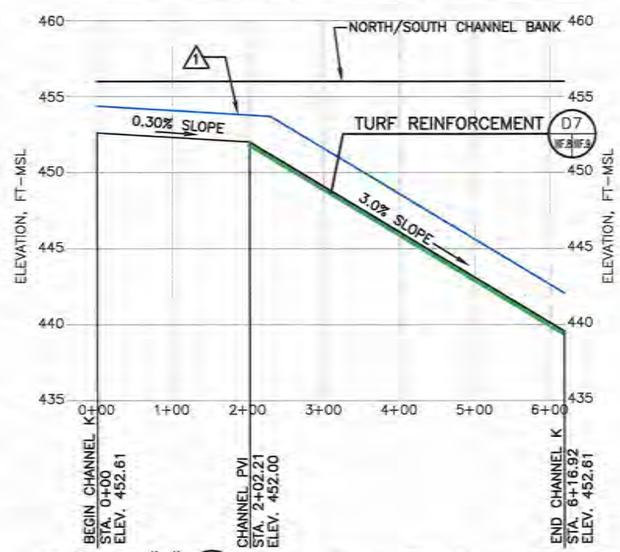
CHANNEL STATION FROM	CHANNEL STATION TO	BOTTOM WIDTH (FT)	PEAK INFLOW (CFS)	SLOPE (%)	FLOW DEPTH (FT.)	VELOCITY (FT/S)
0+00	13+77.20	10	310	0.10	4.40	3.04
13+77.20	15+67.00	36" CMP CULVERT "4"				
15+67.00	16+13.94	0	17	0.47	1.46	2.66
16+13.94	16+67.60	0	17	0.32	1.57	2.30
16+67.60	23+72.35	0	17	0.37	1.53	2.43

NOTE: NORMAL DEPTH CALCULATION DOES NOT ACCOUNT FOR BACK WATER WHICH WILL INCREASE FLOW DEPTH (SEE PROFILE) AND DECREASE VELOCITY.

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED 25-YEAR FLOOD PROFILE.
2. UPDATED HYDRAULIC CALCULATIONS.



CHANNEL "K" (K, IIF.4/IIF.5)

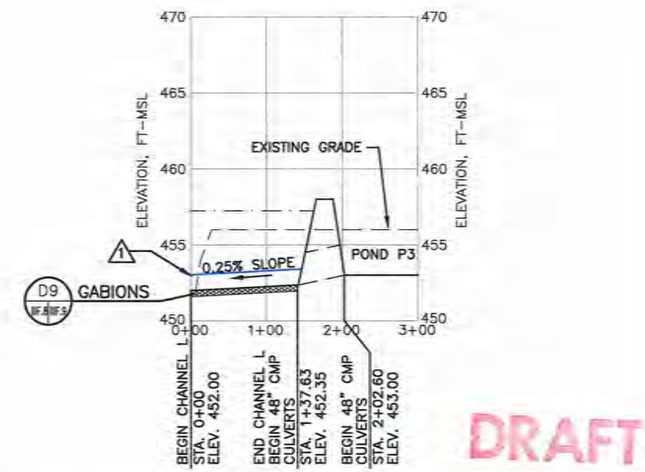
SCALE IN FEET (HORIZONTAL) 0 100 200

SCALE IN FEET (VERTICAL) 0 5 10

25-YEAR CHANNEL "K" INFORMATION

CHANNEL STATION FROM	CHANNEL STATION TO	BOTTOM WIDTH (FT)	PEAK INFLOW (CFS)	SLOPE (%)	FLOW DEPTH (FT.)	VELOCITY (FT/S)
0+00	2+02.21	15	121	0.30	1.78	3.35
2+02.21	6+16.92	0	175	3.00	2.47	9.54

NOTE: NORMAL DEPTH CALCULATION DOES NOT ACCOUNT FOR BACK WATER WHICH WILL INCREASE FLOW DEPTH (SEE PROFILE) AND DECREASE VELOCITY.



DRAFT

CHANNEL "L" (L, IIF.4/IIF.5)

SCALE IN FEET (HORIZONTAL) 0 100 200

SCALE IN FEET (VERTICAL) 0 5 10

25-YEAR CHANNEL "L" INFORMATION

CHANNEL STATION FROM	CHANNEL STATION TO	BOTTOM WIDTH (FT)	PEAK INFLOW (CFS)	SLOPE (%)	FLOW DEPTH (FT.)	VELOCITY (FT/S)
0+00	1+37.63	25	55	0.25	0.91	2.17

NOTE: NORMAL DEPTH CALCULATION DOES NOT ACCOUNT FOR BACK WATER WHICH WILL INCREASE FLOW DEPTH (SEE PROFILE) AND DECREASE VELOCITY.

NOTES:

1. REFER TO DRAWING IIIF.4 FOR PROFILE LOCATIONS.
2. EXISTING GROUND CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
3. HYDRAULIC CALCULATIONS INCLUDED IN APPENDIX IIIF-B.
4. GABIONS SHALL BE USED FOR VELOCITIES OF 13 FT/SEC OR HIGHER.
5. CULVERT CALCULATIONS INCLUDED IN APPENDIX IIIF-B.

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DATE: 02/2012
FILE: 1339-351-11
CAD: IIIF.5 CHANNEL PLAN.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	06/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
PERIMETER CHANNEL PROFILE

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO

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DRAWING IIIF.8

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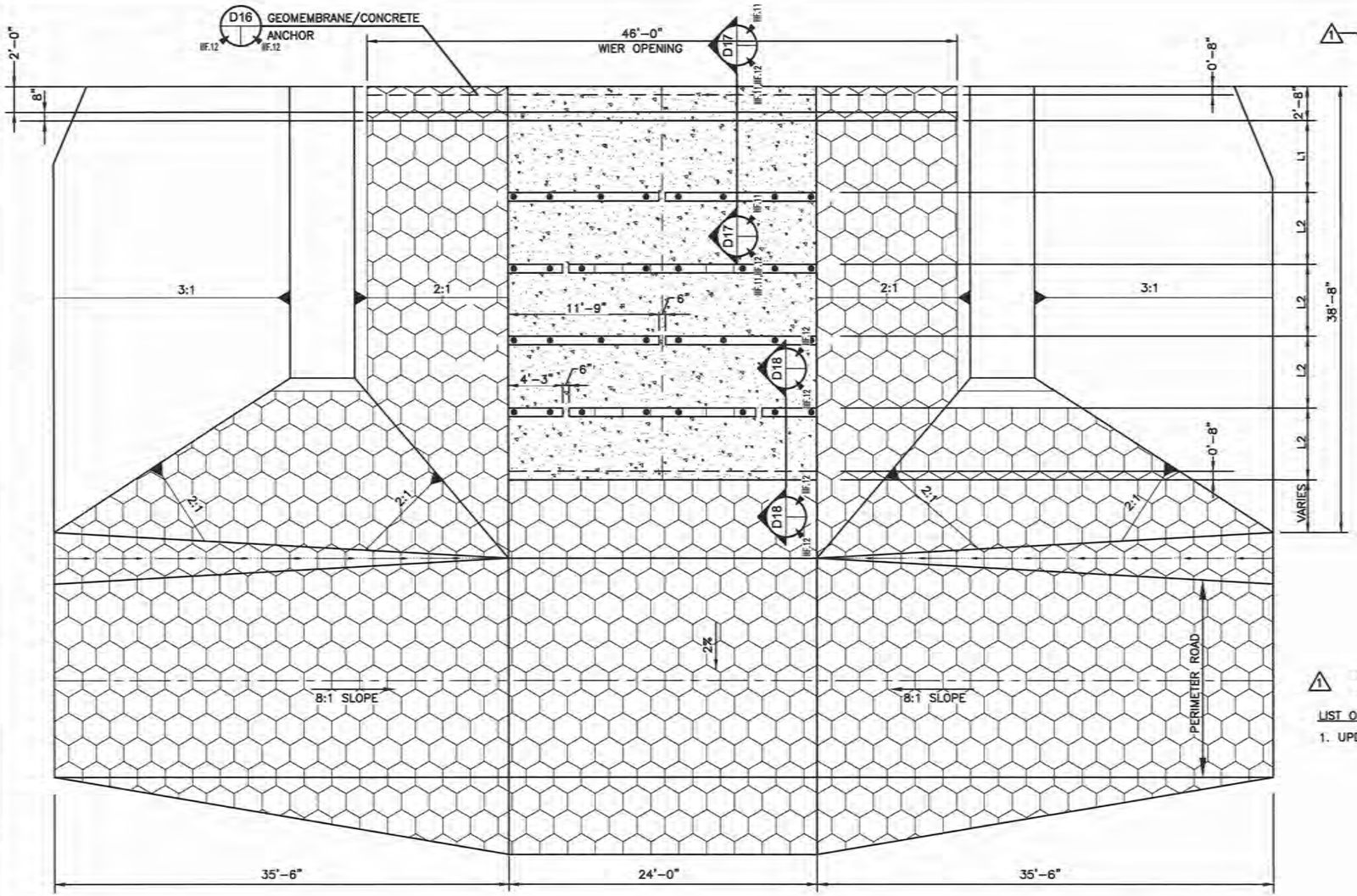
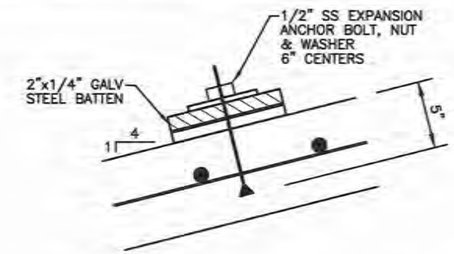


ENERGY DISSIPATOR DETAIL (D15)
(SEE NOTE 1)
IIF.11,IIF.12 IIF.12
0 5 10
SCALE IN FEET

DISSIPATOR DESIGN SUMMARY [1]				
LETDOWN IDENTIFICATION	HEIGHT OF		LENGTH BETWEEN	
	CONCRETE WEIR (K1) (FT)	SECONDARY ELEMENT (K2) (FT)	WEIR AND FIRST ELEMENT (L1) (FT)	ELEMENTS (L2) (FT)
1	3.5	0.67	2.67	6.2
2	3.5	0.67	2.67	6.2
3	3.5	0.67	2.41	4.8
4	3.5	0.67	2.96	6.1
5	3.5	0.67	2.62	6.1
6	3.5	0.67	2.91	5.6
7	3.5	0.67	2.59	6.1
8	3.5	0.67	2.86	5.7
9	3.5	0.67	2.88	6.1
10	3.5	0.67	2.60	6.2
11	3.5	0.67	2.62	6.1
12	3.5	0.67	2.76	6.0

[1] REFER TO APPENDIX IIIF-C FOR SUPPORTING CALCULATIONS

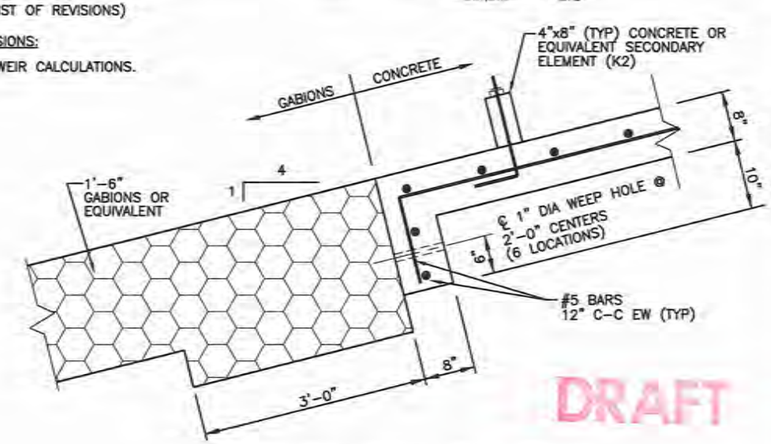


GEOMEMBRANE/CONCRETE ANCHOR (D16)
NTS
IIF.11,IIF.12 IIF.12

1 INDICATES REVISION (SEE LIST OF REVISIONS)

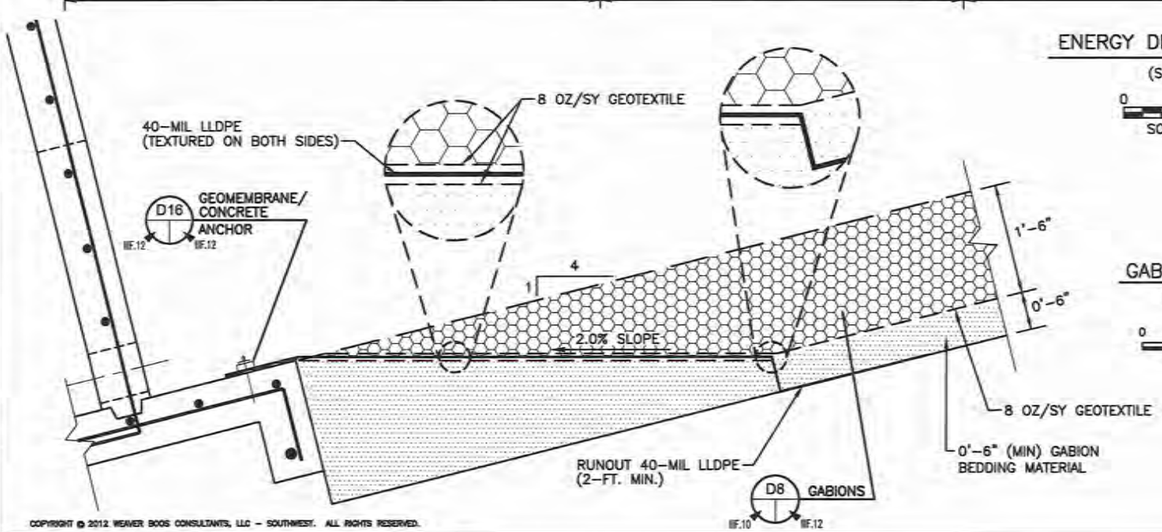
LIST OF REVISIONS:

1. UPDATED WEIR CALCULATIONS.



DRAFT

DISSIPATOR SECTION (TYP) (D18)
IIF.12 IIF.12
0 1 2
SCALE IN FEET



GABION/CONCRETE TRANSITION (D19)
IIF.11 IIF.12
0 1 2
SCALE IN FEET

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DATE: 02/2012
FILE: 1339-351-11
CAD: IIF.12-DRAINAGE.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2015	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
DRAINAGE DETAILS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING IIIF.12

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G:\1339\351\EXPANSION 2009\PART III-SDP\IIIF\IIIF.12-DRAINAGE DETAILS.dwg, jwilson, 1:2

APPENDIX IIIF-A

POST-DEVELOPMENT CONDITION HYDROLOGIC CALCULATIONS

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-16

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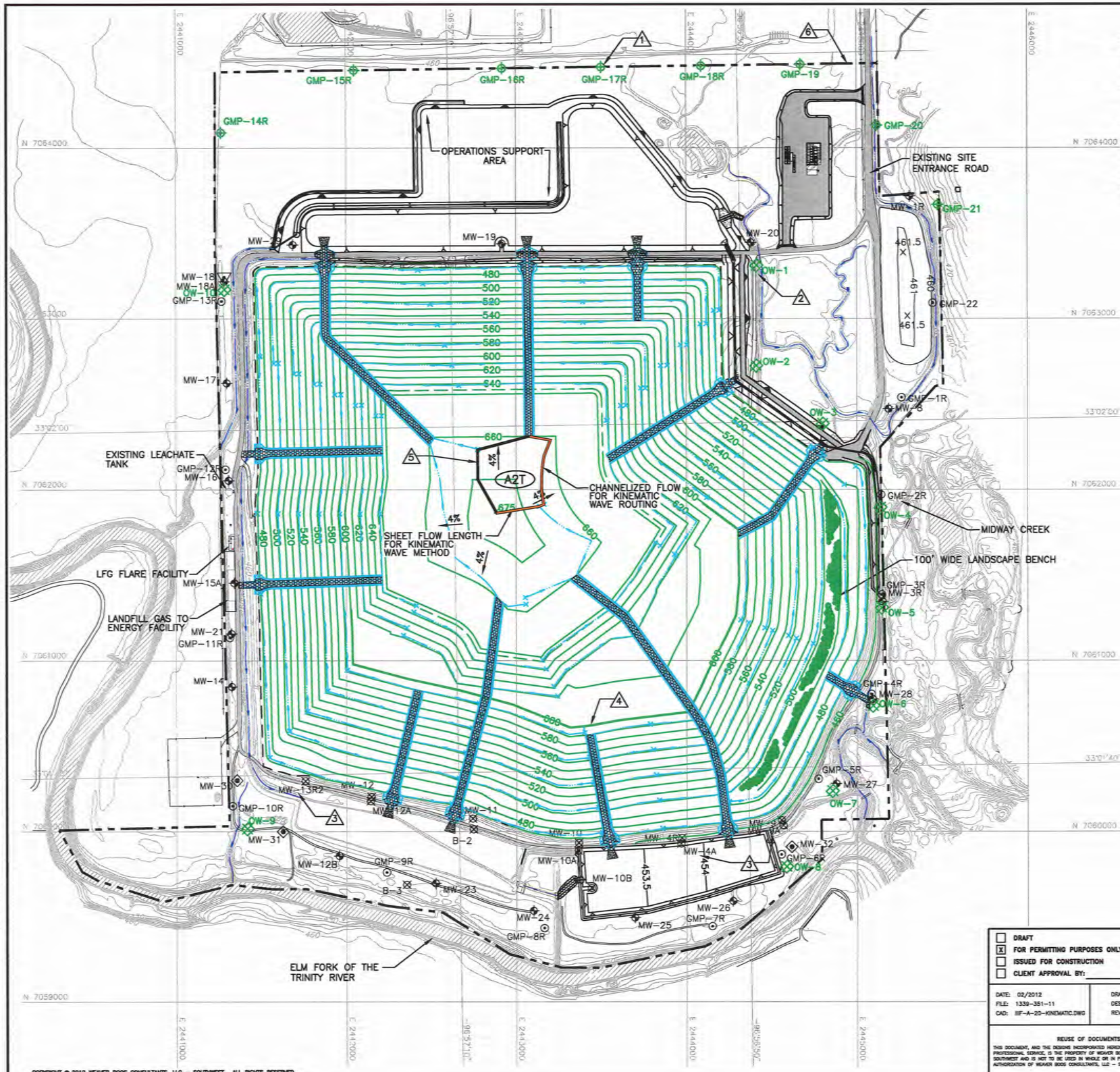
Includes pages IIIF-A-1 through IIIF-A-116

Espey "10-Minute" method has been used to estimate Snyder parameters. Snyder parameter estimations are provided on pages IIIF-A-21 through IIIF-A-26.

As discussed in Section 2 of Appendix IIIF, hydrographs for the areas outside of the permit boundary (O1, ~~O1A,~~ O2, O3, O4, and O5~~, O6, O7, O8, O9, OSB, and OSC~~), and larger areas inside the permit boundary (S7, S9, and S11) were developed using the Snyder unit hydrograph method. The percent imperviousness ranges from 2 percent to 12 percent, for the majority of the non-landfill no-site and off-site areas, which represents the majority of the watershed as undeveloped. Pond areas are assumed to be 100 percent impervious, and areas with significant channel surface or paved surfaces were assigned higher percentages of impervious area, as shown on IIIF-A-22.

Drainage Areas

The drainage areas used for this analysis are shown on Sheets IIIF-A-28 and IIIF-A-29. The routing scheme for the post-development condition is shown in the HEC-1 output file presented on pages IIIF-A-30 through IIIF-A-104.



LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
4. REVISED FINAL COVER CONTOURS.
5. REVISED DRAINAGE AREA.
6. UPDATED PERMIT BOUNDARY INFORMATION.

N

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR (SEE NOTE 1)
- 600 — FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL
- 3 OW-1 — PROPOSED WOODBINE MONITOR WELL
- DRAINAGE AREA BOUNDARY
- A2T — DRAINAGE AREA DESIGNATION
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.

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DATE: 02/2012
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DESIGN BY: CRM
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	2nd TCEQ COMMENT RESPONSE
3	01/2016	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
KINEMATIC WAVE PARAMETERS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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SHEET IIIF-A-20

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Prep By: CRM
Date: 8/5/2016

Chkd By: ____
Date: _____

CAMELOT LANDFILL
1339-351-11-02-6B.6
UNIT HYDROGRAPH DATA
PROPOSED EXPANSION CONDITION

Snyder's Hydrograph Coefficients (Espey's 10 Minute Method)

Proposed Expansion Conditions

Area No.	Area (acres)	Max. Flow Length (L) (ft)	S (ft/ft)	I (%)	Manning "n"	Φ[1]	T_r[2] (min)	T_{lag}[3] (min)	T_{lag} (hr)	Area[4] (sq mi)	q_p[5] (cfs/sq mi)	C_p[6]
O1	~~87.47~~ 117.94	3,580	0.0101	23	0.04	0.80	25.7	23.2	0.39	~~0.1367~~ 0.1843	~~1059.5~~ 1048.2	0.64
~~O1A~~	~~23.42~~	~~2,285~~	~~0.0132~~	~~4~~	~~0.04~~	~~0.85~~	~~32.7~~	~~30.2~~	~~0.50~~	~~0.0366~~	~~864.1~~	~~0.68~~
O2	1008.38	14,770	0.0050	18	0.04	0.81	45.3	42.8	0.71	1.5756	524.7	0.58
O3	16.18	835	0.0611	2	0.04	0.86	20.4	17.9	0.30	0.0253	1452.4	0.68
O4	86.04	3,840	0.0180	10	0.04	0.84	28.4	25.9	0.43	0.1344	954.5	0.64
O5	116.47	2,140	0.0121	2	0.04	0.86	38.0	35.5	0.59	0.1820	690.4	0.64
S1	~~10.26~~ 9.73	875	0.0020	2	0.04	0.86	48.5	46.0	0.77	~~0.0160~~ 0.0152	~~585.8~~ 587.0	~~0.70~~ 0.71
S2	~~30.64~~ 29.76	2,676	0.0009	2	0.04	0.86	76.6	74.1	1.23	~~0.0465~~ 0.0465	~~344.4~~ 344.2	~~0.66~~ 0.66
S3	4.55	250	0.0120	2	0.04	0.86	23.2	20.7	0.35	0.0071	1330.2	0.72
S4	~~43.34~~ 38.22	3,950	0.0058	2	0.04	0.86	52.6	50.1	0.83	~~0.0677~~ 0.0597	~~507.4~~ 509.6	~~0.66~~ 0.66
S5	7.34	1,405	0.0085	2	0.04	0.86	37.7	35.2	0.59	0.0115	778.1	0.71
S6	13.92	3,910	0.0063	2	0.04	0.86	51.4	48.9	0.81	0.0218	544.2	0.69
S7	5.39	1,015	0.0148	2	0.04	0.86	30.4	27.9	0.47	0.0084	989.9	0.72
S8	10.12	785	0.0522	2	0.04	0.86	20.9	18.4	0.31	0.0158	1440.6	0.69
S9	22.75	802	0.0279	2	0.04	0.86	24.6	22.1	0.37	0.0355	1173.3	0.68
S10	10.76	282	0.0317	2	0.04	0.86	18.7	16.2	0.27	0.0168	1617.9	0.68

1 Conveyance efficiency coefficient from Dodson & Associates Inc., *ProHec-1 Program Documentation*, 1995, pages 6-19 and 6-20.
2 $T_r = 3.1(L^{0.23})(S^{-0.25})(I^{-0.18})(\Phi^{1.57})$
3 $T_{lag} = T_r - \Delta t/2$
4 From area summary sheet
5 $q_p = 31600(A^{-0.04})(T_r^{-1.07})$
6 $C_p = 49.375(A^{-0.04})(T_r^{-1.07})(T_{lag})$

T_r = surface runoff to unit hydrograph peak (min)
L = distance along main channel from study point to watershed boundary (ft)
S = main channel slope (ft/ft)
I = impervious cover within the watershed (%)
T_{lag} = watershed lag time (min)
Δt= computation interval (minutes)
q_p = unit hydrograph peak discharge (cfs/sq mi)
C_p = Snyder's peaking coefficient

Snyder Unit Hydrograph uses lag time (T_{lag}) and peaking coefficient accounting for flood wave and watershed storage conditions.

Drainage area "O1" is used in this example.

Estimated Watershed specific parameters

A =	~~87.47~~ 117.94	acres	watershed area
L =	3580	feet	maximun flow length with this watershed
S =	0.0101	feet/feet	watershed slope
I =	23	percent (%)	watershed imperviousness
n =	0.04		Manning's coefficient

Calculate Tr: time beginning of surface runoff to the unit hydrograph peak in minutes

$T_r = 3.1(L^{0.23})(S^{-0.25})(I^{-0.18})(\Phi^{1.57})$

Estimate : conveyance efficiency coefficient
See figure 6.12 on page IIIF-A-19 for estimating
Φ = for 6 percent impervious cover and n = 0.04

Φ= 0.80

$T_r = 3.1(3580^{0.23})(.010^{-0.25})(23^{-0.18})(0.8^{1.57})$

T_r= 25.7 min

Calculate T_{lag}: watershed lag time

T_{lag}= Tr - (Δt/2) — Δt is calculation interval, and 5 minutes is used in the HEC - 1 modeling in this project

T_{lag}= 23.2 minutes

T_{lag}= 0.39 hours

A= A/640

A= ~~0.1367~~ 0.1843 square miles

Calculate q_p: peak discharge of unit hydrograph per unit area (cfs/sq. mi).

$q_p = 31600(A^{-0.04})(T_r^{-1.07})$

q_p= ~~$31600(0.1367^{-0.04})(25.7^{-1.07})$~~ $31600(0.1843^{-0.04})(25.7^{-1.0})$

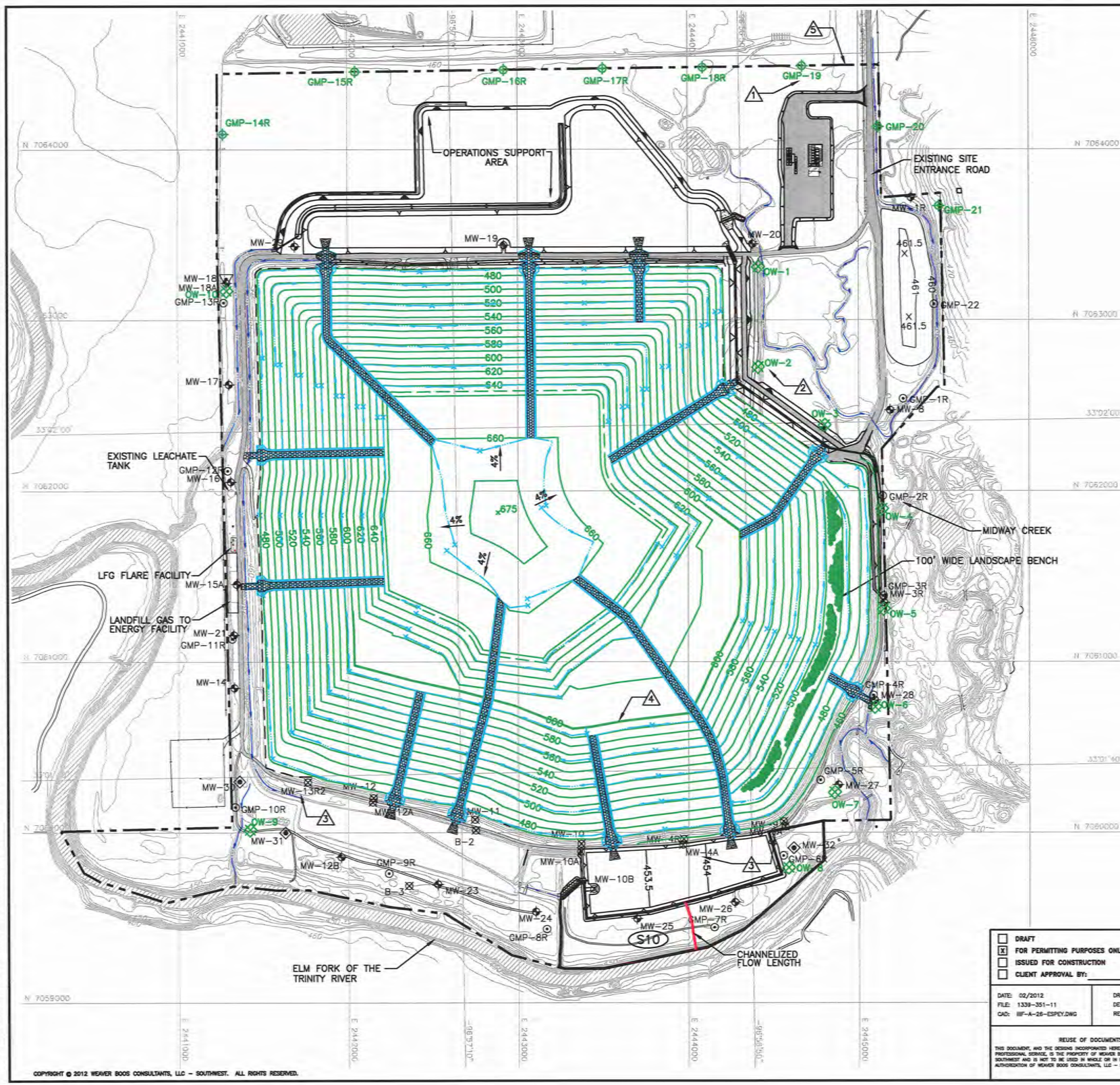
q_p= ~~1059.5~~ 1048.2 cfs/sq. mi

Calculate Peaking coefficient C_p:

$C_p = 49.375(A^{-0.04})(T_r^{-1.07})(T_{lag})$

C_p= ~~$49.375(0.1367^{-0.04})(25.7^{-1.07})(0.39)$~~ $49.375(0.1843^{-0.04})(25.7^{-1.07})(0.39)$

C_p= 0.64



N

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR (SEE NOTE 1)
- FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- MW-8 PERMITTED GROUNDWATER MONITORING WELL
- MW-12 OBSERVATION/MONITORING WELL
- GMP-1R EXISTING LANDFILL GAS MONITORING PROBE
- GMP-14R PROPOSED GAS MONITORING PROBE
- MW-30 PROPOSED GROUNDWATER MONITORING WELL
- OW-1 PROPOSED WOODBINE MONITOR WELL
- DRAINAGE AREA BOUNDARY
- S10 DRAINAGE AREA DESIGNATION
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.

LIST OF REVISIONS:

1. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
4. REVISED FINAL COVER CONTOURS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

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☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
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DESIGN BY: CRM
REVIEWED BY: JPY

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT ESPEY "10-MINUTE" METHOD PARAMETERS

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DENTON COUNTY, TEXAS

Weaver Boos Consultants

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SHEET IIIF-A-26

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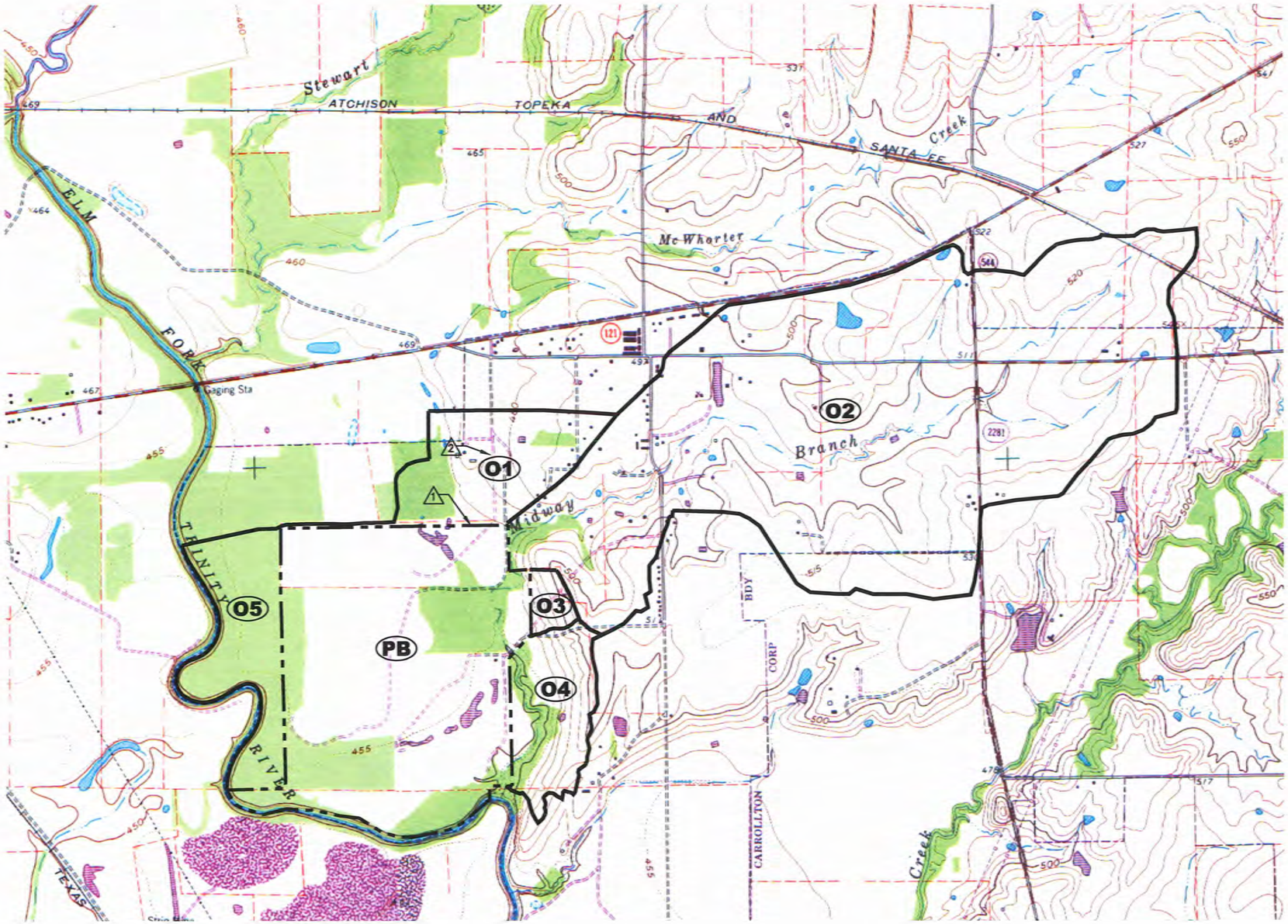

N

0 1000 2000
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- DRAINAGE AREA BOUNDARY
- (O2) DRAINAGE AREA LABEL
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

DRAINAGE AREA NO.	AREA (ACRES)
01	120.7
02	1,008.4
03	16.2
04	86.0
05	116.5
PB	459.8
TOTAL	1,807.6

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — U.S. Route — State Route

LEWISVILLE EAST, TEX.
SW/4 FRISCO 15 QUADRANGLE
N3300—W9652.5/7.5
1960
PHOTOREVISED 1968
AMS 6650 III SW-SERIES V882

DRAFT

NOTES:

1. DRAINAGE AREA DELINEATION WITHIN THE PERMIT BOUNDARY IS INCLUDED ON SHEET IIIF-A-29.
2. TOPOGRAPHY REPRODUCED FROM USGS 7.5 MINUTE QUADRANGLE TOPOGRAPHIC MAP (LEWISVILLE EAST, TX, PHOTO REVISED 1981).

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED DRAINAGE INFORMATION.

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
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DATE: 02/2012
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DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OFFSITE DRAINAGE AREA MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
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SHEET IIIF-A-28

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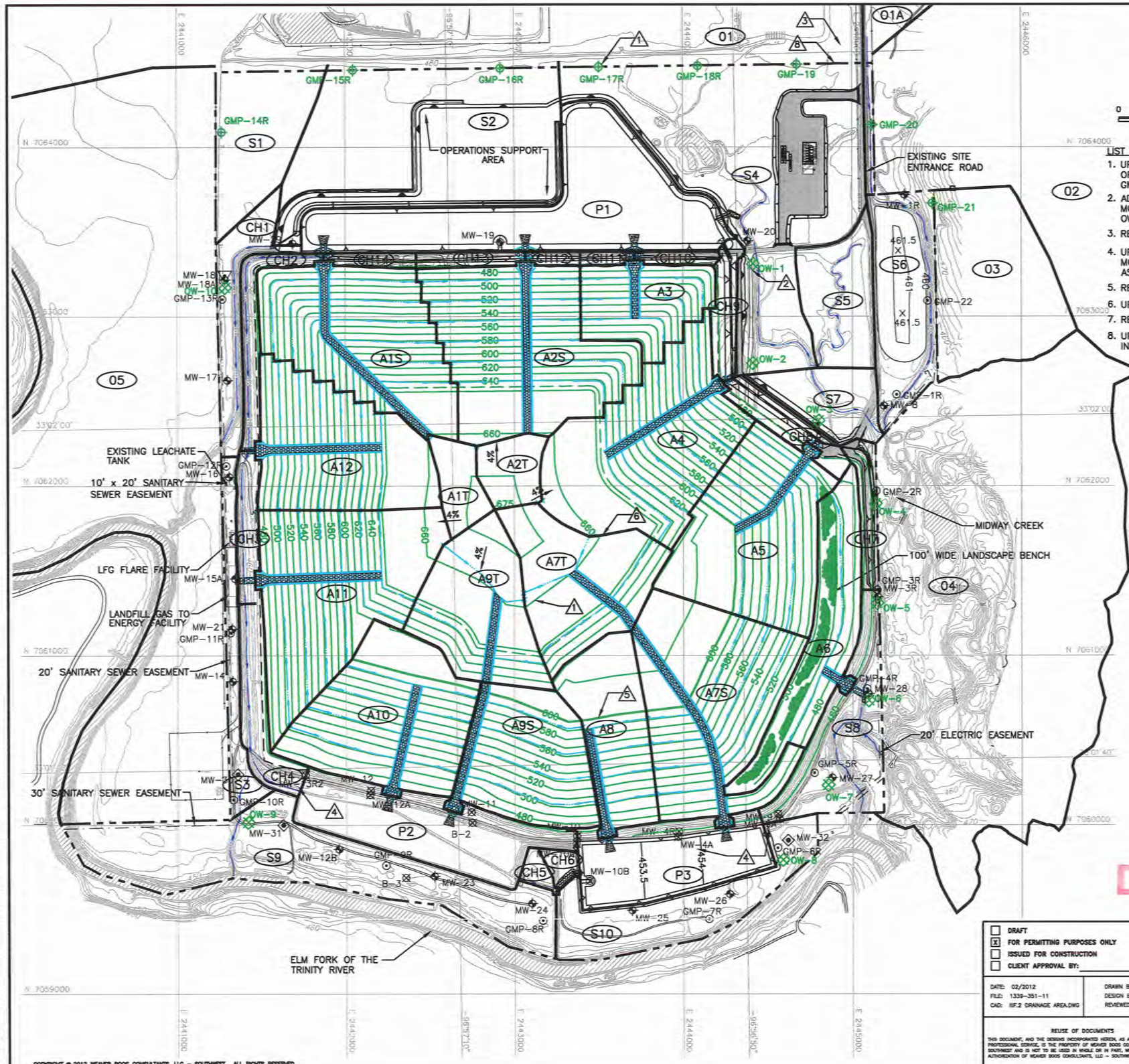

SCALE IN FEET: 0 300 600

LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. REMOVED EASEMENTS.
4. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
5. REVISED FINAL COVER CONTOURS.
6. UPDATED DRAINAGE AREAS.
7. REVISED NOTE 3.
8. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR (SEE NOTE 1)
- FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EASEMENT BOUNDARY
- MW-8 PERMITTED GROUNDWATER MONITORING WELL
- MW-12 OBSERVATION/MONITORING WELL
- GMP-1R EXISTING LANDFILL GAS MONITORING PROBE
- GMP-14R PROPOSED GAS MONITORING PROBE
- MW-30 PROPOSED GROUNDWATER MONITORING WELL
- OW-1 PROPOSED WOODBINE MONITOR WELL
- DRAINAGE AREA BOUNDARY
- A7T DRAINAGE AREA DESIGNATION
- INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
4. REFER TO DRAWING IIIF-A-28 FOR COMPLETE OFFSITE DRAINAGE AREA DELINEATIONS.

DRAINAGE AREA NO.	AREA (ACRES)	DRAINAGE AREA NO.	AREA (ACRES)
S1	10.26	A9T	12.33
S2	30.86	A10	17.87
S3	4.55	A11	21.60
S4	43.34	A12	16.48
S5	7.34	CH1	5.94
S6	13.92	CH2	3.29
S7	5.39	CH3	2.64
S8	10.12	CH4	4.55
S9	22.75	CH5	0.76
S10	10.76	CH6	0.83
A1T	3.07	CH7	2.33
A1S	18.86	CH8	3.02
A2T	3.35	CH9	2.57
A2S	22.03	CH10	0.85
A3	8.06	CH11	0.56
A4	21.68	CH12	0.59
A5	18.65	CH13	1.29
A6	10.99	CH14	1.01
A7T	13.02	P1	23.10
A7S	22.24	P2	12.60
A8	10.29	P3	10.83
A9S	13.06		

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DATE: 02/2012
FILE: 1339-351-11
CAD: IIIF.2 DRAINAGE AREA.DWG

DRAWN BY: JDW
DESIGN BY: CRM
REVIEWED BY: JPY

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	2nd TCEQ COMMENT RESPONSE
3	01/2016	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
POST DEVELOPMENT DRAINAGE
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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SHEET IIIF-A-29

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1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   03AUG16  TIME  17:44:37  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X               X
                                                XXXXXXX  XXXX     X        XXXXX  X
                                                X     X  X        X               X
                                                X     X  X        X     X         X
                                                X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                   HEC-1 INPUT                                                    PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                       *DIAGRAM
            1          ID        CAMELOT LANDFILL
            2          ID        PROPOSED EXPANSION CONDITION
            3          ID        25-YEAR, 24-HOUR STORM EVENT
            4          ID        FILE:\SOLID WASTE\CITY OF FARMERS BRANCH\EXPANSION\
            5          ID        PARTIII-SDP\APPENDIX IIIF\IIIFA\HEC-1\25PROPPOST----8-16.IH1
            6          IT       5       0    2400     720       0       0
            7          IO       3       0       0
                       *

            8          KK      O1
            9          KM        OFFSITE AREA O1
           10          KO       0       0       0       7      21
           11          BA  0.1838
           12          PH       4             .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44
           13          LS       0      86
           14          US    0.39    0.64
                       *

           15          KK      S4
           16          KM         SUBAREA S4
           17          KO       0       0       0       7      21
           18          BA  0.0597
           19          LS       0      84
           20          US    0.83    0.66
                       *

           21          KK     CS4
           22          KM        COMBINE AREAS PRIOR TO POND P1 OUTLET
           23          KO       0       0       0       7      21
           24          HC       2
                       *

           25          KK     A1T
           26          KM        SUBAREA A1T
           27          KO       0       0       0       7      21
           28          BA  0.0048
           29          LS       0      84
           30          UK     312     .04     .35     100
           31          RD     622    .005     .03            TRAP       0       2      NO
                       *

           32          KK     A1S
           33          KM        SUBAREA A1S
           34          KO       0       0       0       7      21
           35          BA  0.0295
           36          LS       0      86
           37          UK     120     .25     .35     100
           38          RD     881    .005     .03            TRAP       0       2      NO
                       *
1                                                   HEC-1 INPUT                                                    PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           39          KK     CA1
           40          KM        COMBINE A1 SUBAREAS
           41          KO       0       0       0       7      21
           42          HC       2
                       *

           43          KK    CH14
           44          KM        SUBAREA CH14
           45          KO       0       0       0       7      21
           46          BA  0.0016
           47          LS       0      84
```

```
 48          UK      52     0.1    0.35     100
 49          RD     524   0.005    0.03            TRAP       0       3      NO
             *

 50          KK   CCH14
 51          KM        COMBINE CH14 WITH A1 AREAS
 52          KO       0       0       0       7      21
 53          HC       2
             *

 54          KK     A2T
 55          KM        SUBAREA A2T
 56          KO       0       0       0       7      21
 57          BA  0.0052
 58          LS       0      84
 59          UK     287     .04     .35     100
 60          RD     506    .005     .03            TRAP       0       2      NO
             *

 61          KK     A2S
 62          KM        SUBAREA A2S
 63          KO       0       0       0       7      21
 64          BA  0.0344
 65          LS       0      86
 66          UK     120     .25     .35     100
 67          RD     925    .005     .03            TRAP       0       2      NO
             *

 68          KK     CA2
 69          KM        COMBINE A2 SUBAREAS
 70          KO       0       0       0       7      21
 71          HC       2
             *

 72          KK    CH12
 73          KM        SUBAREA CH12
 74          KO       0       0       0       7      21
 75          BA  0.0009
 76          LS       0      84
 77          UK      52     0.1    0.35     100
 78          RD     313   0.005    0.03            TRAP       0       3      NO
             *
1                                          HEC-1 INPUT                                                    PAGE  3

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 79          KK    CH13
 80          KM         SUBAREA CH13
 81          KO       0       0       0       7      21
 82          BA   0.002
 83          LS       0      84
 84          UK      52     0.1    0.35     100
 85          RD     634   0.005    0.03            TRAP       0       3      NO
             *

 86          KK   CCH13
 87          KM        COMBINE CH12 AND CH13 WITH A2 AREAS
 88          KO       0       0       0       7      21
 89          HC       3
             *

 90          KK      A3
 91          KM        SUBAREA A3
 92          KO       0       0       0       7      21
 93          BA  0.0126
 94          LS       0      86
 95          UK     120     .25     .35     100
 96          RD     703    .005     .03            TRAP       0       2      NO
             *

 97          KK    CH10
 98          KM        SUBAREA CH10
 99          KO       0       0       0       7      21
100          BA  0.0013
101          LS       0      84
102          UK      52     0.1    0.35     100
103          RD     483   0.005    0.03            TRAP       0       3      NO
             *

104          KK    CH11
105          KM        SUBAREA CH11
106          KO       0       0       0       7      21
107          BA  0.0009
108          LS       0      84
109          UK      52     0.1    0.35     100
110          RD     313   0.005    0.03            TRAP       0       3      NO
             *

111          KK   CCH11
112          KM        COMBINE CH10 AND CH11 WITH AREA A3
113          KO       0       0       0       7      21
114          HC       3
             *

115          KK     CA3
116          KM        COMBINE AREAS FLOWING DIRECTLY INTO P1
117          KO       0       0       0       7      21
118          HC       3
             *
1                                          HEC-1 INPUT                                                    PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
 119          KK     CH7
 120          KM        CHANNEL CH7
 121          KO       0       0       0       7      21
 122          BA  0.0036
 123          LS       0      84
 124          UK      82     .25     .35     100
 125          RD     830    .003     .03            TRAP       5       2      NO
              *

 126          KK      A5
 127          KM        SUBAREA A5
 128          KO       0       0       0       7      21
 129          BA  0.0291
 130          LS       0      86
 131          UK     150     0.2     .35     100
 132          RD    1057    .005     .03            TRAP       0       2      NO
              *

 133          KK     CA5
 134          KM        COMBINE CH7 AND A5 BEFORE ROUTING THROUGH CH8
 135          KO       0       0       0       7      21
 136          HC       2
              *

 137          KK     CH8
 138          KM        CHANNEL CH8
 139          KO       0       0       0       7      21
 140          BA  0.0047
 141          LS       0      84
 142          UK      46   .0652     .35     100
 143          RD     707     .03     .03            TRAP       5       2     YES
              *

 144          KK      A4
 145          KM        SUBAREA A4
 146          KO       0       0       0       7      21
 147          BA  0.0339
 148          LS       0      86
 149          UK     150     0.2     .35     100
 150          RD     840    .005     .03            TRAP       0       2      NO
              *

 151          KK     CA4
 152          KM        COMBINE WITH A4 BEFORE ROUTING THROUGH CH9
 153          KO       0       0       0       7      21
 154          HC       2
              *

 155          KK     CH9
 156          KM        CHANNEL CH9
 157          KO       0       0       0       7      21
 158          BA   0.004
 159          LS       0      84
 160          UK      75      .1     .35     100
1                                          HEC-1 INPUT                                                                    PAGE  5

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 161          RD     670     .03     .03            TRAP       5       2     YES
              *

 162          KK      P1
 163          KM        DETENTION POND P1
 164          KO       0       0       0       7      21
 165          BA  0.0361
 166          LS             100
 167          UD       0
              *

 168          KK   P1-IN
 169          KM        COMBINE AREAS DISCHARGING TO POND P1
 170          KO       0       0       0       7      21
 171          HC       3
              *

 172          KK     RP1
 173          KM        ROUTE THROUGH POND P1
 174          KO       0       0       0       7      21
 175          RS       1    ELEV   454.5
 176          SA       0 17.7532 18.1645 18.5771 18.9910 19.4062 19.8227 20.2405
 177          SE   454.5     455     456     457     458     459     460     461
 178          SS     458      25     2.6     1.5
 179          SL   455.5  3.1416      .8      .5
              *

 180          KK     CP1
 181          KM        COMBINE DOWNSTREAM OF POND P1 OUTLET
 182          KO       0       0       0       7      21
 183          HC       2
              *

 184          KK      S5
 185          KM        SUBAREA S5
 186          KO       0       0       0       7      21
 187          BA   .0115
 188          LS       0      84
 189          US    0.59    0.71
              *

 190          KK     CS5
 191          KM        COMBINE AREAS UPSTREAM OF S7
 192          KO       0       0       0       7      21
 193          HC       2
```

```
                    *

194                 KK      S7
195                 KM        SUBAREA S7
196                 KO       0       0       0       7      21
197                 BA  0.0084
198                 LS       0      84
199                 US    0.47    0.72
                    *
1                                                HEC-1 INPUT                                                PAGE  6

LINE                ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


200                 KK     CS7
201                 KM        COMBINE WITH AREA S7
202                 KO       0       0       0       7      21
203                 HC       2
                    *

204                 KK      O2
205                 KM  OFFSITE AREA O2
206                 KO       0       0       0       7      21
207                 BA  1.5756
208                 LS       0      85
209                 US    0.71    0.58
                    *

210                 KK      O3
211                 KM  OFFSITE AREA O3
212                 KO       0       0       0       7      21
213                 BA  0.0253
214                 LS       0      84
215                 US     0.3    0.68
                    *

216                 KK      S6
217                 KM  SUBAREA S6
218                 KO       0       0       0       7      21
219                 BA  0.0218
220                 LS       0      84
221                 US    0.81    0.69
                    *

222                 KK     CS6
223                 KM  COMBINE AREAS DISCHARGING OFF OF P.B.
224                 KO       0       0       0       7      21
225                 HC       4
                    *

226                 KK      O4
227                 KM  OFFSITE AREA O4
228                 KO       0       0       0       7      21
229                 BA  0.1344
230                 LS       0      84
231                 US    0.43    0.64
                    *

232                 KK     CO4
233                 KM  MIDWAY BRANCH DISCHARGING BACK ONTO P.B.
234                 KO       0       0       0       7      21
235                 HC       2
                    *
1                                                HEC-1 INPUT                                                PAGE  7

LINE                ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


236                 KK      A6
237                 KM  SUBAREA A6
238                 KO       0       0       0       7      21
239                 BA  0.0172
240                 LS       0      86
241                 UK     120    0.25     .35     100
242                 RD    1314   0.002     .03            TRAP       0       2      NO
                    *

243                 KK      S8
244                 KM  SUBAREA S8
245                 KO       0       0       0       7      21
246                 BA  0.0158
247                 LS       0      84
248                 US    0.31    0.69
                    *

249                 KK     CS8
250                 KM  MIDWAY BRANCH DISCHARGING OFF OF P.B.
251                 KO       0       0       0       7      21
252                 HC       3
                    *

253                 KK      S1
254                 KM  SUBAREA S1
255                 KO       0       0       0       7      21
256                 BA  0.0152
257                 LS       0      84
258                 US    0.77     0.7
                    *

259                 KK      S2
260                 KM  SUBAREA S2
261                 KO       0       0       0       7      21
262                 BA  0.0465
263                 LS       0      84
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 264          US    1.23    0.66
              *

 265          KK     CH1
 266          KM  CHANNEL CH1
 267          KO       0       0       0       7      21
 268          BA  0.0093
 269          LS       0      84
 270          UK     411   0.005     .35     100
 271          RD    1283   .0016     .03            TRAP      15       4     YES
              *

 272          KK      S3
 273          KM  SUBAREA S3
 274          KO       0       0       0       7      21
 275          BA   .0071
 276          LS       0      84
 277          US    0.35    0.72
              *
1                                          HEC-1 INPUT                                                    PAGE  8

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 278          KK      O5
 279          KM  OFFSITE AREA O5
 280          KO       0       0       0       7      21
 281          BA   0.182
 282          LS       0      84
 283          US    0.59    0.64
              *

 284          KK     CO5
 285          KM  COMBINE WEST AREAS DISCHARGING TO ELM FORK
 286          KO       0       0       0       7      21
 287          HC       4
              *

 288          KK     CH2
 289          KM  CHANNEL CH2
 290          KO       0       0       0       7      21
 291          BA  0.0051
 292          LS       0      84
 293          UK      82   .0122     .35     100
 294          RD    1539   .0016     .03            TRAP       8       2      NO
              *

 295          KK     A12
 296          KM  SUBAREA A12
 297          KO       0       0       0       7      21
 298          BA  0.0258
 299          LS       0      86
 300          UK     120     .25     .35     100
 301          RD     556    .005     .03            TRAP       0       2      NO
              *

 302          KK    CA12
 303          KM  COMBINE CH2 AND 12
 304          KO       0       0       0       7      21
 305          HC       2
              *

 306          KK     CH3
 307          KM  CHANNEL CH3
 308          KO       0       0       0       7      21
 309          BA  0.0042
 310          LS       0      84
 311          UK      92   .0435     .35     100
 312          RD     840   .0012     .03            TRAP      10       2     YES
              *

 313          KK     A11
 314          KM  SUBAREA A11
 315          KO       0       0       0       7      21
 316          BA  0.0338
 317          LS       0      86
 318          UK     120     .25     .35     100
 319          RD    1002    .005     .03            TRAP       0       2      NO
              *
1                                          HEC-1 INPUT                                                    PAGE  9

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 320          KK    CA11
 321          KM  COMBINE WITH CH3 AND A11
 322          KO       0       0       0       7      21
 323          HC       2
              *

 324          KK     CH4
 325          KM  CHANNEL CH4
 326          KO       0       0       0       7      21
 327          BA  0.0071
 328          LS       0      84
 329          UK     101   .0792     .35     100
 330          RD    1180   .0025     .03            TRAP      10       2     YES
              *

 331          KK     A9T
 332          KM  SUBAREA A9T
 333          KO       0       0       0       7      21
 334          BA  0.0193
 335          LS       0      84
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 336          UK     410     .04     .35     100
 337          RD     563    .005     .03            TRAP       0       2      NO
              *

 338          KK     A9S
 339          KM  SUBAREA A9S
 340          KO       0       0       0       7      21
 341          BA  0.0204
 342          LS       0      86
 343          UK     150     0.2     .35     100
 344          RD     880    .005     .03            TRAP       0       2      NO
              *

 345          KK     CA9
 346          KM  COMBINE A9 SUBAREAS
 347          KO       0       0       0       7      21
 348          HC       2
              *

 349          KK     A10
 350          KM  SUBAREA A10
 351          KO       0       0       0       7      21
 352          BA  0.0279
 353          LS       0      86
 354          UK     150     0.2     .35     100
 355          RD     747    .005     .03            TRAP       0       2      NO
              *

 356          KK      P2
 357          KM  DETENTION POND P2
 358          KO       0       0       0       7      21
 359          BA  0.0197
 360          LS             100
 361          UD       0
              *
1                                          HEC-1 INPUT                                                    PAGE 10

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 362          KK   P2-IN
 363          KM  COMBINE AREAS DISCHARGING TO POND P2
 364          KO       0       0       0       7      21
 365          HC       4
              *

 366          KK     RP2
 367          KM  ROUTE THROUGH POND P2
 368          KO       0       0       0       7      21
 369          RS       1    ELEV     454
 370          SA       0  4.4466   6.786  8.2567  8.3782  8.5005  8.6236  8.8721  9.1240
 371          SE     454   454.5     455   455.5     456   456.5     457     458     459
 372          SS     458      25     2.6     1.5
 373          SL     456  14.137      .8      .5
              *

 374          KK     CH5
 375          KM  CHANNEL CH5
 376          KO       0       0       0       7      21
 377          BA   .0012
 378          LS       0      84
 379          UK     197   .0051     .35     100
 380          RD     155    .005     .03            TRAP      20       2     YES
              *

 381          KK     A7T
 382          KM  SUBAREA A7T
 383          KO       0       0       0       7      21
 384          BA  0.0203
 385          LS       0      84
 386          UK     257     .04     .35     100
 387          RD     600    .005     .03            TRAP       0       2      NO
              *

 388          KK     A7S
 389          KM  SUBAREA A7S
 390          KO       0       0       0       7      21
 391          BA  0.0348
 392          LS       0      86
 393          UK     120     .25     .35     100
 394          RD    1045    .005     .03            TRAP       0       2      NO
              *

 395          KK     CA7
 396          KM  COMBINE A7 SUBAREAS
 397          KO       0       0       0       7      21
 398          HC       2
              *
1                                          HEC-1 INPUT                                                    PAGE 11

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 399          KK      A8
 400          KM  SUBAREA A8
 401          KO       0       0       0       7      21
 402          BA  0.0161
 403          LS       0      86
 404          UK     150     0.2     .35     100
 405          RD     348    .005     .03            TRAP       0       2      NO
              *

 406          KK      P3
 407          KM  DETENTION POND P3
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```
408          KO       0       0       0       7      21
409          BA  0.0169
410          LS            100
411          UD       0
             *

412          KK   P3-IN
413          KM  COMBINE AREAS DISCHARGING TO POND P3
414          KO       0       0       0       7      21
415          HC       3
             *

416          KK     RP3
417          KM  ROUTE THROUGH POND P3
418          KO       0       0       0       7      21
419          RS       1    ELEV     453
420          SA       0   5.356   7.771   7.965    8.16   8.357   8.555
421          SE     453     454     455     456     457     458     459
422          SS     458      25     2.6     1.5
423          SL   454.5   7.069      .8      .5
             *

424          KK     CH6
425          KM  CHANNEL CH6
426          KO       0       0       0       7      21
427          BA  0.0013
428          LS       0      84
429          UK      50     0.1     .35     100
430          RD     155    .005     .03            TRAP      20       2     YES
             *

431          KK    CCH6
432          KM  COMBINE AREAS UPSTREAM OF S8
433          KO       0       0       0       7      21
434          HC       2
             *

435          KK      S9
436          KM  SUBAREA S9
437          KO       0       0       0       7      21
438          BA  0.0355
439          LS       0      84
440          US    0.37    0.68
             *
1                                          HEC-1 INPUT                                                PAGE 12

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

441          KK     S10
442          KM  SUBAREA S10
443          KO       0       0       0       7      21
444          BA  0.0168
445          LS       0      84
446          US    0.27    0.68
             *

447          KK     CS9
448          KM  COMBINE AREAS DISCHARGING SOUTH OFF OF P.B.
449          KO       0       0       0       7      21
450          HC       3
             *
451          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8          O1
                 .
                 .
    15           .           S4
                 .             .
                 .             .
    21         CS4............
                 .
                 .
    25           .          A1T
                 .             .
                 .             .
    32           .             .          A1S
                 .             .            .
                 .             .            .
    39           .          CA1............
                 .             .
                 .             .
    43           .             .         CH14
                 .             .            .
                 .             .            .
```

```
 50          .       CCH14............
             .           .
             .           .
 54          .           .         A2T
             .           .           .
             .           .           .
 61          .           .           .         A2S
             .           .           .           .
             .           .           .           .
 68          .           .         CA2............
             .           .           .
             .           .           .
 72          .           .           .        CH12
             .           .           .           .
             .           .           .           .
 79          .           .           .           .        CH13
             .           .           .           .           .
             .           .           .           .           .
 86          .           .       CCH13........................
             .           .           .
             .           .           .
 90          .           .           .          A3
             .           .           .           .
             .           .           .           .
 97          .           .           .           .        CH10
             .           .           .           .           .
             .           .           .           .           .
104          .           .           .           .           .        CH11
             .           .           .           .           .           .
             .           .           .           .           .           .
111          .           .           .       CCH11........................
             .           .           .           .
             .           .           .           .
115          .         CA3........................
             .           .
             .           .
119          .           .         CH7
             .           .           .
             .           .           .
126          .           .           .          A5
             .           .           .           .
             .           .           .           .
133          .           .         CA5............
             .           .           V
             .           .           V
137          .           .         CH8 ***
             .           .           .
             .           .           .
144          .           .           .          A4
             .           .           .           .
             .           .           .           .
151          .           .         CA4............
             .           .           V
             .           .           V
155          .           .         CH9 ***
             .           .           .
             .           .           .
162          .           .           .          P1
             .           .           .           .
             .           .           .           .
168          .       P1-IN........................
             .           V
             .           V
172          .         RP1
             .           .
             .           .
180        CP1............
             .
             .
184          .          S5
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                .          .
190          CS5............
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194             .          S7
                .           .
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200          CS7............
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204             .          O2
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                .           .
210             .           .          O3
                .           .           .
                .           .           .
216             .           .           .          S6
                .           .           .           .
                .           .           .           .
222          CS6.................................
                .
                .
226             .          O4
                .           .
                .           .
232          CO4............
                .
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236             .          A6
                .           .
                .           .
243             .           .          S8
                .           .           .
                .           .           .
249          CS8........................
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                .
253             .          S1
                .           .
                .           .
259             .           .          S2
                .           .           V
                .           .           V
265             .           .         CH1 ***
                .           .           .
                .           .           .
272             .           .           .          S3
                .           .           .           .
                .           .           .           .
278             .           .           .           .          O5
                .           .           .           .           .
                .           .           .           .           .
284             .        CO5.................................
                .           .
                .           .
288             .           .         CH2
                .           .           .
                .           .           .
295             .           .           .         A12
                .           .           .           .
                .           .           .           .
302             .           .       CA12............
                .           .           V
                .           .           V
306             .           .         CH3 ***
                .           .           .
                .           .           .
313             .           .           .         A11
                .           .           .           .
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320             .           .       CA11............
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                 .          .          V
                 .          .          V
   324           .          .        CH4 ***
                 .          .          .
                 .          .          .
   331           .          .          .         A9T
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                 .          .          .           .
   338           .          .          .           .         A9S
                 .          .          .           .           .
                 .          .          .           .           .
   345           .          .          .         CA9............
                 .          .          .           .
                 .          .          .           .
   349           .          .          .           .         A10
                 .          .          .           .           .
                 .          .          .           .           .
   356           .          .          .           .           .          P2
                 .          .          .           .           .           .
                 .          .          .           .           .           .
   362           .          .      P2-IN.................................
                 .          .          V
                 .          .          V
   366           .          .        RP2
                 .          .          V
                 .          .          V
   374           .          .        CH5 ***
                 .          .          .
                 .          .          .
   381           .          .          .         A7T
                 .          .          .           .
                 .          .          .           .
   388           .          .          .           .         A7S
                 .          .          .           .           .
                 .          .          .           .           .
   395           .          .          .         CA7............
                 .          .          .           .
                 .          .          .           .
   399           .          .          .           .          A8
                 .          .          .           .           .
                 .          .          .           .           .
   406           .          .          .           .           .          P3
                 .          .          .           .           .           .
                 .          .          .           .           .           .
   412           .          .          .       P3-IN.......................
                 .          .          .           V
                 .          .          .           V
   416           .          .          .         RP3
                 .          .          .           V
                 .          .          .           V
   424           .          .          .         CH6 ***
                 .          .          .           .
                 .          .          .           .
   431           .          .      CCH6............
                 .          .          .
                 .          .          .
   435           .          .          .          S9
                 .          .          .           .
                 .          .          .           .
   441           .          .          .           .         S10
                 .          .          .           .           .
                 .          .          .           .           .
   447           .          .        CS9........................
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1****************************************
*************************************
 *                                    *                                                    *
*
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                 *
U.S. ARMY CORPS OF ENGINEERS     *
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 *                JUN   1998                *                                                                    *
HYDROLOGIC ENGINEERING CENTER     *
 *             VERSION 4.1                  *                                                                    *
609 SECOND STREET           *
 *                                          *                                                                    *
DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   03AUG16  TIME  17:44:37      *                                                                    *
(916) 756-1104             *
 *                                          *                                                                    *
*
 ****************************************
****************************************


                            CAMELOT LANDFILL
                            PROPOSED EXPANSION CONDITION
                            25-YEAR, 24-HOUR STORM EVENT
                            FILE:\SOLID WASTE\CITY OF FARMERS BRANCH\EXPANSION\
                            PARTIII-SDP\APPENDIX IIIF\IIIFA\HEC-1\25PROPPOST----8-16.IH1

   7 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         720  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      4    0  ENDING DATE
                      NDTIME        1155  ENDING TIME
                       ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   59.92 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   8 KK     *        O1  *
            *            *
            **************
                            OFFSITE AREA O1

  10 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  11 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .18  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                            DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                 STORM AREA =     .18

  13 LS          SCS LOSS RATE
                       STRTL         .33  INITIAL ABSTRACTION
                      CRVNBR       86.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 US          SNYDER UNITGRAPH
                          TP         .39  LAG
                          CP         .64  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                                  ***
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                                        UNIT HYDROGRAPH PARAMETERS
                                   CLARK   TC=   .45 HR,       R=   .34 HR
                                  SNYDER   TP=   .39 HR,      CP=   .65

                                            UNIT HYDROGRAPH
                                        25 END-OF-PERIOD ORDINATES
              17.       62.      120.      170.      194.      182.      147.      115.       90.       71.
              55.       43.       34.       27.       21.       16.       13.       10.        8.        6.
               5.        4.        3.        2.        2.

     ***            ***            ***            ***            ***

                     HYDROGRAPH AT STATION       O1

   TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     394.     12.42                 92.         28.         11.         11.
                        (INCHES)    4.651       5.762       5.762       5.762
                         (AC-FT)     46.         56.         56.         56.

                        CUMULATIVE AREA =     .18 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   15 KK    *        S4  *
            *            *
            **************
                                SUBAREA S4

   17 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

   18 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .06  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .06

   19 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

   20 US          SNYDER UNITGRAPH
                           TP         .83  LAG
                           CP         .66  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                        ***

                                        UNIT HYDROGRAPH PARAMETERS
                                   CLARK   TC=   .94 HR,       R=   .69 HR
                                  SNYDER   TP=   .84 HR,      CP=   .67

                                            UNIT HYDROGRAPH
                                        50 END-OF-PERIOD ORDINATES
               1.        4.        7.       12.       16.       21.       25.       28.       30.       31.
              31.       29.       26.       23.       20.       18.       16.       14.       13.       11.
              10.        9.        8.        7.        6.        5.        5.        4.        4.        3.
               3.        3.        2.        2.        2.        2.        1.        1.        1.        1.
               1.        1.        1.        1.        1.        0.        0.        0.        0.        0.

     ***            ***            ***            ***            ***

                     HYDROGRAPH AT STATION       S4

   TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      83.     12.92                 29.          9.          4.          4.
                        (INCHES)    4.467       5.531       5.531       5.531
                         (AC-FT)     14.         18.         18.         18.
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                    CUMULATIVE AREA =     .06 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


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          *            *
  21 KK   *       CS4  *
          *            *
          **************
                         COMBINE AREAS PRIOR TO POND P1 OUTLET

  23 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


  24 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                 ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CS4

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     450.     12.50                120.         37.         15.         15.
                        (INCHES)    4.599       5.705       5.705       5.705
                         (AC-FT)     60.         74.         74.         74.

                        CUMULATIVE AREA =     .24 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
  25 KK   *       A1T  *
          *            *
          **************
                         SUBAREA A1T

  27 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  28 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .00  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                            DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                 STORM AREA =     .00

  29 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
  30 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        312.  OVERLAND FLOW LENGTH
                           S       .0400  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
  31 RD            MAIN CHANNEL
                           L        622.  CHANNEL LENGTH
                           S       .0050  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .00  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD         .00  BOTTOM WIDTH OR DIAMETER
                           Z        2.00  SIDE SLOPE
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RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                    ***
                          COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                  COMPUTATION TIME STEP
ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                              PEAK                  CELERITY
                                (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

PLANE1       .85      1.67       2.54     62.40     15.25    728.32      5.55       .42
MAIN        1.63      1.33       3.25    311.00     14.85    730.68      5.51      3.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1423E+01 OUTFLOW= .1411E+01 BASIN STORAGE= .4464E-03 PERCENT ERROR=    .8

                                  INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN        1.63      1.33       5.00              14.81    730.00      5.51

   ***          ***          ***          ***          ***

                    HYDROGRAPH AT STATION      A1T

  TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      15.     12.17                2.          1.          0.          0.
                        (INCHES)   4.491       5.502       5.509       5.509
                         (AC-FT)     1.          1.          1.          1.

                        CUMULATIVE AREA =     .00 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
  32 KK     *       A1S  *
            *            *
            **************
                          SUBAREA A1S

  34 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  35 BA          SUBBASIN CHARACTERISTICS
                       TAREA        .03  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .03

  36 LS          SCS LOSS RATE
                       STRTL        .33  INITIAL ABSTRACTION
                      CRVNBR      86.00  CURVE NUMBER
                       RTIMP        .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
  37 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L       120.  OVERLAND FLOW LENGTH
                           S      .2500  SLOPE
                           N       .350  ROUGHNESS COEFFICIENT
                          PA      100.0  PERCENT OF SUBBASIN
                       DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
  38 RD            MAIN CHANNEL
                           L       881.  CHANNEL LENGTH
                           S      .0050  SLOPE
                           N       .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA        .03  CONTRIBUTING AREA
                       SHAPE       TRAP  CHANNEL SHAPE
                          WD        .00  BOTTOM WIDTH OR DIAMETER
                           Z       2.00  SIDE SLOPE
```

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RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                    ***
                          COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                COMPUTATION TIME STEP
 ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                PEAK                CELERITY
                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

PLANE1        2.13      1.67        .70     24.00    148.63    725.02      5.79       .61
MAIN          1.63      1.33       2.60    440.50    138.99    725.52      5.64      5.65

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .9108E+01 OUTFLOW= .8871E+01 BASIN STORAGE= .4882E-03 PERCENT ERROR=
2.6

                                  INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN          1.63      1.33       5.00              136.68    725.00      5.64

     ***            ***            ***            ***            ***

                    HYDROGRAPH AT STATION      A1S

   TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     137.     12.08                15.          4.          2.           2.
                       (INCHES)   4.646       5.637       5.638        5.638
                        (AC-FT)      7.          9.          9.           9.

                       CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
   39 KK    *       CA1  *
            *            *
            **************
                          COMBINE A1 SUBAREAS

   41 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS

   42 HC          HYDROGRAPH COMBINATION
                       ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***

     ***            ***            ***            ***            ***

                    HYDROGRAPH AT STATION      CA1

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     150.     12.08                17.          5.          2.           2.
                       (INCHES)   4.622       5.618       5.620        5.620
                        (AC-FT)      8.         10.         10.          10.

                       CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
   43 KK    *      CH14  *
            *            *
            **************
                          SUBAREA CH14
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 45 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                      IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 46 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .00  SUBBASIN AREA

                PRECIPITATION DATA

 12 PH                        DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......  ............... TP-40 ...............  ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                           STORM AREA =       .00

 47 LS          SCS LOSS RATE
                     STRTL         .38  INITIAL ABSTRACTION
                    CRVNBR       84.00  CURVE NUMBER
                     RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 48 UK            OVERLAND-FLOW ELEMENT NO. 1
                         L         52.  OVERLAND FLOW LENGTH
                         S       .1000  SLOPE
                         N        .350  ROUGHNESS COEFFICIENT
                        PA       100.0  PERCENT OF SUBBASIN
                     DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 49 RD            MAIN CHANNEL
                         L        524.  CHANNEL LENGTH
                         S       .0050  SLOPE
                         N        .030  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .00  CONTRIBUTING AREA
                     SHAPE        TRAP  CHANNEL SHAPE
                        WD         .00  BOTTOM WIDTH OR DIAMETER
                         Z        3.00  SIDE SLOPE
                    RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                         ***
                         COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT         DX        PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                 CELERITY
                                                 (MIN)       (FT)       (CFS)    (MIN)       (IN)      (FPS)

                  PLANE1      1.35      1.67        .67     10.40        7.93    724.45      5.56        .33
                  MAIN        1.48      1.33       3.46    262.00        7.12    725.83      5.49       2.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .4743E+00 OUTFLOW= .4688E+00 BASIN STORAGE= .3115E-03 PERCENT ERROR=
1.1


                                INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN        1.48      1.33       5.00                  7.05    725.00      5.48

      ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION     CH14

    TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.88, TOTAL EXCESS =     5.56

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                   6-HR        24-HR        72-HR      59.92-HR
+   (CFS)       (HR)
                           (CFS)
+       7.     12.08                  1.           0.           0.           0.
                        (INCHES)   4.503        5.483        5.483        5.483
                         (AC-FT)      0.           0.           0.           0.

                        CUMULATIVE AREA =      .00 SQ MI



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  50 KK      *     CCH14  *
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            *            *
            **************
                                COMBINE CH14 WITH A1 AREAS

   52 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


   53 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION    CCH14

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+     157.     12.08                18.          5.          2.           2.
                         (INCHES)    4.617       5.612       5.614        5.614
                          (AC-FT)       9.         11.         11.          11.

                         CUMULATIVE AREA =     .04 SQ MI


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            *            *
   54 KK    *       A2T  *
            *            *
            **************
                                SUBAREA A2T

   56 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

   57 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .01

   58 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
   59 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        287.  OVERLAND FLOW LENGTH
                            S       .0400  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
   60 RD            MAIN CHANNEL
                            L        506.  CHANNEL LENGTH
                            S       .0050  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .01  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD         .00  BOTTOM WIDTH OR DIAMETER
                            Z        2.00  SIDE SLOPE
                       RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH
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                                                          ***
                                      COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                             COMPUTATION TIME STEP
                  ELEMENT    ALPHA        M          DT         DX        PEAK     TIME TO      VOLUME     MAXIMUM
                                                                                    PEAK                   CELERITY
                                                    (MIN)      (FT)      (CFS)     (MIN)        (IN)       (FPS)

                 PLANE1        .85       1.67        2.41     57.40      16.95    727.98        5.55         .41
                 MAIN         1.63       1.33        2.57    253.00      16.62    728.27        5.51        3.28


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1542E+01 OUTFLOW= .1529E+01 BASIN STORAGE= .3784E-03 PERCENT ERROR=
.8


                                            INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                 MAIN         1.63       1.33        5.00                16.44    730.00        5.52

      ***             ***             ***             ***             ***

                      HYDROGRAPH AT STATION       A2T

    TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.88, TOTAL EXCESS =     5.56

   PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR        72-HR       59.92-HR
+   (CFS)       (HR)
                             (CFS)
+       16.     12.17                  3.           1.           0.            0.
                          (INCHES)   4.495        5.510        5.516         5.516
                           (AC-FT)      1.           2.           2.            2.

                        CUMULATIVE AREA =       .01 SQ MI



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             *            *
   61 KK     *       A2S  *
             *            *
             **************
                              SUBAREA A2S

   63 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

   64 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .03  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                               DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR    2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44      .00     .00     .00     .00

                                                    STORM AREA =       .03

   65 LS          SCS LOSS RATE
                        STRTL         .33  INITIAL ABSTRACTION
                       CRVNBR       86.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
   66 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        120.  OVERLAND FLOW LENGTH
                            S       .2500  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
   67 RD            MAIN CHANNEL
                            L        925.  CHANNEL LENGTH
                            S       .0050  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .03  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
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                    WD        .00  BOTTOM WIDTH OR DIAMETER
                     Z       2.00  SIDE SLOPE
                RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                    ***
                              COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                      COMPUTATION TIME STEP
              ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                          PEAK                  CELERITY
                                                (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

             PLANE1        2.13      1.67        .70     24.00    173.33    725.02      5.79       .61
             MAIN          1.63      1.33       2.63    462.50    166.99    725.08      5.64      5.87

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1062E+02 OUTFLOW= .1035E+02 BASIN STORAGE= .5170E-03 PERCENT ERROR=
2.5

                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

             MAIN          1.63      1.33       5.00              166.21    725.00      5.66

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      A2S

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+     166.     12.08          17.          5.          2.           2.
                        (INCHES)     4.672       5.662       5.663        5.663
                         (AC-FT)       9.         10.         10.          10.

                        CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
   68 KK    *       CA2  *
            *            *
            **************
                                COMBINE A2 SUBAREAS

   70 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS

   71 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CA2

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+     181.     12.08          20.          6.          2.           2.
                        (INCHES)     4.647       5.642       5.644        5.644
                         (AC-FT)      10.         12.         12.          12.

                        CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
   72 KK    *      CH12  *
            *            *
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              **************
                                 SUBAREA CH12

  74 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  75 BA          SUBBASIN CHARACTERISTICS
                       TAREA        .00  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                             DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                              STORM AREA =      .00

  76 LS          SCS LOSS RATE
                       STRTL        .38  INITIAL ABSTRACTION
                      CRVNBR      84.00  CURVE NUMBER
                       RTIMP        .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
  77 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        52.  OVERLAND FLOW LENGTH
                           S      .1000  SLOPE
                           N       .350  ROUGHNESS COEFFICIENT
                          PA      100.0  PERCENT OF SUBBASIN
                       DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
  78 RD            MAIN CHANNEL
                           L       313.  CHANNEL LENGTH
                           S      .0050  SLOPE
                           N       .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA        .00  CONTRIBUTING AREA
                       SHAPE       TRAP  CHANNEL SHAPE
                          WD        .00  BOTTOM WIDTH OR DIAMETER
                           Z       3.00  SIDE SLOPE
                      RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                        ***
                                     COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                            COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                 CELERITY
                                                  (MIN)      (FT)     (CFS)    (MIN)        (IN)      (FPS)

                   PLANE1       1.35     1.67       .67     10.40      4.46    724.45       5.56        .33
                   MAIN         1.48     1.33      2.38    156.50      4.44    724.72       5.50       2.19

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2668E+00 OUTFLOW= .2641E+00 BASIN STORAGE= .1752E-03 PERCENT ERROR=
.9


                                           INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                   MAIN         1.48     1.33      5.00                4.31    725.00       5.51

      ***            ***           ***             ***             ***

                         HYDROGRAPH AT STATION       CH12

     TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.88, TOTAL EXCESS =     5.56

  PEAK FLOW      TIME                            MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR         72-HR      59.92-HR
+   (CFS)        (HR)
                              (CFS)
+        4.     12.08                     0.           0.           0.           0.
                          (INCHES)     4.524        5.512        5.512        5.512
                           (AC-FT)        0.           0.           0.           0.

                          CUMULATIVE AREA =      .00 SQ MI



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            *           *
 79 KK      *      CH13 *
            *           *
            **************
                              SUBAREA CH13

 81 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 82 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .00  SUBBASIN AREA

                PRECIPITATION DATA

 12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .00

 83 LS          SCS LOSS RATE
                      STRTL        .38  INITIAL ABSTRACTION
                     CRVNBR      84.00  CURVE NUMBER
                      RTIMP        .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 84 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L        52.  OVERLAND FLOW LENGTH
                          S      .1000  SLOPE
                          N       .350  ROUGHNESS COEFFICIENT
                         PA      100.0  PERCENT OF SUBBASIN
                      DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 85 RD            MAIN CHANNEL
                          L       634.  CHANNEL LENGTH
                          S      .0050  SLOPE
                          N       .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .00  CONTRIBUTING AREA
                      SHAPE       TRAP  CHANNEL SHAPE
                         WD        .00  BOTTOM WIDTH OR DIAMETER
                          Z       3.00  SIDE SLOPE
                    RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                CELERITY
                                                   (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                  PLANE1        1.35     1.67        .67     10.40      9.91   724.45      5.56       .33
                  MAIN          1.48     1.33       3.96    317.00      9.58   723.77      5.48      2.67


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .5929E+00 OUTFLOW= .5848E+00 BASIN STORAGE= .3570E-03 PERCENT ERROR=
1.3


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN          1.48     1.33       5.00                8.74   725.00      5.47

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     CH13

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+       9.     12.08                 1.          0.          0.          0.
                        (INCHES)   4.495       5.473       5.473       5.473
                         (AC-FT)     0.          1.          1.          1.

                        CUMULATIVE AREA =     .00 SQ MI


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            *            *
  86 KK     *     CCH13  *
            *            *
            **************
                                COMBINE CH12 AND CH13 WITH A2 AREAS

  88 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


  89 HC          HYDROGRAPH COMBINATION
                       ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***            ***            ***            ***            ***

                         HYDROGRAPH AT STATION    CCH13

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+     194.     12.08                21.          6.          3.           3.
                         (INCHES)     4.637       5.631       5.633        5.633
                          (AC-FT)      11.         13.         13.          13.

                          CUMULATIVE AREA =     .04 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  90 KK     *        A3  *
            *            *
            **************
                                SUBAREA A3

  92 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  93 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

  94 LS          SCS LOSS RATE
                       STRTL         .33  INITIAL ABSTRACTION
                      CRVNBR       86.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
  95 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        120.  OVERLAND FLOW LENGTH
                           S       .2500  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
  96 RD            MAIN CHANNEL
                           L        703.  CHANNEL LENGTH
                           S       .0050  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
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                    CA          .01  CONTRIBUTING AREA
                 SHAPE         TRAP  CHANNEL SHAPE
                    WD          .00  BOTTOM WIDTH OR DIAMETER
                     Z         2.00  SIDE SLOPE
                RUPSTQ           NO  ROUTE UPSTREAM HYDROGRAPH

                                                    ***
                              COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                     COMPUTATION TIME STEP
                 ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                 PLANE1      2.13      1.67        .70     24.00     63.48    725.03      5.79       .61
                 MAIN        1.63      1.33       2.57    351.50     60.17    724.11      5.65      4.56


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .3890E+01 OUTFLOW= .3794E+01 BASIN STORAGE= .3773E-03 PERCENT ERROR=
2.5


                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                 MAIN        1.63      1.33       5.00               57.53    725.00      5.65

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       A3

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+      58.     12.08                 6.          2.          1.          1.
                       (INCHES)    4.651       5.648       5.648       5.648
                        (AC-FT)       3.          4.          4.          4.

                       CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
   97 KK    *      CH10  *
            *            *
            **************
                                SUBAREA CH10

   99 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  100 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .00

  101 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  102 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L         52.  OVERLAND FLOW LENGTH
                            S       .1000  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  103 RD            MAIN CHANNEL
```

```
                    L        483.  CHANNEL LENGTH
                    S       .0050  SLOPE
                    N        .030  CHANNEL ROUGHNESS COEFFICIENT
                   CA         .00  CONTRIBUTING AREA
                SHAPE        TRAP  CHANNEL SHAPE
                   WD         .00  BOTTOM WIDTH OR DIAMETER
                    Z        3.00  SIDE SLOPE
              RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                  ***
                          COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                  COMPUTATION TIME STEP
          ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                        PEAK                  CELERITY
                                             (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

         PLANE1        1.35      1.67        .67     10.40      6.44   724.45      5.56       .33
         MAIN          1.48      1.33       3.36    241.50      6.35   724.81      5.51      2.40

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .3854E+00 OUTFLOW= .3819E+00 BASIN STORAGE= .2777E-03 PERCENT ERROR=
.8

                                      INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

         MAIN          1.48      1.33       5.00                6.23   725.00      5.55

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION     CH10

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+       6.     12.08                 1.          0.          0.          0.
                       (INCHES)    4.568       5.548       5.549       5.549
                        (AC-FT)       0.          0.          0.          0.

                       CUMULATIVE AREA =     .00 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  104 KK    *      CH11  *
            *            *
            **************
                                SUBAREA CH11

  106 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  107 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .00

  108 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  109 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L         52.  OVERLAND FLOW LENGTH
                          S       .1000  SLOPE
                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
```

```
                    DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 110 RD           MAIN CHANNEL
                        L        313.  CHANNEL LENGTH
                        S       .0050  SLOPE
                        N        .030  CHANNEL ROUGHNESS COEFFICIENT
                       CA         .00  CONTRIBUTING AREA
                    SHAPE        TRAP  CHANNEL SHAPE
                       WD         .00  BOTTOM WIDTH OR DIAMETER
                        Z        3.00  SIDE SLOPE
                   RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                       COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1        1.35      1.67        .67     10.40      4.46    724.45      5.56       .33
                  MAIN          1.48      1.33       2.38    156.50      4.44    724.72      5.50      2.19

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2668E+00 OUTFLOW= .2641E+00 BASIN STORAGE= .1752E-03 PERCENT ERROR=
.9


                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN          1.48      1.33       5.00                4.31    725.00      5.51

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     CH11

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+       4.     12.08                 0.          0.          0.          0.
                       (INCHES)    4.524       5.512       5.512       5.512
                        (AC-FT)       0.          0.          0.          0.

                       CUMULATIVE AREA =     .00 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 111 KK     *     CCH11  *
            *            *
            **************
                                COMBINE CH10 AND CH11 WITH AREA A3

 113 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


 114 HC          HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    CCH11

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      68.     12.08                 7.          2.          1.          1.
                       (INCHES)    4.636       5.631       5.631       5.631
                        (AC-FT)       4.          4.          4.          4.

                       CUMULATIVE AREA =     .01 SQ MI
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 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  115 KK    *       CA3  *
            *            *
            **************
                              COMBINE AREAS FLOWING DIRECTLY INTO P1

  117 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


  118 HC          HYDROGRAPH COMBINATION
                        ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***            ***            ***            ***            ***

                         HYDROGRAPH AT STATION      CA3

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                           (CFS)
+     419.     12.08                  46.         14.          6.           6.
                         (INCHES)   4.629       5.624       5.625        5.625
                          (AC-FT)     23.         28.         28.          28.

                          CUMULATIVE AREA =     .09 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  119 KK    *       CH7  *
            *            *
            **************
                              CHANNEL CH7

  121 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  122 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .00  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .00

  123 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  124 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        82.  OVERLAND FLOW LENGTH
                           S      .2500  SLOPE
                           N       .350  ROUGHNESS COEFFICIENT
                          PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  125 RD            MAIN CHANNEL
                           L       830.  CHANNEL LENGTH
```

```
                    S       .0030  SLOPE
                    N        .030  CHANNEL ROUGHNESS COEFFICIENT
                   CA         .00  CONTRIBUTING AREA
                SHAPE        TRAP  CHANNEL SHAPE
                   WD        5.00  BOTTOM WIDTH OR DIAMETER
                    Z        2.00  SIDE SLOPE
              RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                   ***
                          COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                COMPUTATION TIME STEP
          ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                          PEAK                CELERITY
                                             (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

         PLANE1        2.13      1.67        .69     16.40     17.84    724.42      5.56       .53
         MAIN           .98      1.39       5.00    415.00     16.54    725.00      5.35      2.54


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1067E+01 OUTFLOW= .1026E+01 BASIN STORAGE= .7822E-03 PERCENT ERROR=
3.7


                                     INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


         MAIN           .98      1.39       5.00               16.54    725.00      5.35

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      CH7

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+      17.     12.08                   2.          1.          0.          0.
                       (INCHES)     4.438       5.346       5.347       5.347
                        (AC-FT)        1.          1.          1.          1.

                       CUMULATIVE AREA =     .00 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  126 KK    *        A5  *
            *            *
            **************
                         SUBAREA A5

  128 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  129 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .03  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .03

  130 LS          SCS LOSS RATE
                        STRTL         .33  INITIAL ABSTRACTION
                       CRVNBR       86.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  131 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        150.  OVERLAND FLOW LENGTH
                            S       .2000  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
```

```
                 MUSKINGUM-CUNGE
 132 RD            MAIN CHANNEL
                           L       1057.  CHANNEL LENGTH
                           S      .0050  SLOPE
                           N       .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA        .03  CONTRIBUTING AREA
                       SHAPE       TRAP  CHANNEL SHAPE
                          WD        .00  BOTTOM WIDTH OR DIAMETER
                           Z       2.00  SIDE SLOPE
                      RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                 COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                        COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                        (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                     PLANE1        1.90      1.67        .95     30.00    141.75    724.96      5.79       .61
                     MAIN          1.63      1.33       3.16    528.50    128.22    723.87      5.63      5.57

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .8985E+01 OUTFLOW= .8736E+01 BASIN STORAGE= .6004E-03 PERCENT ERROR=
2.8

                                            INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                     MAIN          1.63      1.33       5.00              125.46    725.00      5.61

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION       A5

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     125.     12.08                  14.          4.          2.           2.
                       (INCHES)     4.625       5.614       5.615        5.615
                        (AC-FT)        7.          9.          9.           9.

                       CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 133 KK     *       CA5  *
            *            *
            **************
                                COMBINE CH7 AND A5 BEFORE ROUTING THROUGH CH8

 135 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS

 136 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      CA5

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     142.     12.08                  16.          5.          2.           2.
                       (INCHES)     4.604       5.584       5.585        5.585
                        (AC-FT)        8.         10.         10.          10.

                       CUMULATIVE AREA =     .03 SQ MI
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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


              **************
              *            *
  137 KK      *       CH8  *
              *            *
              **************
                                  CHANNEL CH8

  139 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

  140 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .00

  141 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  142 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L         46.  OVERLAND FLOW LENGTH
                            S       .0652  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  143 RD            MAIN CHANNEL
                            L        707.  CHANNEL LENGTH
                            S       .0300  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .00  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD        5.00  BOTTOM WIDTH OR DIAMETER
                            Z        2.00  SIDE SLOPE
                       RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                      (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        1.09      1.67        .57      9.20     23.41    724.95      5.56       .28
                    MAIN          3.11      1.39       1.08    353.50    158.45    725.87      5.57     10.86


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9741E+01  EXCESS= .1393E+01 OUTFLOW= .1111E+02 BASIN STORAGE= .2682E-03 PERCENT ERROR=
.3


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN          3.11      1.39       5.00              155.21    725.00      5.57

       ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION      CH8

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     155.     12.08                  18.          6.          2.          2.
                       (INCHES)     4.598       5.573       5.574       5.574
                        (AC-FT)        9.         11.         11.         11.

                       CUMULATIVE AREA =     .04 SQ MI
```

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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


            **************
            *            *
 144 KK     *       A4   *
            *            *
            **************
                           SUBAREA A4

 146 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 147 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .03  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                             DEPTHS FOR  4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......  ............... TP-40 ...............  ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =      .03

 148 LS          SCS LOSS RATE
                      STRTL        .33  INITIAL ABSTRACTION
                     CRVNBR      86.00  CURVE NUMBER
                      RTIMP        .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 149 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L       150.  OVERLAND FLOW LENGTH
                          S      .2000  SLOPE
                          N       .350  ROUGHNESS COEFFICIENT
                         PA      100.0  PERCENT OF SUBBASIN
                      DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
 150 RD            MAIN CHANNEL
                          L       840.  CHANNEL LENGTH
                          S      .0050  SLOPE
                          N       .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .03  CONTRIBUTING AREA
                      SHAPE       TRAP  CHANNEL SHAPE
                         WD        .00  BOTTOM WIDTH OR DIAMETER
                          Z       2.00  SIDE SLOPE
                     RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                             ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                    ELEMENT   ALPHA      M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                               PEAK                CELERITY
                                                 (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                   PLANE1      1.90     1.67       .95     30.00    165.13    724.95      5.79        .61
                   MAIN        1.63     1.33      2.42    420.00    156.03    725.65      5.65       5.79

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1047E+02 OUTFLOW= .1022E+02 BASIN STORAGE= .5021E-03 PERCENT ERROR=
2.4


                                       INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                   MAIN        1.63     1.33      5.00              152.38    725.00      5.65

     ***            ***           ***            ***            ***

                          HYDROGRAPH AT STATION        A4

    TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.65, TOTAL EXCESS =     5.79

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR        72-HR      59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     152.     12.08                  17.           5.           2.           2.
                        (INCHES)    4.655        5.652        5.653        5.653
                          (AC-FT)      8.          10.          10.          10.
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                    CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  151 KK    *       CA4  *
            *            *
            **************
                                COMBINE WITH A4 BEFORE ROUTING THROUGH CH9

  153 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  154 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      CA4

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     308.     12.08                   35.         11.          4.           4.
                        (INCHES)     4.625       5.611       5.612        5.612
                         (AC-FT)      18.         21.         21.          21.

                        CUMULATIVE AREA =     .07 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  155 KK    *       CH9  *
            *            *
            **************
                                CHANNEL CH9

  157 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  158 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                        STORM AREA =     .00

  159 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  160 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L         75.  OVERLAND FLOW LENGTH
                            S       .1000  SLOPE
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                        N        .350  ROUGHNESS COEFFICIENT
                       PA       100.0  PERCENT OF SUBBASIN
                    DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 161 RD           MAIN CHANNEL
                        L        670.  CHANNEL LENGTH
                        S       .0300  SLOPE
                        N        .030  CHANNEL ROUGHNESS COEFFICIENT
                       CA         .00  CONTRIBUTING AREA
                    SHAPE        TRAP  CHANNEL SHAPE
                       WD        5.00  BOTTOM WIDTH OR DIAMETER
                        Z        2.00  SIDE SLOPE
                   RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                        ***
                                 COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                        COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1       1.35      1.67        .74     15.00     19.44    724.59      5.56       .38
                  MAIN         3.11      1.39        .85    335.00    317.30    726.05      5.60     13.12


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2134E+02  EXCESS= .1186E+01 OUTFLOW= .2250E+02 BASIN STORAGE= .2540E-03 PERCENT ERROR=
.1


                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN         3.11      1.39       5.00              310.17    725.00      5.61

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CH9

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     310.     12.08                   37.         11.          5.           5.
                       (INCHES)     4.623       5.608       5.608        5.608
                        (AC-FT)      19.         23.         23.          23.

                       CUMULATIVE AREA =     .08 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
 162 KK     *        P1  *
            *            *
            **************
                                DETENTION POND P1

 164 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 165 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .04

 166 LS          SCS LOSS RATE
                       STRTL         .00  INITIAL ABSTRACTION
                      CRVNBR      100.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 167 UD          SCS DIMENSIONLESS UNITGRAPH
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                    TLAG         .00  LAG

                                                                  ***

                                                          UNIT HYDROGRAPH
                                                       5 END-OF-PERIOD ORDINATES
              208.       58.       11.        2.        0.

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION       P1

    TOTAL RAINFALL =    7.44, TOTAL LOSS =     .00, TOTAL EXCESS =    7.44

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     186.     12.08                21.          7.          3.           3.
                       (INCHES)    5.468       7.437       7.440        7.440
                        (AC-FT)     11.         14.         14.          14.

                       CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  168 KK    *     P1-IN  *
            *            *
            **************
                                COMBINE AREAS DISCHARGING TO POND P1

  170 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  171 HC          HYDROGRAPH COMBINATION
                        ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION    P1-IN

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     915.     12.08                105.         33.         13.          13.
                       (INCHES)    4.763       5.925       5.939        5.939
                        (AC-FT)     52.         65.         65.          65.

                       CUMULATIVE AREA =     .20 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  172 KK    *       RP1  *
            *            *
            **************
                                ROUTE THROUGH POND P1

  174 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                 HYDROGRAPH ROUTING DATA
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175 RS          STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        ELEV  TYPE OF INITIAL CONDITION
                    RSVRIC      454.50  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

176 SA              AREA          .0      17.8      18.2      18.6      19.0      19.4      19.8      20.2

177 SE          ELEVATION      454.50    455.00    456.00    457.00    458.00    459.00    460.00    461.00

179 SL          LOW-LEVEL OUTLET
                     ELEVL      455.50  ELEVATION AT CENTER OF OUTLET
                     CAREA        3.14  CROSS-SECTIONAL AREA
                      COQL         .80  COEFFICIENT
                      EXPL         .50  EXPONENT OF HEAD

178 SS          SPILLWAY
                      CREL      458.00  SPILLWAY CREST ELEVATION
                     SPWID       25.00  SPILLWAY WIDTH
                      COQW        2.60  WEIR COEFFICIENT
                      EXPW        1.50  EXPONENT OF HEAD

                                                          ***

                                          COMPUTED STORAGE-ELEVATION DATA

           STORAGE        .00      2.96     20.92     39.29     58.07     77.27     96.88    116.91
         ELEVATION     454.50    455.00    456.00    457.00    458.00    459.00    460.00    461.00

                                          COMPUTED OUTFLOW-ELEVATION DATA

           OUTFLOW        .00       .00     19.56     20.70     21.98     23.44     25.10     27.01     29.24     31.87
         ELEVATION     454.50    455.50    456.44    456.55    456.69    456.85    457.05    457.30    457.60    458.00

           OUTFLOW      33.02     36.99     45.59     60.62     83.84    117.03    161.97    220.42    294.18    385.02
         ELEVATION     458.05    458.16    458.32    458.54    458.81    459.14    459.52    459.96    460.45    461.00


                                       COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

           STORAGE        .00      2.96     11.89     20.92     28.97     31.05     33.54     36.54     39.29     40.22
           OUTFLOW        .00       .00       .00     14.25     19.56     20.70     21.98     23.44     24.69     25.10
         ELEVATION     454.50    455.00    455.50    456.00    456.44    456.55    456.69    456.85    457.00    457.05

           STORAGE      44.80     50.59     58.07     59.09     61.10     64.16     68.31     73.55     77.27     79.89
           OUTFLOW      27.01     29.24     31.87     33.02     36.99     45.59     60.62     83.84    102.71    117.03
         ELEVATION     457.30    457.60    458.00    458.05    458.16    458.32    458.54    458.81    459.00    459.14

           STORAGE      87.38     96.02     96.88    105.85    116.91
           OUTFLOW     161.97    220.42    226.61    294.18    385.02
         ELEVATION     459.52    459.96    460.00    460.45    461.00

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      RP1

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+      28.     15.17                 28.         23.         11.          11.
                         (INCHES)  1.260       4.109       4.818        4.818
                          (AC-FT)    14.         45.         53.          53.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     59.92-HR
+  (AC-FT)      (HR)
       48.     15.17                 47.         36.         21.          21.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     59.92-HR
+   (FEET)      (HR)
    457.45     15.25               457.39      456.82      455.94       455.94

                        CUMULATIVE AREA =     .20 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
180 KK      *       CP1  *
            *            *
            **************
                                COMBINE DOWNSTREAM OF POND P1 OUTLET

182 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           7  PUNCH COMPUTED HYDROGRAPH
```

```
                    IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                   ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                   ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                  TIMINT        .083  TIME INTERVAL IN HOURS


  183 HC          HYDROGRAPH COMBINATION
                   ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***             ***             ***             ***             ***

                       HYDROGRAPH AT STATION      CP1

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     475.     12.50                144.         57.         26.          26.
                        (INCHES)    2.980       4.769       5.300        5.300
                         (AC-FT)     71.        114.        127.         127.

                        CUMULATIVE AREA =     .45 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  184 KK    *        S5  *
            *            *
            **************
                              SUBAREA S5

  186 KO          OUTPUT CONTROL VARIABLES
                   IPRNT           3  PRINT CONTROL
                   IPLOT           0  PLOT CONTROL
                   QSCAL          0.  HYDROGRAPH PLOT SCALE
                   IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                    IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                   ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                   ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                  TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  187 BA          SUBBASIN CHARACTERISTICS
                   TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .01

  188 LS          SCS LOSS RATE
                   STRTL         .38  INITIAL ABSTRACTION
                  CRVNBR       84.00  CURVE NUMBER
                   RTIMP         .00  PERCENT IMPERVIOUS AREA

  189 US          SNYDER UNITGRAPH
                     TP         .59  LAG
                     CP         .71  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .69 HR,       R=   .42 HR
                                         SNYDER   TP=   .58 HR,      CP=   .70

                                                     UNIT HYDROGRAPH
                                              32 END-OF-PERIOD ORDINATES
                  0.        2.        3.        5.        7.        8.        9.        9.        8.        7.
                  5.        4.        4.        3.        2.        2.        2.        1.        1.        1.
                  1.        1.        0.        0.        0.        0.        0.        0.        0.        0.
                  0.        0.

      ***             ***             ***             ***             ***

                       HYDROGRAPH AT STATION       S5

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
```

```
                                        6-HR        24-HR        72-HR      59.92-HR
+   (CFS)        (HR)
                          (CFS)
+      21.      12.58                    6.           2.           1.           1.
                        (INCHES)      4.489        5.535        5.535        5.535
                         (AC-FT)        3.           3.           3.           3.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  190 KK      *       CS5  *
              *            *
              **************
                                COMBINE AREAS UPSTREAM OF S7

  192 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  193 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      CS5

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR        72-HR      59.92-HR
+   (CFS)        (HR)
                          (CFS)
+     495.      12.50                  149.          59.          26.          26.
                        (INCHES)      3.017        4.785        5.306        5.306
                         (AC-FT)       74.         117.         130.         130.

                        CUMULATIVE AREA =     .46 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  194 KK      *        S7  *
              *            *
              **************
                                SUBAREA S7

  196 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

  197 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                        STORM AREA =     .01

  198 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
```

```
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 199 US          SNYDER UNITGRAPH
                      TP         .47  LAG
                      CP         .72  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .57 HR,       R=   .32 HR
                                         SNYDER   TP=   .47 HR,      CP=   .71

                                                     UNIT HYDROGRAPH
                                                UNIT HYDROGRAPH
                                            25 END-OF-PERIOD ORDINATES
                 1.       2.       4.       6.       8.       8.       8.       6.       5.       4.
                 3.       2.       2.       1.       1.       1.       1.       0.       0.       0.
                 0.       0.       0.       0.       0.

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION       S7

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+      17.     12.50                 4.          1.          1.          1.
                       (INCHES)    4.494       5.536       5.536       5.536
                        (AC-FT)      2.          2.          2.          2.

                       CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


            **************
            *            *
 200 KK     *       CS7  *
            *            *
            **************
                                COMBINE WITH AREA S7

 202 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


 203 HC          HYDROGRAPH COMBINATION
                      ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      CS7

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     512.     12.50                153.         60.         27.         27.
                       (INCHES)    3.043       4.796       5.310       5.310
                        (AC-FT)     76.        120.        133.        133.

                       CUMULATIVE AREA =     .47 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 204 KK     *        O2  *
            *            *
            **************
                              OFFSITE AREA O2

 206 KO          OUTPUT CONTROL VARIABLES
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```
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                     IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 207 BA          SUBBASIN CHARACTERISTICS
                      TAREA       1.58  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =    1.58

 208 LS          SCS LOSS RATE
                      STRTL        .35  INITIAL ABSTRACTION
                     CRVNBR      85.00  CURVE NUMBER
                      RTIMP        .00  PERCENT IMPERVIOUS AREA

 209 US          SNYDER UNITGRAPH
                        TP        .71  LAG
                        CP        .58  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                        ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .79 HR,       R=   .76 HR
                                         SNYDER   TP=   .71 HR,      CP=   .58

                                                   UNIT HYDROGRAPH
                                              54 END-OF-PERIOD ORDINATES
                 31.      115.      232.      367.      512.      648.      752.      817.      841.      808.
                733.      657.      589.      528.      473.      424.      380.      341.      306.      274.
                246.      220.      197.      177.      159.      142.      127.      114.      102.       92.
                 82.       74.       66.       59.       53.       48.       43.       38.       34.       31.
                 28.       25.       22.       20.       18.       16.       14.       13.       11.       10.
                  9.        8.        7.        7.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION       O2

    TOTAL RAINFALL =    7.42, TOTAL LOSS =    1.77, TOTAL EXCESS =    5.66

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                           (CFS)
+    2171.     12.75                767.        239.         96.         96.
                        (INCHES)    4.524       5.632       5.632       5.632
                         (AC-FT)     380.        473.        473.        473.

                        CUMULATIVE AREA =    1.58 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              *            *
 210 KK       *        O3  *
              *            *
              **************
                            OFFSITE AREA O3

 212 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 213 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .03  SUBBASIN AREA
```

```
                PRECIPITATION DATA

 12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .03

 214 LS         SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 215 US         SNYDER UNITGRAPH
                        TP         .30  LAG
                        CP         .68  PEAKING COEFFICIENT

                SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                        ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .35 HR,       R=   .23 HR
                                         SNYDER   TP=   .30 HR,      CP=   .68

                                                    UNIT HYDROGRAPH
                                                18 END-OF-PERIOD ORDINATES
                5.       17.       30.       36.       32.       23.       16.       11.        8.        5.
                4.        3.        2.        1.        1.        1.        0.        0.

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       O3

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+      62.     12.33                 12.          4.          2.          2.
                       (INCHES)    4.500       5.539       5.539       5.539
                        (AC-FT)      6.          7.          7.          7.

                       CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 216 KK     *        S6  *
            *            *
            **************
                          SUBAREA S6

 218 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 219 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

 12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .02

 220 LS         SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 221 US         SNYDER UNITGRAPH
                        TP         .81  LAG
                        CP         .69  PEAKING COEFFICIENT
```

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                SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .94 HR,       R=   .62 HR
                                         SNYDER   TP=   .81 HR,      CP=   .69

                                                   UNIT HYDROGRAPH
                                              46 END-OF-PERIOD ORDINATES
                 0.       1.       3.       5.       6.       8.      10.      11.      12.      12.
                12.      11.      10.       8.       7.       6.       6.       5.       4.       4.
                 3.       3.       2.       2.       2.       2.       1.       1.       1.       1.
                 1.       1.       1.       1.       0.       0.       0.       0.       0.       0.
                 0.       0.       0.       0.       0.       0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       S6

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      32.     12.83                  10.          3.          1.          1.
                        (INCHES)    4.475       5.534       5.534       5.534
                         (AC-FT)      5.          6.          6.          6.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  222 KK    *       CS6  *
            *            *
            **************
                        COMBINE AREAS DISCHARGING OFF OF P.B.

  224 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  225 HC          HYDROGRAPH COMBINATION
                        ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CS6

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+    2663.     12.75                 942.        305.        125.        125.
                        (INCHES)    4.189       5.420       5.558       5.558
                         (AC-FT)     467.        604.        620.        620.

                        CUMULATIVE AREA =    2.09 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  226 KK    *        O4  *
            *            *
            **************
                        OFFSITE AREA O4

  228 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
```

```
                    IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                     IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 229 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .13  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .13

 230 LS          SCS LOSS RATE
                      STRTL        .38  INITIAL ABSTRACTION
                     CRVNBR      84.00  CURVE NUMBER
                      RTIMP        .00  PERCENT IMPERVIOUS AREA

 231 US          SNYDER UNITGRAPH
                         TP        .43  LAG
                         CP        .64  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                            CLARK   TC=   .51 HR,       R=   .36 HR
                                           SNYDER   TP=   .43 HR,      CP=   .64

                                                     UNIT HYDROGRAPH
                                                 27 END-OF-PERIOD ORDINATES
                 10.       36.       71.      105.      126.      131.      115.       92.       73.       58.
                 46.       37.       29.       23.       18.       15.       12.        9.        7.        6.
                  5.        4.        3.        2.        2.        1.        1.

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       O4

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     269.     12.50                  65.         20.          8.          8.
                        (INCHES)    4.491       5.534       5.534       5.534
                         (AC-FT)     32.         40.         40.         40.

                        CUMULATIVE AREA =     .13 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 232 KK     *       CO4  *
            *            *
            **************
                        MIDWAY BRANCH DISCHARGING BACK ONTO P.B.

 234 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


 235 HC          HYDROGRAPH COMBINATION
                      ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CO4

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
```

```
                                    6-HR       24-HR       72-HR     59.92-HR
+   (CFS)        (HR)
                          (CFS)
+    2884.      12.67                1007.        325.        133.         133.
                        (INCHES)     4.206       5.426       5.557        5.557
                         (AC-FT)      499.        644.        659.         659.

                        CUMULATIVE AREA =    2.23 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  236 KK      *        A6  *
              *            *
              **************
                      SUBAREA A6

  238 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

  239 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .02  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

  240 LS          SCS LOSS RATE
                        STRTL         .33  INITIAL ABSTRACTION
                       CRVNBR       86.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  241 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        120.  OVERLAND FLOW LENGTH
                            S       .2500  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  242 RD            MAIN CHANNEL
                            L       1314.  CHANNEL LENGTH
                            S       .0020  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .02  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD         .00  BOTTOM WIDTH OR DIAMETER
                            Z        2.00  SIDE SLOPE
                      RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                            COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        2.13      1.67        .70     24.00     86.66    725.02      5.79       .61
                    MAIN          1.03      1.33       5.00    657.00     72.90    725.00      5.57      3.50


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .5311E+01 OUTFLOW= .5112E+01 BASIN STORAGE= .9760E-03 PERCENT ERROR=
3.7


                                            INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN          1.03      1.33       5.00               72.90    725.00      5.57

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION       A6
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    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                           (CFS)
+      73.     12.08                 9.          3.          1.           1.
                         (INCHES)  4.638       5.573       5.573        5.573
                          (AC-FT)    4.          5.          5.           5.

                         CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  243 KK    *        S8  *
            *            *
            **************
                      SUBAREA S8

  245 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  246 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .02  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

  247 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

  248 US          SNYDER UNITGRAPH
                          TP        .31  LAG
                          CP        .69  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .37 HR,       R=   .24 HR
                                         SNYDER   TP=   .31 HR,      CP=   .68

                                                     UNIT HYDROGRAPH
                                                 18 END-OF-PERIOD ORDINATES
                  3.       10.       18.       22.       20.       15.       10.        7.        5.        4.
                  2.        2.        1.        1.        1.        0.        0.        0.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION       S8

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                           (CFS)
+      39.     12.33                 8.          2.          1.           1.
                         (INCHES)  4.499       5.538       5.538        5.538
                          (AC-FT)    4.          5.          5.           5.

                         CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  249 KK    *       CS8  *
            *            *
            **************
                          MIDWAY BRANCH DISCHARGING OFF OF P.B.

  251 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  252 HC          HYDROGRAPH COMBINATION
                        ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      CS8

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                           (CFS)
+    2921.     12.67                1023.        330.        135.        135.
                        (INCHES)    4.211       5.428       5.557       5.557
                         (AC-FT)     507.        654.        669.        669.

                         CUMULATIVE AREA =    2.26 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


            **************
            *            *
  253 KK    *        S1  *
            *            *
            **************
                          SUBAREA S1

  255 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  256 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .02  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .02

  257 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  258 US          SNYDER UNITGRAPH
                          TP         .77  LAG
                          CP         .70  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                                  ***

                                                     UNIT HYDROGRAPH PARAMETERS
                                                CLARK   TC=   .89 HR,       R=   .57 HR
                                               SNYDER   TP=   .77 HR,      CP=   .69

                                                          UNIT HYDROGRAPH
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                                                  42 END-OF-PERIOD ORDINATES
                 0.       1.       2.       4.       5.       7.       8.       9.       9.       9.
                 9.       8.       7.       6.       5.       4.       4.       3.       3.       2.
                 2.       2.       1.       1.       1.       1.       1.       1.       1.       1.
                 0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
                 0.       0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       S1

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      23.     12.83                 7.          2.          1.          1.
                        (INCHES)   4.477       5.532       5.532       5.532
                         (AC-FT)     4.          4.          4.          4.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  259 KK    *        S2  *
            *            *
            **************
                         SUBAREA S2

  261 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  262 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .05  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .05

  263 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

  264 US          SNYDER UNITGRAPH
                          TP       1.23  LAG
                          CP        .66  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                  UNIT HYDROGRAPH PARAMETERS
                                            CLARK   TC=  1.38 HR,       R=  1.03 HR
                                           SNYDER   TP=  1.23 HR,      CP=   .66

                                                      UNIT HYDROGRAPH
                                                  75 END-OF-PERIOD ORDINATES
                 0.       1.       2.       4.       5.       7.       8.      10.      12.      13.
                14.      15.      16.      16.      17.      16.      16.      15.      13.      12.
                11.      11.      10.       9.       8.       8.       7.       6.       6.       6.
                 5.       5.       4.       4.       4.       3.       3.       3.       3.       2.
                 2.       2.       2.       2.       2.       1.       1.       1.       1.       1.
                 1.       1.       1.       1.       1.       1.       1.       1.       1.       0.
                 0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
                 0.       0.       0.       0.       0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       S2

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56
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```
  PEAK FLOW      TIME                             MAXIMUM AVERAGE FLOW
                                         6-HR        24-HR       72-HR      59.92-HR
+    (CFS)       (HR)
                              (CFS)
+       50.     13.25                    22.          7.          3.           3.
                             (INCHES)   4.418       5.533       5.533       5.533
                              (AC-FT)     11.         14.         14.          14.

                             CUMULATIVE AREA =      .05 SQ MI
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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  265 KK    *      CH1   *
            *            *
            **************
                         CHANNEL CH1

  267 KO         OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  268 BA         SUBBASIN CHARACTERISTICS
                       TAREA        .01  SUBBASIN AREA

                 PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =       .01

  269 LS         SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
  270 UK           OVERLAND-FLOW ELEMENT NO. 1
                           L       411.  OVERLAND FLOW LENGTH
                           S      .0050  SLOPE
                           N       .350  ROUGHNESS COEFFICIENT
                          PA      100.0  PERCENT OF SUBBASIN
                       DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
  271 RD           MAIN CHANNEL
                           L      1283.  CHANNEL LENGTH
                           S      .0016  SLOPE
                           N       .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA        .01  CONTRIBUTING AREA
                       SHAPE       TRAP  CHANNEL SHAPE
                          WD      15.00  BOTTOM WIDTH OR DIAMETER
                           Z       4.00  SIDE SLOPE
                      RUPSTQ        YES  ROUTE UPSTREAM HYDROGRAPH

                                                        ***
                               COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                      COMPUTATION TIME STEP
                  ELEMENT     ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME     MAXIMUM
                                                                                PEAK                 CELERITY
                                                 (MIN)     (FT)      (CFS)     (MIN)       (IN)       (FPS)

                 PLANE1        .30      1.67      3.98     45.67     17.56    741.79       5.55         .20
                 MAIN          .46      1.43      5.00    641.50     55.64    800.00       5.51        2.27

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1372E+02  EXCESS= .2757E+01 OUTFLOW= .1640E+02 BASIN STORAGE= .3597E-02 PERCENT ERROR=
.5

                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                 MAIN          .46      1.43      5.00               55.64    800.00       5.51

      ***             ***             ***             ***             ***
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                        HYDROGRAPH AT STATION      CH1

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+      56.     13.33                  26.          8.          3.           3.
                         (INCHES)    4.415       5.508       5.511        5.511
                          (AC-FT)     13.         16.         16.          16.

                         CUMULATIVE AREA =     .06 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  272 KK    *        S3  *
            *            *
            **************
                          SUBAREA S3

  274 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  275 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .01  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .01

  276 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

  277 US          SNYDER UNITGRAPH
                          TP        .35  LAG
                          CP        .72  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                            CLARK   TC=   .45 HR,       R=   .23 HR
                                           SNYDER   TP=   .35 HR,      CP=   .72

                                                       UNIT HYDROGRAPH
                                                  18 END-OF-PERIOD ORDINATES
                  1.        3.        6.        9.        9.        8.        6.        4.        3.        2.
                  1.        1.        1.        0.        0.        0.        0.        0.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION       S3

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+      17.     12.42                   3.          1.          0.           0.
                         (INCHES)    4.500       5.538       5.538        5.538
                          (AC-FT)      2.          2.          2.           2.

                         CUMULATIVE AREA =     .01 SQ MI
```

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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  278 KK      *        O5  *
              *            *
              **************
                             OFFSITE AREA O5

  280 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

  281 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .18  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .18

  282 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

  283 US          SNYDER UNITGRAPH
                          TP        .59  LAG
                          CP        .64  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                                 ***

                                                      UNIT HYDROGRAPH PARAMETERS
                                                 CLARK   TC=   .67 HR,       R=   .52 HR
                                                SNYDER   TP=   .59 HR,      CP=   .64

                                                          UNIT HYDROGRAPH
                                                      38 END-OF-PERIOD ORDINATES
                    7.       24.       48.       74.      100.      119.      129.      129.      116.       99.
                   84.       72.       61.       52.       44.       38.       32.       27.       23.       20.
                   17.       14.       12.       10.        9.        7.        6.        5.        5.        4.
                    3.        3.        2.        2.        2.        1.        1.        1.

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION       O5

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                             (CFS)
+     302.     12.67            88.         27.         11.          11.
                         (INCHES)      4.481       5.533       5.533        5.533
                          (AC-FT)        43.         54.         54.          54.

                         CUMULATIVE AREA =     .18 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  284 KK      *       CO5  *
              *            *
              **************
                             COMBINE WEST AREAS DISCHARGING TO ELM FORK

  286 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
```

```
                    IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                   ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                   ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                  TIMINT        .083  TIME INTERVAL IN HOURS


  287 HC          HYDROGRAPH COMBINATION
                   ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

       ***            ***            ***            ***            ***

                     HYDROGRAPH AT STATION      CO5

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     379.     12.67        125.         39.         15.          15.
                       (INCHES)      4.453       5.527       5.528        5.528
                        (AC-FT)       62.         77.         77.          77.

                       CUMULATIVE AREA =     .26 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  288 KK    *      CH2   *
            *            *
            **************
                          CHANNEL CH2

  290 KO          OUTPUT CONTROL VARIABLES
                   IPRNT           3  PRINT CONTROL
                   IPLOT           0  PLOT CONTROL
                   QSCAL          0.  HYDROGRAPH PLOT SCALE
                   IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                    IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                   ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                   ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                  TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  291 BA          SUBBASIN CHARACTERISTICS
                   TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .01

  292 LS          SCS LOSS RATE
                   STRTL         .38  INITIAL ABSTRACTION
                  CRVNBR       84.00  CURVE NUMBER
                   RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  293 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L         82.  OVERLAND FLOW LENGTH
                           S       .0122  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  294 RD            MAIN CHANNEL
                           L       1539.  CHANNEL LENGTH
                           S       .0016  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .01  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD        8.00  BOTTOM WIDTH OR DIAMETER
                           Z        2.00  SIDE SLOPE
                     RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                         COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M          DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                   PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1       .47      1.67       1.55     16.40     20.08    724.70      5.56       .19
```

```
                MAIN          .61      1.42       5.00    513.00     15.36    730.00      4.85      1.99

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1512E+01 OUTFLOW= .1320E+01 BASIN STORAGE= .2050E-02 PERCENT ERROR=
12.5

                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN          .61      1.42       5.00               15.36    730.00      4.85

      ***              ***              ***              ***              ***

                          HYDROGRAPH AT STATION       CH2

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

   PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR       72-HR      59.92-HR
 +   (CFS)       (HR)
                          (CFS)
 +      15.     12.17                2.           1.          0.           0.
                        (INCHES)   4.118        4.852       4.854        4.854
                         (AC-FT)      1.           1.          1.           1.

                         CUMULATIVE AREA =      .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
   295 KK    *       A12  *
             *            *
             **************
                          SUBAREA A12

   297 KO          OUTPUT CONTROL VARIABLES
                         IPRNT            3  PRINT CONTROL
                         IPLOT            0  PLOT CONTROL
                         QSCAL           0.  HYDROGRAPH PLOT SCALE
                         IPNCH            7  PUNCH COMPUTED HYDROGRAPH
                          IOUT           21  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2          720  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT         .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

   298 BA          SUBBASIN CHARACTERISTICS
                         TAREA          .03  SUBBASIN AREA

                   PRECIPITATION DATA

    12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                   ..... HYDRO-35 ......      ............... TP-40 ...............   ........... TP-49 ...........
                   5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                     .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =       .03

   299 LS          SCS LOSS RATE
                         STRTL          .33  INITIAL ABSTRACTION
                        CRVNBR        86.00  CURVE NUMBER
                         RTIMP          .00  PERCENT IMPERVIOUS AREA

                   KINEMATIC WAVE
   300 UK            OVERLAND-FLOW ELEMENT NO. 1
                             L         120.  OVERLAND FLOW LENGTH
                             S        .2500  SLOPE
                             N         .350  ROUGHNESS COEFFICIENT
                            PA        100.0  PERCENT OF SUBBASIN
                         DXMIN            5  MINIMUM NUMBER OF DX INTERVALS
                   MUSKINGUM-CUNGE
   301 RD            MAIN CHANNEL
                             L         556.  CHANNEL LENGTH
                             S        .0050  SLOPE
                             N         .030  CHANNEL ROUGHNESS COEFFICIENT
                            CA          .03  CONTRIBUTING AREA
                         SHAPE         TRAP  CHANNEL SHAPE
                            WD          .00  BOTTOM WIDTH OR DIAMETER
                             Z         2.00  SIDE SLOPE
                        RUPSTQ           NO  ROUTE UPSTREAM HYDROGRAPH

                                                      ***
                                    COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                           COMPUTATION TIME STEP
                  ELEMENT     ALPHA       M          DT         DX        PEAK     TIME TO     VOLUME     MAXIMUM
                                                                                     PEAK                 CELERITY
```

```
                                                  (MIN)      (FT)      (CFS)      (MIN)       (IN)       (FPS)

                    PLANE1        2.13      1.67        .70     24.00    129.98    725.02      5.79        .61
                    MAIN          1.63      1.33       1.70    556.00    126.27    724.71      5.03       5.46

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .7966E+01 OUTFLOW= .6914E+01 BASIN STORAGE= .3232E-03 PERCENT ERROR=
13.2

                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                    MAIN          1.63      1.33       5.00              123.51    725.00      5.04

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      A12

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                           (CFS)
+     124.     12.08                   12.          3.          1.          1.
                         (INCHES)     4.318       5.043       5.043       5.043
                          (AC-FT)       6.          7.          7.          7.

                         CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

             **************
             *            *
  302 KK     *      CA12  *
             *            *
             **************
                            COMBINE CH2 AND 12

  304 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS

  305 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     CA12

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                           (CFS)
+     136.     12.08                   14.          4.          2.          2.
                         (INCHES)     4.284       5.011       5.012       5.012
                          (AC-FT)       7.          8.          8.          8.

                         CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  306 KK     *       CH3  *
             *            *
             **************
                            CHANNEL CH3

  308 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
```

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                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 309 BA         SUBBASIN CHARACTERISTICS
                     TAREA        .00  SUBBASIN AREA

                PRECIPITATION DATA

  12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00

 310 LS         SCS LOSS RATE
                     STRTL        .38  INITIAL ABSTRACTION
                    CRVNBR      84.00  CURVE NUMBER
                     RTIMP        .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 311 UK           OVERLAND-FLOW ELEMENT NO. 1
                         L        92.  OVERLAND FLOW LENGTH
                         S      .0435  SLOPE
                         N       .350  ROUGHNESS COEFFICIENT
                        PA      100.0  PERCENT OF SUBBASIN
                     DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
              MUSKINGUM-CUNGE
 312 RD           MAIN CHANNEL
                         L       840.  CHANNEL LENGTH
                         S      .0012  SLOPE
                         N       .030  CHANNEL ROUGHNESS COEFFICIENT
                        CA        .00  CONTRIBUTING AREA
                     SHAPE       TRAP  CHANNEL SHAPE
                        WD      10.00  BOTTOM WIDTH OR DIAMETER
                         Z       2.00  SIDE SLOPE
                    RUPSTQ        YES  ROUTE UPSTREAM HYDROGRAPH

                                                        ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                         COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                PEAK                  CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1        .89      1.67       1.14     18.40     18.94    725.03      5.56       .31
                  MAIN          .47      1.44       4.30    840.00    118.97    727.19      5.00      3.25


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8260E+01  EXCESS= .1245E+01 OUTFLOW= .9350E+01 BASIN STORAGE= .1367E-02 PERCENT ERROR=
1.6


                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN          .47      1.44       5.00              112.68    730.00      4.98

      ***            ***             ***             ***             ***

                       HYDROGRAPH AT STATION      CH3

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     113.     12.17                   16.          5.          2.           2.
                       (INCHES)     4.259       4.983       4.984        4.984
                        (AC-FT)        8.          9.          9.           9.

                       CUMULATIVE AREA =     .04 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
 313 KK      *       A11  *
             *            *
             **************
                          SUBAREA A11

 315 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
```

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                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                     IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 316 BA         SUBBASIN CHARACTERISTICS
                    TAREA        .03  SUBBASIN AREA

                PRECIPITATION DATA

  12 PH                           DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                             STORM AREA =       .03

 317 LS         SCS LOSS RATE
                   STRTL         .33  INITIAL ABSTRACTION
                  CRVNBR       86.00  CURVE NUMBER
                   RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 318 UK           OVERLAND-FLOW ELEMENT NO. 1
                       L        120.  OVERLAND FLOW LENGTH
                       S       .2500  SLOPE
                       N        .350  ROUGHNESS COEFFICIENT
                      PA       100.0  PERCENT OF SUBBASIN
                   DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 319 RD           MAIN CHANNEL
                       L       1002.  CHANNEL LENGTH
                       S       .0050  SLOPE
                       N        .030  CHANNEL ROUGHNESS COEFFICIENT
                      CA         .03  CONTRIBUTING AREA
                   SHAPE        TRAP  CHANNEL SHAPE
                      WD         .00  BOTTOM WIDTH OR DIAMETER
                       Z        2.00  SIDE SLOPE
                  RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                    ***
                              COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                     COMPUTATION TIME STEP
                 ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                               PEAK               CELERITY
                                                (MIN)     (FT)      (CFS)     (MIN)       (IN)      (FPS)

                PLANE1       2.13     1.67       .70     24.00     170.30    725.02       5.79        .61
                MAIN         1.63     1.33      2.86    501.00     151.20    726.03       5.63       5.84

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1044E+02 OUTFLOW= .1015E+02 BASIN STORAGE= .5596E-03 PERCENT ERROR=
2.8


                                   INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                MAIN         1.63     1.33      5.00               150.51    725.00       5.62

     ***            ***            ***             ***             ***

                           HYDROGRAPH AT STATION      A11

    TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.65, TOTAL EXCESS =     5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR       72-HR      59.92-HR
+   (CFS)       (HR)
                           (CFS)
+     151.     12.08                  17.          5.          2.          2.
                         (INCHES)   4.631       5.619       5.619       5.619
                          (AC-FT)      8.         10.         10.         10.

                          CUMULATIVE AREA =      .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 320 KK     *      CA11  *
            *            *
            **************
                          COMBINE WITH CH3 AND A11
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 322 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


 323 HC          HYDROGRAPH COMBINATION
                       ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     CA11

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     258.     12.08                   33.         10.          4.           4.
                        (INCHES)     4.441       5.295       5.296        5.296
                         (AC-FT)       16.         19.         19.          19.

                         CUMULATIVE AREA =     .07 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 324 KK     *       CH4  *
            *            *
            **************
                         CHANNEL CH4

 326 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 327 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

 328 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 329 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        101.  OVERLAND FLOW LENGTH
                           S       .0792  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
 330 RD            MAIN CHANNEL
                           L       1180.  CHANNEL LENGTH
                           S       .0025  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .01  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD       10.00  BOTTOM WIDTH OR DIAMETER
                           Z        2.00  SIDE SLOPE
                     RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                                  ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
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                ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                              PEAK                CELERITY
                                                (MIN)      (FT)      (CFS)     (MIN)       (IN)      (FPS)

               PLANE1       1.20      1.67        .99     20.20     32.39    724.55      5.56       .38
               MAIN          .68      1.44       3.86   1180.00    252.54    730.23      5.26      5.09

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1946E+02  EXCESS= .2105E+01 OUTFLOW= .2133E+02 BASIN STORAGE= .1493E-02 PERCENT ERROR=
1.1

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

               MAIN          .68      1.44       5.00              252.17    730.00      5.27

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      CH4

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     252.     12.17                 36.         11.          4.          4.
                        (INCHES)   4.425       5.265       5.266       5.266
                         (AC-FT)     18.         21.         21.         21.

                        CUMULATIVE AREA =     .08 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  331 KK    *       A9T  *
            *            *
            **************
                         SUBAREA A9T

  333 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  334 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .02  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                        STORM AREA =     .02

  335 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  336 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L       410.  OVERLAND FLOW LENGTH
                            S      .0400  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  337 RD            MAIN CHANNEL
                            L       563.  CHANNEL LENGTH
                            S      .0050  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .02  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       2.00  SIDE SLOPE
                      RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH
```

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                                                  ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                              COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M         DT        DX        PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                     (MIN)      (FT)      (CFS)    (MIN)       (IN)      (FPS)

                    PLANE1       .85      1.67       3.17     82.00      56.11   732.18      5.55       .45
                    MAIN        1.63      1.33       2.12    281.50      55.45   730.96      5.48      4.43


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .5722E+01 OUTFLOW= .5639E+01 BASIN STORAGE= .9384E-03 PERCENT ERROR=
1.4


                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN        1.63      1.33       5.00               54.85   730.00      5.48

       ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION      A9T

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+      55.     12.17                  9.          3.          1.          1.
                       (INCHES)    4.492       5.473       5.480       5.480
                        (AC-FT)       5.          6.          6.          6.

                       CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  338 KK    *       A9S  *
            *            *
            **************
                      SUBAREA A9S

  340 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  341 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .02  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

  342 LS          SCS LOSS RATE
                        STRTL        .33  INITIAL ABSTRACTION
                       CRVNBR      86.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  343 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L       150.  OVERLAND FLOW LENGTH
                            S      .2000  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  344 RD            MAIN CHANNEL
                            L       880.  CHANNEL LENGTH
                            S      .0050  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .02  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
```

```
                    Z        2.00  SIDE SLOPE
                RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                    ***
                              COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                     COMPUTATION TIME STEP
            ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                          PEAK                  CELERITY
                                             (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

           PLANE1       1.90      1.67        .95     30.00     99.39   724.96      5.79       .61
           MAIN         1.63      1.33       2.87    440.00     92.99   724.30      5.64      5.10

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .6299E+01 OUTFLOW= .6138E+01 BASIN STORAGE= .4935E-03 PERCENT ERROR=
2.5

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

           MAIN         1.63      1.33       5.00               90.60   725.00      5.64

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      A9S

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      91.     12.08                 10.          3.          1.          1.
                        (INCHES)   4.647       5.639       5.640       5.640
                         (AC-FT)     5.          6.          6.          6.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
  345 KK    *       CA9  *
            *            *
            **************
                        COMBINE A9 SUBAREAS

  347 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS

  348 HC          HYDROGRAPH COMBINATION
                        ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CA9

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     138.     12.08                 19.          6.          2.          2.
                        (INCHES)   4.566       5.558       5.563       5.563
                         (AC-FT)     10.         12.         12.         12.

                        CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  349 KK    *       A10  *
            *            *
            **************
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```
                    SUBAREA A10

 351 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 352 BA          SUBBASIN CHARACTERISTICS
                       TAREA        .03  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                            DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .03

 353 LS          SCS LOSS RATE
                       STRTL        .33  INITIAL ABSTRACTION
                      CRVNBR      86.00  CURVE NUMBER
                       RTIMP        .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 354 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L       150.  OVERLAND FLOW LENGTH
                           S      .2000  SLOPE
                           N       .350  ROUGHNESS COEFFICIENT
                          PA      100.0  PERCENT OF SUBBASIN
                       DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
 355 RD            MAIN CHANNEL
                           L       747.  CHANNEL LENGTH
                           S      .0050  SLOPE
                           N       .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA        .03  CONTRIBUTING AREA
                       SHAPE       TRAP  CHANNEL SHAPE
                          WD        .00  BOTTOM WIDTH OR DIAMETER
                           Z       2.00  SIDE SLOPE
                     RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                    PLANE1        1.90      1.67        .95     30.00    135.91   724.96      5.79       .61
                    MAIN          1.63      1.33       2.26    373.50    129.76   724.62      5.66      5.52


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .8614E+01 OUTFLOW= .8415E+01 BASIN STORAGE= .4415E-03 PERCENT ERROR=
2.3


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN          1.63      1.33       5.00              127.59   725.00      5.66

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      A10

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                            (CFS)
+     128.     12.08                14.          4.          2.          2.
                         (INCHES)  4.660       5.660       5.661       5.661
                          (AC-FT)     7.          8.          8.          8.

                         CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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356 KK     *        P2  *
           *            *
           **************
                    DETENTION POND P2

358 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

359 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

 12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .02

360 LS          SCS LOSS RATE
                      STRTL         .00  INITIAL ABSTRACTION
                     CRVNBR      100.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

361 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .00  LAG

                                                                 ***

                                                          UNIT HYDROGRAPH
                                                     5 END-OF-PERIOD ORDINATES
               113.       32.        6.        1.        0.

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       P2

   TOTAL RAINFALL =    7.44, TOTAL LOSS =     .00, TOTAL EXCESS =    7.44

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                         (CFS)
+     102.     12.08                  12.          4.          2.          2.
                       (INCHES)     5.468       7.437       7.440       7.440
                        (AC-FT)        6.          8.          8.          8.

                       CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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           *            *
362 KK     *     P2-IN  *
           *            *
           **************
                    COMBINE AREAS DISCHARGING TO POND P2

364 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


365 HC          HYDROGRAPH COMBINATION
                      ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                 ***

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION    P2-IN

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
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                                    6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     594.     12.08                 81.         25.         10.          10.
                        (INCHES)    4.614       5.651       5.668        5.668
                         (AC-FT)     40.         49.         49.          49.

                        CUMULATIVE AREA =     .16 SQ MI


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            *            *
  366 KK    *       RP2  *
            *            *
            **************
                      ROUTE THROUGH POND P2

  368 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


               HYDROGRAPH ROUTING DATA

  369 RS          STORAGE ROUTING
                        NSTPS          1  NUMBER OF SUBREACHES
                         ITYP       ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC     454.00  INITIAL CONDITION
                            X        .00 WORKING R AND D COEFFICIENT

  370 SA               AREA         .0       4.4       6.8       8.3       8.4       8.5       8.6       8.9       9.1

  371 SE          ELEVATION     454.00    454.50    455.00    455.50    456.00    456.50    457.00    458.00    459.00

  373 SL          LOW-LEVEL OUTLET
                        ELEVL     456.00  ELEVATION AT CENTER OF OUTLET
                        CAREA      14.14  CROSS-SECTIONAL AREA
                         COQL        .80  COEFFICIENT
                         EXPL        .50  EXPONENT OF HEAD

  372 SS          SPILLWAY
                         CREL     458.00  SPILLWAY CREST ELEVATION
                        SPWID      25.00  SPILLWAY WIDTH
                         COQW       2.60  WEIR COEFFICIENT
                         EXPW       1.50  EXPONENT OF HEAD

                                                          ***

                                          COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00       .74      3.53      7.28     11.44     15.66     19.94     28.69     37.69
          ELEVATION     454.00    454.50    455.00    455.50    456.00    456.50    457.00    458.00    459.00

                                          COMPUTED OUTFLOW-ELEVATION DATA

            OUTFLOW        .00       .00    122.28    123.10    123.94    124.78    125.64    126.50    127.38    128.27
          ELEVATION     454.00    456.00    457.82    457.84    457.87    457.89    457.92    457.95    457.97    458.00

            OUTFLOW     137.24    141.43    146.68    153.10    160.79    169.87    180.43    192.58    206.44    222.10
          ELEVATION     458.16    458.21    458.28    458.36    458.44    458.54    458.64    458.75    458.87    459.00


                                        COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

            STORAGE        .00       .74      3.53      7.28     11.44     15.66     19.94     27.08     27.29     27.51
            OUTFLOW        .00       .00       .00       .00       .00     64.14     90.70    122.28    123.10    123.94
          ELEVATION     454.00    454.50    455.00    455.50    456.00    456.50    457.00    457.82    457.84    457.87

            STORAGE      27.74     27.97     28.20     28.44     28.69     30.08     30.60     31.19     31.87     32.63
            OUTFLOW     124.78    125.64    126.50    127.38    128.27    137.24    141.43    146.68    153.10    160.79
          ELEVATION     457.89    457.92    457.95    457.97    458.00    458.16    458.21    458.28    458.36    458.44

            STORAGE      33.47     34.40     35.41     36.51     37.69
            OUTFLOW     169.87    180.43    192.58    206.44    222.10
          ELEVATION     458.54    458.64    458.75    458.87    459.00

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      RP2

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
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                          (CFS)
+     120.     12.75                    66.         19.          8.           8.
                        (INCHES)     3.766       4.353       4.354        4.354
                         (AC-FT)       33.         38.         38.          38.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
                                        6-HR       24-HR       72-HR     59.92-HR
+  (AC-FT)      (HR)
       26.     12.75                    18.         13.         10.          10.

  PEAK STAGE    TIME                           MAXIMUM AVERAGE STAGE
                                        6-HR       24-HR       72-HR     59.92-HR
+   (FEET)      (HR)
    457.75     12.75                 456.76      456.21      455.78       455.78

                        CUMULATIVE AREA =     .16 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  374 KK    *       CH5  *
            *            *
            **************
                         CHANNEL CH5

  376 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  377 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00

  378 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  379 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        197.  OVERLAND FLOW LENGTH
                            S       .0051  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  380 RD            MAIN CHANNEL
                            L        155.  CHANNEL LENGTH
                            S       .0050  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .00  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD       20.00  BOTTOM WIDTH OR DIAMETER
                            Z        2.00  SIDE SLOPE
                      RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        .30      1.67       3.83     39.40      3.15    735.42      5.55       .17
                    MAIN          .65      1.51        .58    155.00    120.68    765.85      4.36      4.47


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3792E+02  EXCESS= .3558E+00 OUTFLOW= .3823E+02 BASIN STORAGE= .2950E-03 PERCENT ERROR=
.1


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL
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                 MAIN           .65      1.51       5.00              120.67    765.00      4.36

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CH5

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     121.     12.75                 67.         19.          8.          8.
                        (INCHES)    3.768       4.358       4.359       4.359
                         (AC-FT)     33.         38.         38.         38.

                        CUMULATIVE AREA =     .16 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  381 KK    *       A7T  *
            *            *
            **************
                          SUBAREA A7T

  383 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  384 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .02  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

  385 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  386 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L       257.  OVERLAND FLOW LENGTH
                            S      .0400  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  387 RD            MAIN CHANNEL
                            L       600.  CHANNEL LENGTH
                            S      .0050  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .02  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       2.00  SIDE SLOPE
                      RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                     COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                            COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                     PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1         .85      1.67       2.19     51.40     68.42    727.94      5.55       .40
                    MAIN          1.63      1.33       2.15    300.00     67.09    728.44      5.47      4.65


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .6018E+01 OUTFLOW= .5922E+01 BASIN STORAGE= .6611E-03 PERCENT ERROR=
1.6
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                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                   MAIN          1.63      1.33       5.00               65.82    730.00      5.47

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      A7T

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      66.     12.17                 10.          3.          1.          1.
                        (INCHES)    4.494       5.462       5.467       5.467
                         (AC-FT)      5.          6.          6.          6.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  388 KK    *       A7S  *
            *            *
            **************
                          SUBAREA A7S

  390 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  391 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .03  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .03

  392 LS          SCS LOSS RATE
                        STRTL        .33  INITIAL ABSTRACTION
                       CRVNBR      86.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  393 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L       120.  OVERLAND FLOW LENGTH
                            S      .2500  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  394 RD            MAIN CHANNEL
                            L      1045.  CHANNEL LENGTH
                            S      .0050  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .03  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       2.00  SIDE SLOPE
                      RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        2.13      1.67        .70     24.00    175.34    725.02      5.79       .61
                    MAIN          1.63      1.33       2.96    522.50    169.02    725.04      5.64      5.89
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 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1074E+02 OUTFLOW= .1047E+02 BASIN STORAGE= .5783E-03 PERCENT ERROR=
2.6

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                   MAIN          1.63      1.33       5.00              168.60    725.00      5.68

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      A7S

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     169.     12.08                 18.          5.          2.           2.
                        (INCHES)    4.689       5.675       5.676        5.676
                         (AC-FT)      9.         11.         11.          11.

                        CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             *            *
  395 KK     *       CA7  *
             *            *
             **************
                          COMBINE A7 SUBAREAS

  397 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  398 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      CA7

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     229.     12.08                 27.          8.          3.           3.
                        (INCHES)    4.614       5.597       5.599        5.599
                         (AC-FT)      14.         16.         16.          16.

                        CUMULATIVE AREA =     .06 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             *            *
  399 KK     *        A8  *
             *            *
             **************
                          SUBAREA A8

  401 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS
```

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                SUBBASIN RUNOFF DATA

 402 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .02

 403 LS          SCS LOSS RATE
                       STRTL         .33  INITIAL ABSTRACTION
                      CRVNBR       86.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 404 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        150.  OVERLAND FLOW LENGTH
                           S       .2000  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
 405 RD            MAIN CHANNEL
                           L        348.  CHANNEL LENGTH
                           S       .0050  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .02  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD         .00  BOTTOM WIDTH OR DIAMETER
                           Z        2.00  SIDE SLOPE
                     RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                   PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                    PLANE1       1.90      1.67        .95     30.00     78.44   724.96      5.79       .61
                    MAIN         1.63      1.33       1.21    348.00     74.64   724.54      5.10      4.81

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .4971E+01 OUTFLOW= .4380E+01 BASIN STORAGE= .2132E-03 PERCENT ERROR=
11.9

                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                    MAIN         1.63      1.33       5.00               74.26   725.00      5.11

       ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION       A8

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      74.     12.08                 8.          2.          1.          1.
                        (INCHES)   4.364       5.105       5.106       5.106
                         (AC-FT)     4.          4.          4.          4.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 406 KK     *         P3 *
            *            *
            **************
                          DETENTION POND P3

 408 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
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                    TIMINT        .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 409 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

 410 LS          SCS LOSS RATE
                      STRTL         .00  INITIAL ABSTRACTION
                     CRVNBR      100.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 411 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .00  LAG

                                                                  ***

                                                            UNIT HYDROGRAPH
                                                       5 END-OF-PERIOD ORDINATES
                97.       27.        5.        1.        0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       P3

    TOTAL RAINFALL =    7.44, TOTAL LOSS =     .00, TOTAL EXCESS =    7.44

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      87.     12.08                     10.          3.          1.           1.
                        (INCHES)     5.468       7.437       7.440        7.440
                         (AC-FT)        5.          7.          7.           7.

                        CUMULATIVE AREA =     .02 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
 412 KK      *     P3-IN  *
             *            *
             **************
                          COMBINE AREAS DISCHARGING TO POND P3

 414 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


 415 HC          HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION    P3-IN

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+     391.     12.08                     45.         14.          6.           6.
                        (INCHES)     4.718       5.843       5.862        5.862
                         (AC-FT)       22.         27.         28.          28.

                        CUMULATIVE AREA =     .09 SQ MI
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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  416 KK    *       RP3  *
            *            *
            **************
                          ROUTE THROUGH POND P3

  418 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               HYDROGRAPH ROUTING DATA

  419 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC      453.00  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

  420 SA              AREA          .0       5.4       7.8       8.0       8.2       8.4       8.6

  421 SE          ELEVATION      453.00    454.00    455.00    456.00    457.00    458.00    459.00

  423 SL          LOW-LEVEL OUTLET
                       ELEVL      454.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        7.07  CROSS-SECTIONAL AREA
                        COQL         .80  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

  422 SS          SPILLWAY
                        CREL      458.00  SPILLWAY CREST ELEVATION
                       SPWID       25.00  SPILLWAY WIDTH
                        COQW        2.60  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

                                                          ***

                                          COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00      1.79      8.31     16.18     24.24     32.50     40.96
          ELEVATION     453.00    454.00    455.00    456.00    457.00    458.00    459.00

                                          COMPUTED OUTFLOW-ELEVATION DATA

            OUTFLOW        .00       .00     53.75     56.72     60.04     63.77     67.99     72.81     78.37     84.85
          ELEVATION     453.00    454.50    455.90    456.06    456.25    456.48    456.75    457.08    457.49    458.00

            OUTFLOW      86.01     87.68     90.42     94.49    100.15    107.65    117.25    129.21    143.78    161.21
          ELEVATION     458.04    458.09    458.15    458.23    458.32    458.42    458.54    458.68    458.83    459.00


                                       COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

            STORAGE        .00      1.79      4.75      8.31     15.42     16.18     16.69     18.20     20.00     22.19
            OUTFLOW        .00       .00       .00     32.07     53.75     55.55     56.72     60.04     63.77     67.99
          ELEVATION     453.00    454.00    454.50    455.00    455.90    456.00    456.06    456.25    456.48    456.75

            STORAGE      24.24     24.87     28.23     32.50     32.88     33.25     33.75     34.39     35.15     36.05
            OUTFLOW      71.71     72.81     78.37     84.85     86.01     87.68     90.42     94.49    100.15    107.65
          ELEVATION     457.00    457.08    457.49    458.00    458.04    458.09    458.15    458.23    458.32    458.42

            STORAGE      37.07     38.23     39.53     40.96
            OUTFLOW     117.25    129.21    143.78    161.21
          ELEVATION     458.54    458.68    458.83    459.00

      ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      RP3

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      54.     12.92                   38.         11.          5.           5.
                        (INCHES)     3.987       4.851       4.852        4.852
                         (AC-FT)       19.         23.         23.          23.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     59.92-HR
+  (AC-FT)      (HR)
       15.     12.83                   11.          6.          5.           5.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     59.92-HR
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+   (FEET)       (HR)
    455.91      12.92                455.32      454.74      454.38       454.38

                        CUMULATIVE AREA =     .09 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 424 KK     *       CH6  *
            *            *
            **************
                        CHANNEL CH6

 426 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 427 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00

 428 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 429 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L         50.  OVERLAND FLOW LENGTH
                          S       .1000  SLOPE
                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
                      DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
 430 RD            MAIN CHANNEL
                          L        155.  CHANNEL LENGTH
                          S       .0050  SLOPE
                          N        .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .00  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD       20.00  BOTTOM WIDTH OR DIAMETER
                          Z        2.00  SIDE SLOPE
                     RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                            COMPUTATION TIME STEP
                   ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1        1.35      1.67        .60     10.00      6.48    724.83      5.56       .33
                  MAIN           .65      1.51        .75    155.00     54.67    769.96      4.85      3.43


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2280E+02  EXCESS= .3854E+00 OUTFLOW= .2314E+02 BASIN STORAGE= .2237E-03 PERCENT ERROR=
.2


                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN           .65      1.51       5.00               54.67    770.00      4.85

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      CH6

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                           MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     59.92-HR
```

```
+   (CFS)        (HR)
                          (CFS)
+      55.     12.83                  38.         12.          5.           5.
                        (INCHES)     3.984       4.853       4.854        4.854
                         (AC-FT)       19.         23.         23.          23.

                         CUMULATIVE AREA =     .09 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  431 KK     *      CCH6  *
             *            *
             **************
                           COMBINE AREAS UPSTREAM OF S8

  433 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  434 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     CCH6

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)        (HR)
                          (CFS)
+     175.     12.75                 105.         31.         12.          12.
                        (INCHES)     3.841       4.532       4.533        4.533
                         (AC-FT)       52.         61.         61.          61.

                         CUMULATIVE AREA =     .25 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  435 KK     *        S9  *
             *            *
             **************
                           SUBAREA S9

  437 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  438 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .04  SUBBASIN AREA

                  PRECIPITATION DATA

   12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                        STORM AREA =     .04

  439 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA
```

```
 440 US          SNYDER UNITGRAPH
                          TP          .37  LAG
                          CP          .68  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .45 HR,       R=   .28 HR
                                        SNYDER   TP=   .37 HR,      CP=   .68

                                                    UNIT HYDROGRAPH
                                                21 END-OF-PERIOD ORDINATES
                 4.       14.       28.       38.       42.       38.       29.       21.       16.       12.
                 9.        6.        5.        4.        3.        2.        1.        1.        1.        1.
                 0.

     ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION       S9

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                          (CFS)
+      80.     12.42                     17.          5.          2.          2.
                        (INCHES)      4.495       5.534       5.534       5.534
                         (AC-FT)        9.         10.         10.         10.

                        CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 441 KK     *       S10  *
            *            *
            **************
                      SUBAREA S10

 443 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         720  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 444 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

 445 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 446 US          SNYDER UNITGRAPH
                          TP          .27  LAG
                          CP          .68  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .34 HR,       R=   .20 HR
                                        SNYDER   TP=   .27 HR,      CP=   .68

                                                    UNIT HYDROGRAPH
                                                15 END-OF-PERIOD ORDINATES
                 4.       13.       23.       26.       22.       14.        9.        6.        4.        3.
                 2.        1.        1.        1.        0.
```

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      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      S10

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                              (CFS)
+      44.     12.33                 8.          2.          1.          1.
                         (INCHES)     4.495       5.532       5.532       5.532
                        (AC-FT)       4.          5.          5.          5.

                        CUMULATIVE AREA =     .02 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 447 KK     *       CS9  *
            *            *
            **************
                      COMBINE AREAS DISCHARGING SOUTH OFF OF P.B.

 449 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        720  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


 450 HC          HYDROGRAPH COMBINATION
                      ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      CS9

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     59.92-HR
+   (CFS)       (HR)
                              (CFS)
+     287.     12.42                128.         39.         16.         16.
                         (INCHES)     3.900       4.702       4.704       4.704
                          (AC-FT)      64.         77.         77.         77.

                        CUMULATIVE AREA =     .31 SQ MI

1
                                                  RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION     FLOW    PEAK                                          AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                            O1       394.   12.42          92.         28.         11.       .18

          HYDROGRAPH AT
+                            S4        83.   12.92          29.          9.          4.       .06

          2 COMBINED AT
+                           CS4       450.   12.50         120.         37.         15.       .24

          HYDROGRAPH AT
+                           A1T        15.   12.17           2.          1.          0.       .00

          HYDROGRAPH AT
+                           A1S       137.   12.08          15.          4.          2.       .03

          2 COMBINED AT
+                           CA1       150.   12.08          17.          5.          2.       .03

          HYDROGRAPH AT
+                          CH14         7.   12.08           1.          0.          0.       .00

          2 COMBINED AT
+                         CCH14       157.   12.08          18.          5.          2.       .04

          HYDROGRAPH AT
+                           A2T        16.   12.17           3.          1.          0.       .01

          HYDROGRAPH AT
+                           A2S       166.   12.08          17.          5.          2.       .03

          2 COMBINED AT
+                           CA2       181.   12.08          20.          6.          2.       .04
```

+	HYDROGRAPH AT	CH12	4.	12.08	0.	0.	0.	.00	
+	HYDROGRAPH AT	CH13	9.	12.08	1.	0.	0.	.00	
+	3 COMBINED AT	CCH13	194.	12.08	21.	6.	3.	.04	
+	HYDROGRAPH AT	A3	58.	12.08	6.	2.	1.	.01	
+	HYDROGRAPH AT	CH10	6.	12.08	1.	0.	0.	.00	
+	HYDROGRAPH AT	CH11	4.	12.08	0.	0.	0.	.00	
+	3 COMBINED AT	CCH11	68.	12.08	7.	2.	1.	.01	
+	3 COMBINED AT	CA3	419.	12.08	46.	14.	6.	.09	
+	HYDROGRAPH AT	CH7	17.	12.08	2.	1.	0.	.00	
+	HYDROGRAPH AT	A5	125.	12.08	14.	4.	2.	.03	
+	2 COMBINED AT	CA5	142.	12.08	16.	5.	2.	.03	
+	HYDROGRAPH AT	CH8	155.	12.08	18.	6.	2.	.04	
+	HYDROGRAPH AT	A4	152.	12.08	17.	5.	2.	.03	
+	2 COMBINED AT	CA4	308.	12.08	35.	11.	4.	.07	
+	HYDROGRAPH AT	CH9	310.	12.08	37.	11.	5.	.08	
+	HYDROGRAPH AT	P1	186.	12.08	21.	7.	3.	.04	
+	3 COMBINED AT	P1-IN	915.	12.08	105.	33.	13.	.20	
+	ROUTED TO	RP1	28.	15.17	28.	23.	11.	.20	
+									457.45 15.25
+	2 COMBINED AT	CP1	475.	12.50	144.	57.	26.	.45	
+	HYDROGRAPH AT	S5	21.	12.58	6.	2.	1.	.01	
+	2 COMBINED AT	CS5	495.	12.50	149.	59.	26.	.46	
+	HYDROGRAPH AT	S7	17.	12.50	4.	1.	1.	.01	
+	2 COMBINED AT	CS7	512.	12.50	153.	60.	27.	.47	
+	HYDROGRAPH AT	O2	2171.	12.75	767.	239.	96.	1.58	
+	HYDROGRAPH AT	O3	62.	12.33	12.	4.	2.	.03	
+	HYDROGRAPH AT	S6	32.	12.83	10.	3.	1.	.02	
+	4 COMBINED AT	CS6	2663.	12.75	942.	305.	125.	2.09	
+	HYDROGRAPH AT	O4	269.	12.50	65.	20.	8.	.13	
+	2 COMBINED AT	CO4	2884.	12.67	1007.	325.	133.	2.23	
+	HYDROGRAPH AT	A6	73.	12.08	9.	3.	1.	.02	
+	HYDROGRAPH AT	S8	39.	12.33	8.	2.	1.	.02	
+	3 COMBINED AT	CS8	2921.	12.67	1023.	330.	135.	2.26	
+	HYDROGRAPH AT	S1	23.	12.83	7.	2.	1.	.02	
+	HYDROGRAPH AT	S2	50.	13.25	22.	7.	3.	.05	
	HYDROGRAPH AT								

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+                          CH1        56.   13.33          26.          8.          3.        .06
          HYDROGRAPH AT
+                           S3        17.   12.42           3.          1.          0.        .01
          HYDROGRAPH AT
+                           O5       302.   12.67          88.         27.         11.        .18
          4 COMBINED AT
+                          CO5       379.   12.67         125.         39.         15.        .26
          HYDROGRAPH AT
+                          CH2        15.   12.17           2.          1.          0.        .01
          HYDROGRAPH AT
+                          A12       124.   12.08          12.          3.          1.        .03
          2 COMBINED AT
+                         CA12       136.   12.08          14.          4.          2.        .03
          HYDROGRAPH AT
+                          CH3       113.   12.17          16.          5.          2.        .04
          HYDROGRAPH AT
+                          A11       151.   12.08          17.          5.          2.        .03
          2 COMBINED AT
+                         CA11       258.   12.08          33.         10.          4.        .07
          HYDROGRAPH AT
+                          CH4       252.   12.17          36.         11.          4.        .08
          HYDROGRAPH AT
+                          A9T        55.   12.17           9.          3.          1.        .02
          HYDROGRAPH AT
+                          A9S        91.   12.08          10.          3.          1.        .02
          2 COMBINED AT
+                          CA9       138.   12.08          19.          6.          2.        .04
          HYDROGRAPH AT
+                          A10       128.   12.08          14.          4.          2.        .03
          HYDROGRAPH AT
+                           P2       102.   12.08          12.          4.          2.        .02
          4 COMBINED AT
+                         P2-IN      594.   12.08          81.         25.         10.        .16
          ROUTED TO
+                          RP2       120.   12.75          66.         19.          8.        .16
+                                                                                          457.75       12.75
          HYDROGRAPH AT
+                          CH5       121.   12.75          67.         19.          8.        .16
          HYDROGRAPH AT
+                          A7T        66.   12.17          10.          3.          1.        .02
          HYDROGRAPH AT
+                          A7S       169.   12.08          18.          5.          2.        .03
          2 COMBINED AT
+                          CA7       229.   12.08          27.          8.          3.        .06
          HYDROGRAPH AT
+                           A8        74.   12.08           8.          2.          1.        .02
          HYDROGRAPH AT
+                           P3        87.   12.08          10.          3.          1.        .02
          3 COMBINED AT
+                         P3-IN      391.   12.08          45.         14.          6.        .09
          ROUTED TO
+                          RP3        54.   12.92          38.         11.          5.        .09
+                                                                                          455.91       12.92
          HYDROGRAPH AT
+                          CH6        55.   12.83          38.         12.          5.        .09
          2 COMBINED AT
+                         CCH6       175.   12.75         105.         31.         12.        .25
          HYDROGRAPH AT
+                           S9        80.   12.42          17.          5.          2.        .04
          HYDROGRAPH AT
+                          S10        44.   12.33           8.          2.          1.        .02
          3 COMBINED AT
+                          CS9       287.   12.42         128.         39.         16.        .31
1
                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                          INTERPOLATED TO
                                                                       COMPUTATION INTERVAL
      ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                             PEAK                                             PEAK

                          (MIN)     (CFS)     (MIN)      (IN)    (MIN)     (CFS)     (MIN)       (IN)

        A1T    MANE        3.25     14.85    730.68      5.51     5.00     14.81    730.00       5.51
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1423E+01 OUTFLOW= .1411E+01 BASIN STORAGE= .4464E-03 PERCENT ERROR=    .8

              A1S  MANE         2.60    138.99    725.52      5.64      5.00    136.68    725.00        5.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9108E+01 OUTFLOW= .8871E+01 BASIN STORAGE= .4882E-03 PERCENT ERROR=   2.6

             CH14  MANE         3.46      7.12    725.83      5.49      5.00      7.05    725.00        5.48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4743E+00 OUTFLOW= .4688E+00 BASIN STORAGE= .3115E-03 PERCENT ERROR=   1.1

              A2T  MANE         2.57     16.62    728.27      5.51      5.00     16.44    730.00        5.52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1542E+01 OUTFLOW= .1529E+01 BASIN STORAGE= .3784E-03 PERCENT ERROR=    .8

              A2S  MANE         2.63    166.99    725.08      5.64      5.00    166.21    725.00        5.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1062E+02 OUTFLOW= .1035E+02 BASIN STORAGE= .5170E-03 PERCENT ERROR=   2.5

             CH12  MANE         2.38      4.44    724.72      5.50      5.00      4.31    725.00        5.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2668E+00 OUTFLOW= .2641E+00 BASIN STORAGE= .1752E-03 PERCENT ERROR=    .9

             CH13  MANE         3.96      9.58    723.77      5.48      5.00      8.74    725.00        5.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5929E+00 OUTFLOW= .5848E+00 BASIN STORAGE= .3570E-03 PERCENT ERROR=   1.3

               A3  MANE         2.57     60.17    724.11      5.65      5.00     57.53    725.00        5.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3890E+01 OUTFLOW= .3794E+01 BASIN STORAGE= .3773E-03 PERCENT ERROR=   2.5

             CH10  MANE         3.36      6.35    724.81      5.51      5.00      6.23    725.00        5.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3854E+00 OUTFLOW= .3819E+00 BASIN STORAGE= .2777E-03 PERCENT ERROR=    .8

             CH11  MANE         2.38      4.44    724.72      5.50      5.00      4.31    725.00        5.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2668E+00 OUTFLOW= .2641E+00 BASIN STORAGE= .1752E-03 PERCENT ERROR=    .9

              CH7  MANE         5.00     16.54    725.00      5.35      5.00     16.54    725.00        5.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1067E+01 OUTFLOW= .1026E+01 BASIN STORAGE= .7822E-03 PERCENT ERROR=   3.7

               A5  MANE         3.16    128.22    723.87      5.63      5.00    125.46    725.00        5.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8985E+01 OUTFLOW= .8736E+01 BASIN STORAGE= .6004E-03 PERCENT ERROR=   2.8

              CH8  MANE         1.08    158.45    725.87      5.57      5.00    155.21    725.00        5.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9741E+01 EXCESS= .1393E+01 OUTFLOW= .1111E+02 BASIN STORAGE= .2682E-03 PERCENT ERROR=    .3

               A4  MANE         2.42    156.03    725.65      5.65      5.00    152.38    725.00        5.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1047E+02 OUTFLOW= .1022E+02 BASIN STORAGE= .5021E-03 PERCENT ERROR=   2.4

              CH9  MANE          .85    317.30    726.05      5.60      5.00    310.17    725.00        5.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2134E+02 EXCESS= .1186E+01 OUTFLOW= .2250E+02 BASIN STORAGE= .2540E-03 PERCENT ERROR=    .1

               A6  MANE         5.00     72.90    725.00      5.57      5.00     72.90    725.00        5.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5311E+01 OUTFLOW= .5112E+01 BASIN STORAGE= .9760E-03 PERCENT ERROR=   3.7

              CH1  MANE         5.00     55.64    800.00      5.51      5.00     55.64    800.00        5.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1372E+02 EXCESS= .2757E+01 OUTFLOW= .1640E+02 BASIN STORAGE= .3597E-02 PERCENT ERROR=    .5

              CH2  MANE         5.00     15.36    730.00      4.85      5.00     15.36    730.00        4.85
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1512E+01 OUTFLOW= .1320E+01 BASIN STORAGE= .2050E-02 PERCENT ERROR=  12.5

              A12  MANE         1.70    126.27    724.71      5.03      5.00    123.51    725.00        5.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7966E+01 OUTFLOW= .6914E+01 BASIN STORAGE= .3232E-03 PERCENT ERROR=  13.2

              CH3  MANE         4.30    118.97    727.19      5.00      5.00    112.68    730.00        4.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8260E+01 EXCESS= .1245E+01 OUTFLOW= .9350E+01 BASIN STORAGE= .1367E-02 PERCENT ERROR=   1.6

              A11  MANE         2.86    151.20    726.03      5.63      5.00    150.51    725.00        5.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1044E+02 OUTFLOW= .1015E+02 BASIN STORAGE= .5596E-03 PERCENT ERROR=   2.8

              CH4  MANE         3.86    252.54    730.23      5.26      5.00    252.17    730.00        5.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1946E+02 EXCESS= .2105E+01 OUTFLOW= .2133E+02 BASIN STORAGE= .1493E-02 PERCENT ERROR=   1.1

              A9T  MANE         2.12     55.45    730.96      5.48      5.00     54.85    730.00        5.48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5722E+01 OUTFLOW= .5639E+01 BASIN STORAGE= .9384E-03 PERCENT ERROR=   1.4

              A9S  MANE         2.87     92.99    724.30      5.64      5.00     90.60    725.00        5.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6299E+01 OUTFLOW= .6138E+01 BASIN STORAGE= .4935E-03 PERCENT ERROR=   2.5

              A10  MANE         2.26    129.76    724.62      5.66      5.00    127.59    725.00        5.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8614E+01 OUTFLOW= .8415E+01 BASIN STORAGE= .4415E-03 PERCENT ERROR=   2.3

              CH5  MANE          .58    120.68    765.85      4.36      5.00    120.67    765.00        4.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3792E+02 EXCESS= .3558E+00 OUTFLOW= .3823E+02 BASIN STORAGE= .2950E-03 PERCENT ERROR=    .1

              A7T  MANE         2.15     67.09    728.44      5.47      5.00     65.82    730.00        5.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6018E+01 OUTFLOW= .5922E+01 BASIN STORAGE= .6611E-03 PERCENT ERROR=   1.6

              A7S  MANE         2.96    169.02    725.04      5.64      5.00    168.60    725.00        5.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1074E+02 OUTFLOW= .1047E+02 BASIN STORAGE= .5783E-03 PERCENT ERROR=   2.6

               A8  MANE         1.21     74.64    724.54      5.10      5.00     74.26    725.00        5.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4971E+01 OUTFLOW= .4380E+01 BASIN STORAGE= .2132E-03 PERCENT ERROR=  11.9

              CH6  MANE          .75     54.67    769.96      4.85      5.00     54.67    770.00        4.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2280E+02 EXCESS= .3854E+00 OUTFLOW= .2314E+02 BASIN STORAGE= .2237E-03 PERCENT ERROR=    .2


*** NORMAL END OF HEC-1 ***
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Prep By: CCJ
Date: 8/5/2016

CAMELOT LANDFILL
1339-351-11-02-01
25-YEAR EXCESS RAINFALL
VOLUME CALCULATIONS

Chkd By:_____
Date:_____

Required: Determine the 25-year 24-hour storm volume generated by the site and offsite areas using the excess rainfall calculated in the HEC-1 analysis of the proposed expansion site conditions.

Method: 1 Use the excessive rainfall data generated by the HEC-1 analysis (pages IIIF-A-31 through IIIF-A-104) to determine the volume produced by the site for the proposed expansion conditions.

Proposed Expansion Conditions

1. Volume Discharging Southeast Downstream of Entrance Road

1a. Landfill Areas Discharging into Pond P1 and Flowing under Entrance Road

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
A1T	~~0.0085~~ 0.0048	5.56	~~5.47~~ 3.07	~~3~~ 1
A1S	~~0.0289~~ 0.0295	5.79	~~18.48~~ 18.86	9
A2T	~~0.0185~~ 0.0052	5.56	~~11.83~~ 3.35	~~5~~ 2
A2S	~~0.0322~~ 0.0344	5.79	~~20.59~~ 22.03	~~10~~ 11
A3	0.0126	5.79	~~8.07~~ 8.06	4
CH7	0.0036	5.56	2.33	1
A5	~~0.0297~~ 0.0291	5.79	~~19.01~~ 18.65	9
CH8	~~0.0053~~ 0.0047	5.56	~~3.37~~ 3.02	~~2~~ 1
A4	~~0.0211~~ 0.0339	5.79	~~13.51~~ 21.68	~~7~~ 10
CH9	~~0.0048~~ 0.0040	5.56	~~3.09~~ 2.57	1
CH10	0.0013	5.56	0.85	0
CH11	0.0009	5.56	0.56	0
CH12	0.0009	5.56	0.59	0
CH13	0.0020	5.56	1.29	1
CH14	0.0016	5.56	~~1.02~~ 1.01	0
P1	0.0361	7.44	23.10	14
			Total Volume Flowing under Entrance Road	~~67~~ 65

1b. Volume Upstream of Entrance Road

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
O1	~~0.1367~~ 0.1843	~~5.90~~ 5.79	~~87.47~~ 117.94	~~43~~ 57
~~O1A~~	~~0.0366~~	~~5.67~~	~~23.42~~	~~11~~
O2	1.5756	5.66	1,008.23	476
S4	~~0.0677~~ 0.0597	5.56	~~43.34~~ 38.22	~~20~~ 18
S5	0.0115	5.56	7.34	3
S7	0.0084	5.56	5.39	2
			Total Volume Upstream of Entrance Road	556

Prep By: CCJ
Date: 8/5/2016

CAMELOT LANDFILL
1339-351-11-02-01
25-YEAR EXCESS RAINFALL
VOLUME CALCULATIONS

Chkd By:_____
Date:_____

1c. Non-Landfill Areas Downstream of Entrance Road

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
S6	0.0218	5.56	13.92	6
O3	0.0253	5.56	16.18	7
			Total Volume of Non-Landfill Areas D.S. of Entrance Road	14

Total Volume Discharging Southeast Downstream of Entrance Road = ~~636~~ 635 ac-ft

2. Volume in Midway Branch Exiting Permit Boundary

2a. Volume in Midway Branch Entering Permit Boundary

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
O4	0.1344	5.56	86.04	40
			Total Volume in Midway Branch Entering Permit Boundary	40

2b. Landfill Areas Flowing East into Midway Branch

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
A6	0.0172	5.79	~~11.00~~ 10.99	5
S8	0.0158	5.56	10.12	5
			Total Volume Flowing East into Midway Branch	10

Total Volume in Midway Branch Excluding Section 1 Discharge Volume = 50 ac-ft

Total Volume in Midway Branch Exiting Permit Boundary = ~~686~~ 685 ac-ft

3. Volume Discharging South into Elm Fork

3a. Areas Discharging into Pond P2

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
CH2	0.0051	5.56	3.29	2
A12	~~0.0237~~ 0.0258	5.79	~~15.17~~ 16.48	~~7~~ 8
CH3	0.0042	5.56	~~2.71~~ 2.64	1
A11	~~0.0345~~ 0.0338	5.79	~~22.08~~ 21.60	~~11~~ 10
CH4	~~0.0070~~ 0.0071	5.56	~~4.45~~ 4.55	2
~~A10T~~ A9T	0.0193	5.56	~~12.37~~ 12.33	6
~~A9~~ A9S	~~0.0219~~ 0.0204	5.79	~~13.99~~ 13.06	~~7~~ 6
~~A10S~~ A10	~~0.0259~~ 0.0279	5.79	~~16.60~~ 17.87	~~8~~ 9
P2	~~0.0196~~ 0.0197	7.44	~~12.55~~ 12.60	8
			Total Volume Discharging into Pond P2	~~51~~ 52

Prep By: CCJ
Date: 8/5/2016

CAMELOT LANDFILL
1339-351-11-02-01
25-YEAR EXCESS RAINFALL
VOLUME CALCULATIONS

Chkd By:_____
Date:_____

3b. Areas Discharging into Pond P3

Area No.	Area (sq mi)		Total Excess Rainfall (in)	Area(ac)		Volume (ac-ft)	
A7T	~~**0.0212**~~	**0.0203**	**5.56**	~~**13.58**~~	**13.02**	**6**	
A7S	~~**0.0318**~~	**0.0348**	**5.79**	~~**20.36**~~	**22.24**	~~**10**~~	**11**
A8	~~**0.0168**~~	**0.0161**	**5.79**	~~**10.75**~~	**10.29**	**5**	
P3	~~**0.0168**~~	**0.0169**	**7.44**	~~**10.74**~~	**10.83**	**7**	
					Total Volume Discharging into Pond P3	**28**	

3c. Flow Downstream of Ponds P2 and P3

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
CH5	**0.0012**	**5.56**	**0.76**	**0**
CH6	**0.0013**	**5.56**	**0.83**	**0**
			Total Volume Downstream of Ponds P2 and P3	**1**

Total Volume Discharged South to Elm Fork = ~~**80**~~ **81** **ac-ft**

4. Volume Discharging Southeast into Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
S10	**0.0168**	**5.56**	**10.76**	**5**
			Total Volume Discharging Southeast into Elm Fork	**5**

5. Volume Discharging Southwest into Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
S9	**0.0355**	**5.56**	**22.75**	**11**
			Total Volume Discharging Southwest into Elm Fork	**11**

6. Southern Volume Discharging Southwest Towards Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
S3	**0.0071**	**5.56**	**4.55**	**2**
		Total Southern Volume Discharging Southwest Towards Elm Fork		**2**

7. Northern Volume Discharging West Towards Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
S2	**~~0.0482~~ 0.0465**	**5.56**	**~~30.86~~ 29.76**	**14**
CH1	**0.0093**	**5.56**	**5.94**	**3**
		Total Northern Volume Discharging West Towards Elm Fork		**17**

8. Volume Discharging from Northwest Corner Towards Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area(ac)	Volume (ac-ft)
S1	**~~0.0160~~ 0.0152**	**5.56**	**~~10.26~~ 9.73**	**5**
		Total Volume Discharging from NW Corner Towards Elm Fork		**5**

Total Volume Exiting Permit Boundary = ~~805~~ 806 ac-ft

Prep By: CRM
Date: 8/5/2016

CAMELOT LANDFILL
1339-351-11-02-6B.6
25-YEAR VELOCITY CALCULATIONS

Chkd By:_____
Date:_____

Required: Determine the flow velocities entering and exiting the permit boundary using HYDROCALC HYDRAULICS (Version 1.2a, 1996) for the flows calculated for the 25-year storm event in the HEC-1 analysis. HEC-RAS is used to determine the velocity in Elm Fork.

Method:

1. Use the flow data generated by the HEC-1 analysis to determine velocity of runoff entering the landfill permit boundary.
2. Use the flow data generated by the HEC-1 analysis to determine velocity of runoff exiting the landfill permit boundary.

1. Flow Velocity entering the landfill permit boundary

DP1

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 2171 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	2171	0.010	0.03	4.00	20.00	60.00	2.85	8.08

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP2

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 62 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	62	0.090	0.03	4.00	6.00	87.00	0.16	4.38

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP4

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~2881~~ 2884 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	~~2881~~ 2884	0.005	0.03	10.00	2.00	22.00	6.00	8.28

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP12

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~298~~ 394 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	~~298~~ 394	0.001	0.03	77.00	83.00	0.00	~~1.65~~ 1.83	~~1.38~~ 1.48

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

~~DP13~~

- ~~Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.~~

~~Q_{25} = 70 cfs~~

~~Storm Year~~	~~Flow Rate (cfs)~~	~~Bottom Slope (ft/ft)~~	~~Manning's n~~	~~Side Slope (left)~~	~~Side Slope (right)~~	~~Bottom Width (ft)~~	~~Normal Depth (ft)~~	~~Flow Vel. (fps)~~
~~25~~	~~70~~	~~0.019~~	~~0.03~~	~~50.00~~	~~48.00~~	~~0.00~~	~~0.66~~	~~3.27~~

~~Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).~~

2. Flow Velocity exiting the landfill permit boundary

DP3

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~2664~~ 2663 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	~~2664~~ 2663	0.008	0.03	16.00	17.00	27.00	3.85	7.63

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP5

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~2919~~ 2921 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	~~2919~~ 2921	0.008	0.03	2.00	2.00	9.00	~~8.73~~ 8.74	12.63

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP6

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~173~~ 175 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	~~173~~ 175	0.030	0.03	1.00	2.00	1.00	~~2.98~~ 3.00	~~10.60~~ 10.63

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP7

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 44 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	44	0.010	0.03	24.00	29.00	0.00	0.79	2.67

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP8

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 80 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	80	0.083	0.03	4.50	5.00	0.00	1.27	10.39

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP9

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 17 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	17	0.089	0.03	99.00	100.00	0.00	0.22	3.44

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP10

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~57~~ 56 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	57	0.001	0.03	3.00	3.00	20.00	~~1.37~~ 1.36	~~1.72~~ 1.71

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

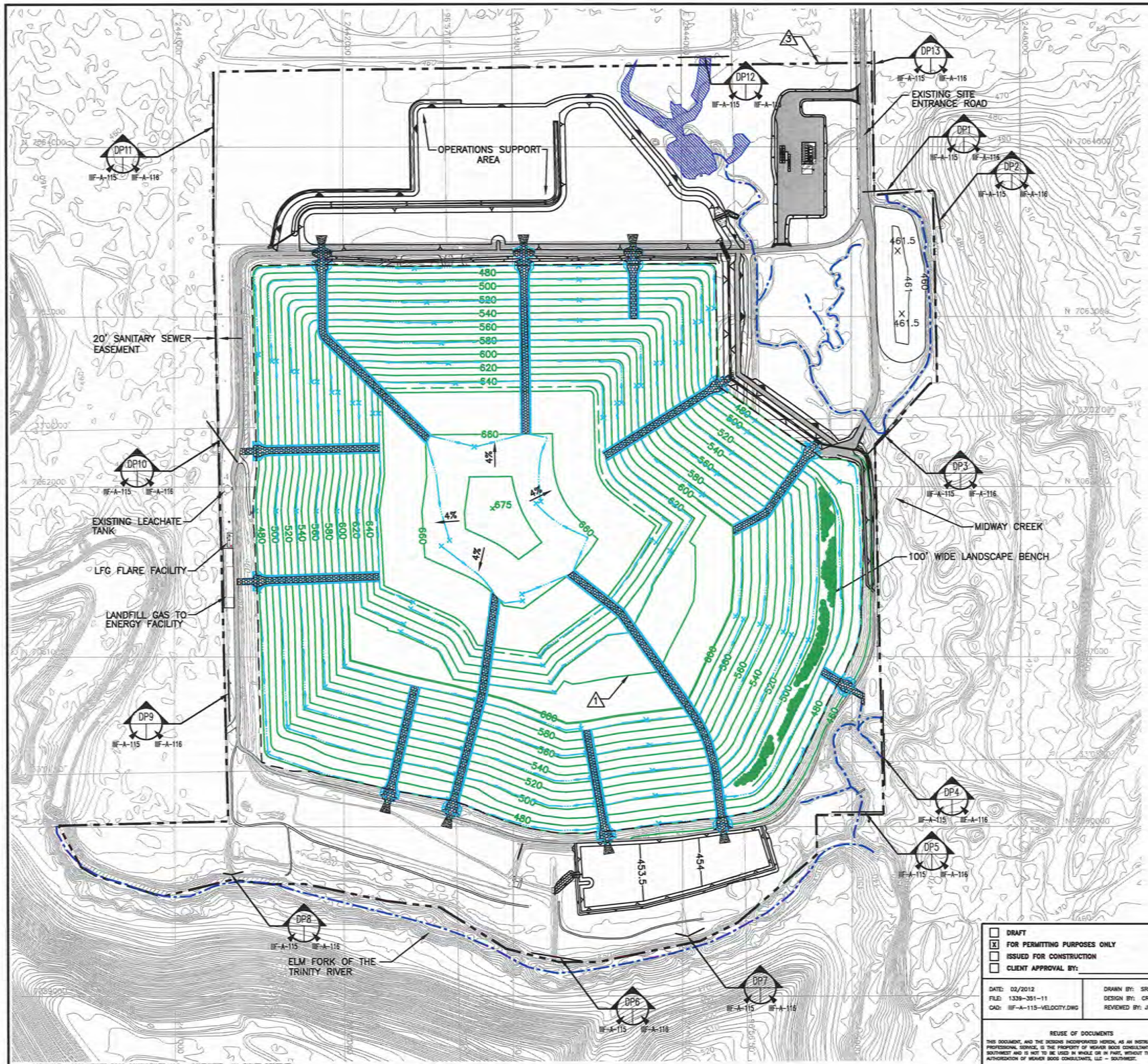
DP11

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~24~~ 23 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	24	0.001	0.03	100.00	100.00	0.00	~~0.59~~ 0.58	0.69

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR (SEE NOTE 1)
- FINAL COVER CONTOUR
- PERMITTED DRAINAGE LETDOWN
- PERMITTED DRAINAGE SWALE
- USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 5)
- USACE JURISDICTIONAL WETLANDS
- INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988. OFF-SITE CONTOURS AND ELEVATIONS PROVIDED BY DFWMAPS.COM FROM AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN JANUARY TO MARCH 2007.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
4. REFER TO SHEET IIIF-A-28 FOR COMPLETE OFFSITE DRAINAGE AREA DELINEATIONS.
5. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM THE GOSHAWK ENVIRONMENTAL CONSULTANTS, INC. SEPTEMBER 2010 REPORT WHICH IS INCLUDED IN PARTS I/II, APPENDIX I/IIB.

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. REVISED NOTE 3.
3. UPDATED PERMIT BOUNDARY INFORMATION.

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- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
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- [ ] CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
CAD: IIIF-A-115-VELOCITY.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
UPDATED PERMITTED DISCHARGE POINT VELOCITY CALCULATIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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SHEET IIIF-A-115

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APPENDIX IIIF-B

PERIMETER CHANNEL, DETENTION POND, AND CULVERT DESIGN

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Includes pages IIIF-B-1 through IIIF-B-19

CHANNEL EROSION CONTROL DESIGN

Channel erosion controls have been designed for flow velocities resulted from the 25-year frequency flow rates. As shown on page IIIF-B-2 velocities in the perimeter channels range from 1.50 ft/s to 9.514 ft/s. The channel lining needed to protect against erosive velocities is shown on Drawings IIIF.5 through IIIF.8 in Appendix IIIF. All channels and drainage features will be inspected and maintained in accordance with the Site Operating Plan.

The following was used to select the type of channel lining material.

- Vegetation – used in all areas where velocities are less than 4 ft/s for channels.
- Turf reinforcement matting – used in channels for velocities between 4 ft/s and 13 ft/s. Please refer to page IIIF-B-6 for more information.
- 2-foot-thick Gabions – used at chute discharges in channels, areas in channels where flow velocities exceed 13 ft/s, and detention ponds (see Appendix IIIF-C – Final Cover Erosion Control Structure Design).

Channel lining details are presented on Drawings IIIF.10 in Appendix IIIF.

2. Flow through the Low Water Outlet

The flow rate through the low water outlet (LWO) is summarized below.

Flow Structure	Pond Bottom Elev (ft-msl)	LWO Invert Elev. Upstream (ft-msl)	LWO Invert Elev. Downstream (ft-msl)	LWO Diameter (in)	25-Year Flow Rate[2] (cfs)	25-Year Outlet Velocity[1] (ft/s)
P1	454.00	454.00	453.00	24	28.0	9.23
P2	454.00	454.00	452.60	2-36	~~59.0~~ 60.0	~~10.60~~ 10.63
P3	453.00	453.00	452.35	36	~~53.0~~ 54.0	~~7.36~~ 7.64
Culvert "1"	457.70	457.70	454.00	24	21.0	6.68
Culvert "2"	455.70	455.70	453.80	3-48	~~87.0~~ 86.0	~~13.83~~ 13.79
Culvert "3"	454.30	454.30	454.00	4-48	~~68.8~~ 77.5	~~5.95~~ 6.21
Culvert "4"	457.00	457.00	455.70	36	17.0	2.41
Culvert "5"	459.00	459.00	458.50	24	15.0	6.41
Culvert "6"	456.00	456.00	455.50	36	30.0	6.89
Culvert "7"	453.10	453.10	452.80	4-48	~~97.3~~ 112.5	~~7.74~~ 10.43
Culvert "8"	452.00	452.00	452.30	4-48	128.0	11.27

[1] Velocities through the low water outlet for P1, P2, and P3 were calculated using the HYDROCALC HYDRAULICS FOR WINDOWS program developed by Dodson and Associates (Version 1.2a, 1996).

[2] The flowrates for all low water outlets are the peak discharges for the respective areas as calculated by HEC-1 since the spillway crest is not overtopped in the 25-year event. Flowrates shown for P2, Culvert 2, Culvert 3, and Culvert 7 are the flow in each pipe of the culvert system. The total 25-year flowrate discharging from P2 is ~~118~~ 120 cfs / 2 pipes = ~~59~~ 60 cfs, from Culvert 2 = ~~261~~ 258 cfs / 3 pipes = ~~87~~ 86 cfs, from Culvert 3 = ~~275~~ 310 cfs / 4 pipes = ~~68.8~~ 77.5 cfs, and from Culvert 7 is ~~389~~ 450 cfs / 4 pipes = ~~97.3~~ 112.5 cfs, and from Culvert 8 is ~~426~~ 512 cfs / 4 pipes = ~~106.5~~ 128 cfs.

The velocity through the low water outlet is larger than the velocity over the spillway, when there is a low water outlet present. The flowrate through the low water outlet is used to design the riprap apron.

The nomograph used for design of the length of the riprap and the median diameter are shown on page IIIF-B-11 (Figure 5.25).

The minimum riprap length and diameter for each outlet is summarized below. The length of the riprap is increased by 20 percent to provide for a conservative design.

Pond	Riprap Design Flowrate (cfs)	Pipe Diameter (in)	Riprap Length (ft)	Adjusted Length L x 1.2 (ft)	Median Rock Diameter (ft)
P1	28.0	24	28	34	1.65
P2	~~59.0~~ 60.0	2-36	18	22	1.40
P3	~~53.0~~ 54.0	36	10	12	1.20
Culvert "1"	21.0	24	10	12	1.20
Culvert "2"	~~87.0~~ 86.0	3-48	10	12	1.20
Culvert "3"	~~68.8~~ 77.5	4-48	10	12	~~1.20~~
Culvert "4"	17.0	36	10	12	1.20
Culvert "5"	15.0	24	10	12	~~1.20~~ 2.80
Culvert "6"	30.0	36	10	12	~~1.20~~ 2.50
Culvert "7"	~~97.3~~ 112.5	4-48	~~10~~ 18	~~12~~ 22	~~1.20~~ 1.40
Culvert "8"	128.0	4-48	24	29	1.60

Apron width required for the ponds (e.g., width of erosion protection in outlet channel) are:
W_{req}=LWO diameter + 0.4*(RipRap Length)

Pond	W_{req} (ft)	$W_{provided}$ (ft)
P1	17.2	60.0
P2	13.2	202.0
P3	10.0	142.0

The riprap will be provided over the entire width of the spillway of ponds P2 and P3 and the outlet channel downstream of all the spillways/low water outlets.

The median diameter of riprap is intended to determine the minimum diameter of the riprap that will be used. As an alternative, 2-foot thick gabions with a d_{50} of 6-inches can be used.

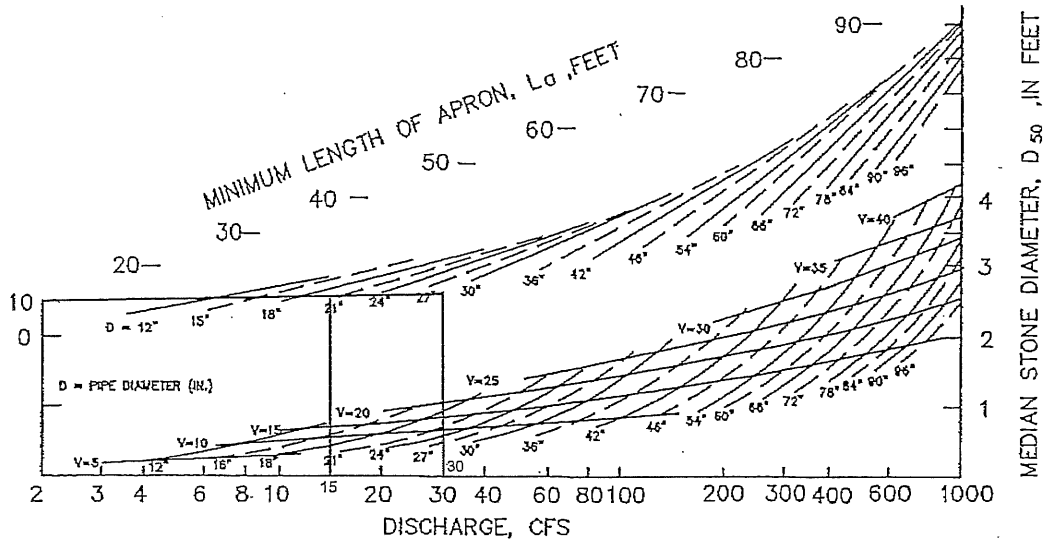


Figure 5.24 Design of outlet protection—minimum tailwater condition, $T_w < 0.5D$ (Environmental Protection Agency, 1976).

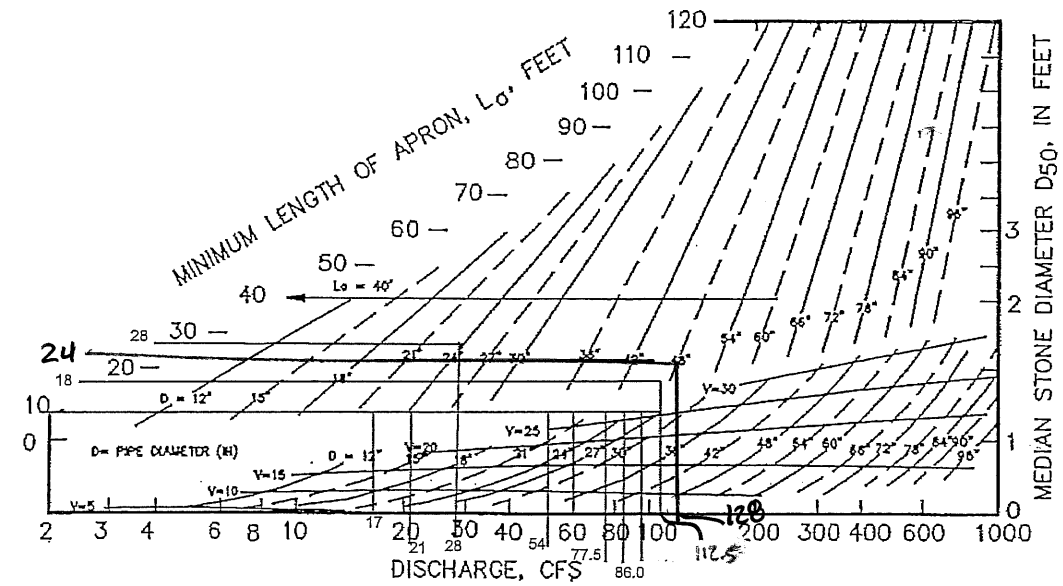
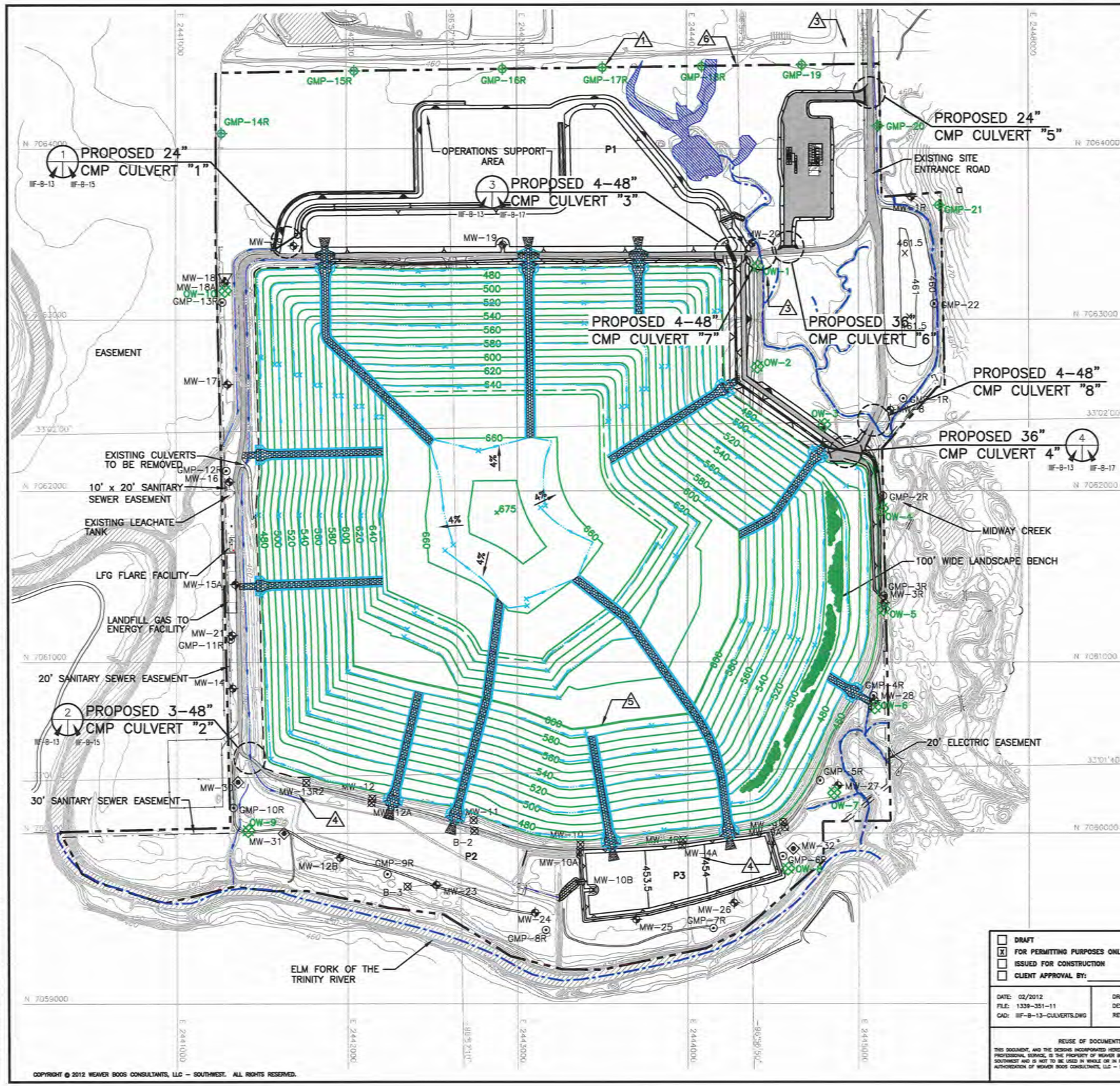


Figure 5.25 Design of outlet protection—maximum tailwater condition, $T_w \geq 0.5D$ (Environmental Protection Agency, 1976).

into the riser 3 ft below its top, what discharge will pass through the four holes with the water level at 1, 2, 4, and 8 ft above the riser? (c) What is the total discharge through the pipe? (d) How might the orifices be sized to provide better stormwater control? (e) Explain whether you would expect two rows (each consisting of four holes) of 8-in.-diameter holes to provide better results? Assume that one row is 2 ft below the riser invert and the other row is 4 ft below the riser invert.

(5.6) A gravel roadway is constructed in a low-lying area such that the roadway is frequently overtopped as a result of severe storms. The roadway is 40 ft wide, and its elevation is 36 ft. (a) If the water level upstream of the roadway is 2 ft above the crest of the roadway, what is the discharge across the roadway? (b) If the roadway is paved, what upstream depth would be required to carry the same flow? (c) Would paving reduce flooding problems?



LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE OBSERVATION MONITOR WELLS OW-1 THROUGH OW-10.
3. REMOVED EASEMENTS.
4. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
5. REVISED FINAL COVER CONTOURS.
6. UPDATED PERMIT BOUNDARY INFORMATION.

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 33°02'00" GEODETIC COORDINATE SYSTEM
- 500 EXISTING CONTOUR (SEE NOTE 1)
- 600 REGRADED BUFFER ZONE AREA
- 600 FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EASEMENT BOUNDARY
- MW-8 PERMITTED GROUNDWATER MONITORING WELL
- MW-30 PROPOSED GROUNDWATER MONITORING WELL
- MW-12 OBSERVATION/MONITORING WELL
- GMP-1R EXISTING LANDFILL GAS MONITORING PROBE
- GMP-14R PROPOSED GAS MONITORING PROBE
- OW-1 PROPOSED WOODBINE MONITOR WELL
- 3 USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 3)
- USACE JURISDICTIONAL WETLANDS
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM THE GOSHAWK ENVIRONMENTAL CONSULTANTS, INC. SEPTEMBER 2010 REPORT WHICH IS INCLUDED IN PARTS I/II, APPENDIX I/IIB.

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- [ ] CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
CAD: IIIF-B-13-CULVERTS.DWG
DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT ANALYZED CULVERT LOCATIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
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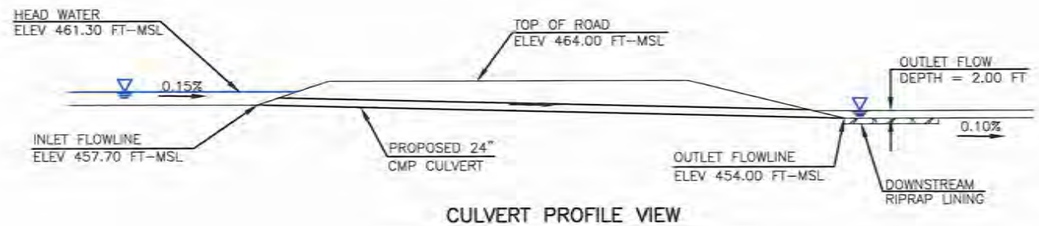
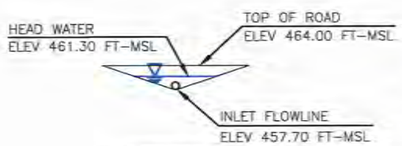


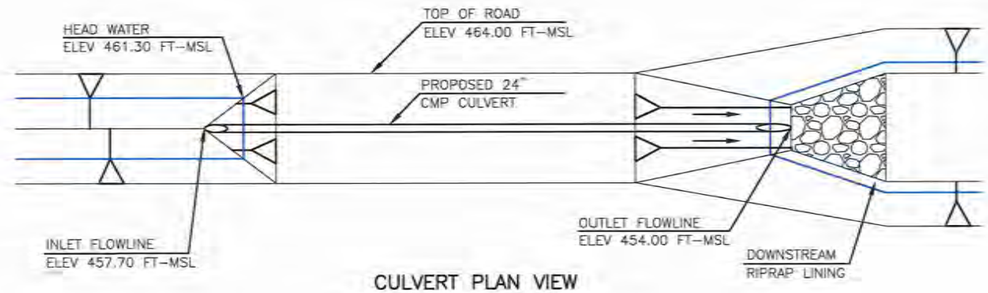
CULVERT PROFILE VIEW

LEGEND:

- FLOW DIRECTION
- RIPRAP
- DESIGN WATER SURFACE



UPSTREAM SECTION VIEW

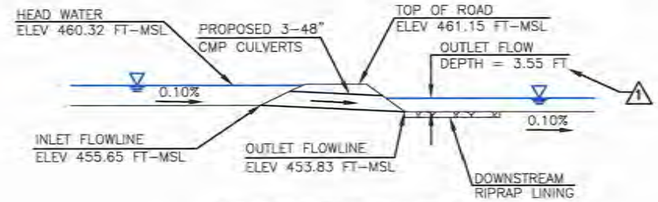


CULVERT PLAN VIEW

DOWNSTREAM SECTION VIEW

CULVERT "1" SECTIONS

1
IIF-B-13 IIF-B-15

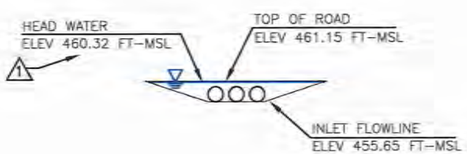


CULVERT PROFILE VIEW

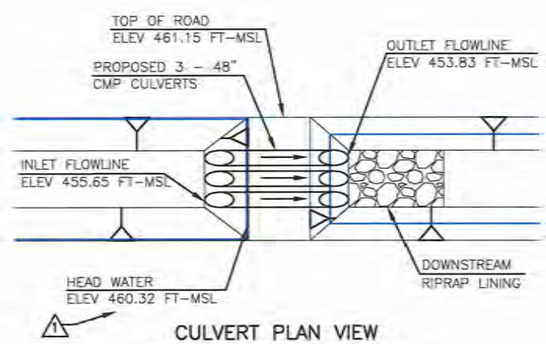
1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

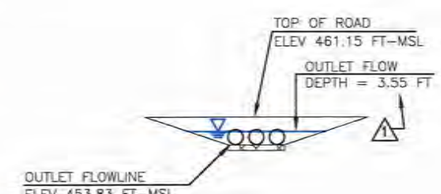
1. UPDATED CULVERT CALCULATIONS.



UPSTREAM SECTION VIEW



CULVERT PLAN VIEW



DOWNSTREAM SECTION VIEW

DRAFT

0 20 40
SCALE IN FEET

CULVERT "2" SECTIONS

2
IIF-B-13 IIF-B-15

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
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DATE: 02/2012
FILE: 1339-351-11
CAD: IIF-B-15-CROSS SECTIONS.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
CULVERT CROSS SECTIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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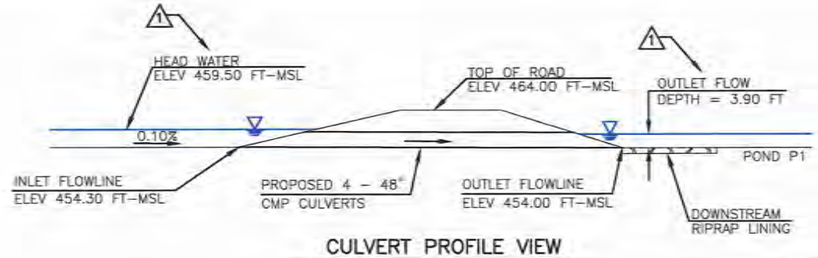
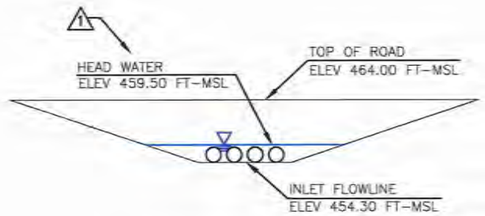


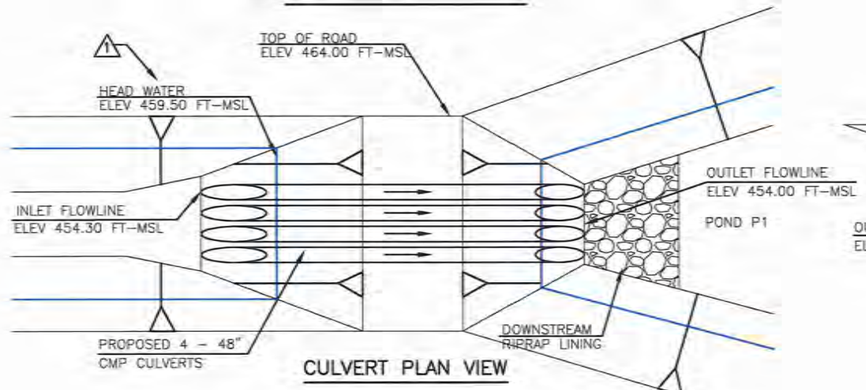
CULVERT PROFILE VIEW

LEGEND:

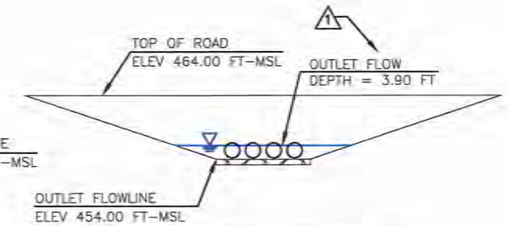
- FLOW DIRECTION
- RIPRAP
- DESIGN WATER SURFACE



UPSTREAM SECTION VIEW

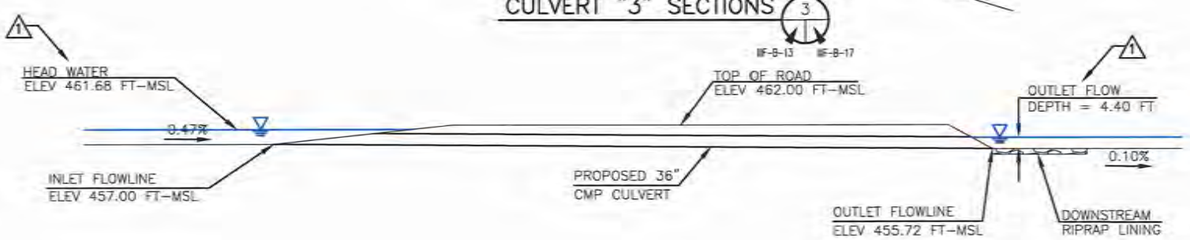


CULVERT PLAN VIEW



DOWNSTREAM SECTION VIEW

CULVERT "3" SECTIONS (3) IIF-B-13 IIF-B-17

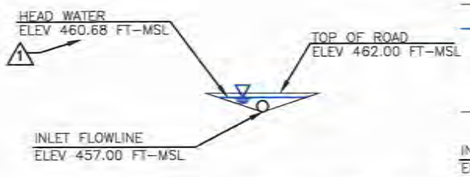


CULVERT PROFILE VIEW

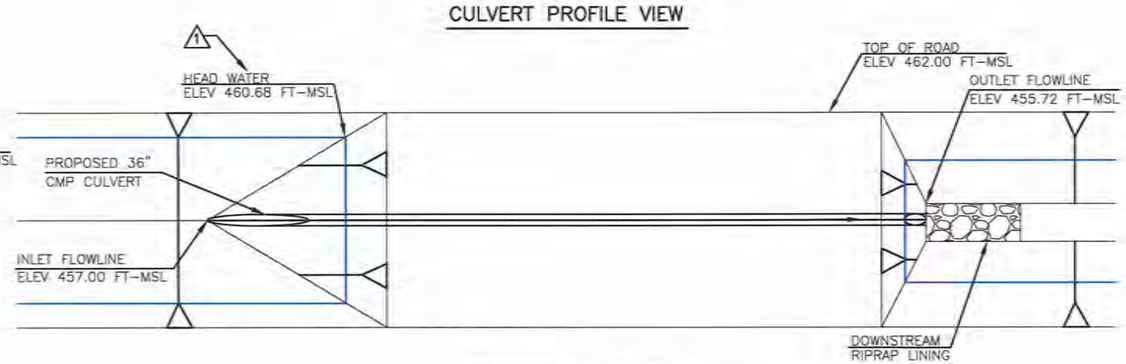
INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

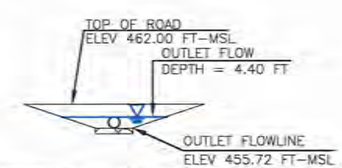
1. UPDATED CULVERT CALCULATIONS.



UPSTREAM SECTION VIEW



CULVERT PLAN VIEW



DOWNSTREAM SECTION VIEW

DRAFT

0 20 40
SCALE IN FEET

CULVERT "4" SECTIONS (4) IIF-B-13 IIF-B-17

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DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
CULVERT CROSS SECTIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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Prep by: CSS
Date: 8/5/2016

CAMELOT LANDFILL
1339-357-11-02-6B.6
CULVERT DESIGN

Chkd By: _____
Date: _____

For proposed 4-48" CMP culverts under access road in Channel "N", Culvert "7":

Total Flow= ~~389~~ 450 cfs
No. of Culverts= 4
Culvert Span= -- inches
Culvert Rise= -- inches
Culvert Diameter= 48 inches

Culvert ID	Culvert Span (ft)	Culvert Span (ft)	FHWA Chart Number	FHWA Scale Number	Culvert Diameter (ft)	Manning's Coefficient	Entrance Loss Coefficient	Culvert Length (ft)	Downstream Invert Elevation (ft msl)	Upstream Invert Elevation (ft msl)	Flow Rate (cfs)	Tailwater Depth[2] (ft)	Headwater Inlet Control[3] (ft)	Headwater Outlet Control[3] (ft)	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7	--	--	2	2	4	0.024	0.8	72.3	452.8	453.1	~~97.3~~ 112.5	2.26	~~5.69~~ 5.29	~~5.01~~ 5.80	4.00	~~2.99~~ 3.20	~~4.00~~ 3.20	~~7.74~~ 10.43

1. Calculations were performed using the HYDROCALC Hydraulics for Windows program developed by Dodson and Associates (Version 1.2a, 1996).
2. Tailwater depth is assumed to be the 25-year, 24-hour storm event flow depth in Channel "N" downstream of the culvert (see page IIIF-B-2 for flow depths).
3. Culvert calculations are performed to show that installation of the culvert will not cause overtopping of the road. The road elevation is 459.00, which gives 6.9 feet of available headwater.

For proposed 4-48" CMP culverts under access road at south end of Channel "N", Culvert "8":

Total Flow= ~~426~~ 512 cfs
No. of Culverts= 4
Culvert Span= -- inches
Culvert Rise= -- inches
Culvert Diameter= 48 inches

Culvert ID	Culvert Span (ft)	Culvert Span (ft)	FHWA Chart Number	FHWA Scale Number	Culvert Diameter (ft)	Manning's Coefficient	Entrance Loss Coefficient	Culvert Length (ft)	Downstream Invert Elevation (ft msl)	Upstream Invert Elevation (ft msl)	Flow Rate (cfs)	Tailwater Depth[2] (ft)	Headwater Inlet Control[3] (ft)	Headwater Outlet Control[3] (ft)	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
8	--	--	2	2	4	0.024	0.8	90.5	452.0	452.3	~~106.5~~ 128.0	2.26	~~6.33~~ 6.04	~~5.85~~ 7.17	4.00	~~3.12~~ 3.39	~~4.00~~ 3.39	~~8.48~~ 11.27

1. Calculations were performed using the HYDROCALC Hydraulics for Windows program developed by Dodson and Associates (Version 1.2a, 1996).
2. Tailwater depth is assumed to be the 25-year, 24-hour storm event flow depth in Channel "N" downstream of the culvert (see page IIIF-B-2 for flow depths).
3. Culvert calculations are performed to show that installation of the culvert will not cause overtopping of the road. The road elevation is 460.00, which gives 7.7 feet of available headwater.

APPENDIX IIIF-C

FINAL COVER EROSION CONTROL STRUCTURE DESIGN

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UNDER THE AUTHORITY OF
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Includes pages IIIF-C-1 through IIIF-C-18

DRAINAGE SWALE DESIGN

- The drainage swale layout is shown on Drawing IIIF.1 – Drainage Structure Plan. A swale detail is provided on Drawing IIIF.9 – Drainage Details.
- Typical Swale Design Summary:
  - Typical swale drainage areas analyzed are shown on sheet IIIF-C-2.
  - Hydraulic calculations are summarized on page IIIF-C-5.
  - Maximum normal depth is ~~1.59~~ 1.80 feet (Drainage Area ~~SW7~~ SW4).
  - Maximum flow velocity is ~~2.89~~ 3.15 fps (Drainage Area ~~SW7~~ SW4).
  - Vegetation will be established on the swales to protect against erosion.
  - Typical swale drainage areas were selected such that all slope conditions (4% and 25%) are included in this analysis. Additionally, swales with large individual drainage areas and short and long swale lengths are included in this analysis.

N

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. SWALE DRAINAGE AREAS UPDATED.
3. REMOVED EASEMENTS.
4. REVISED NOTE 2.
5. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR (SEE NOTE 1)
- 600 — REGRADED BUFFER ZONE AREA
- 600 — PROPOSED FINAL COVER CONTOUR
- 1 — PROPOSED LETDOWN STRUCTURE
- DRAINAGE SWALE
- USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 3)
- USACE JURISDICTIONAL WETLANDS
- SW1 — TYPICAL SWALE DRAINAGE AREA DESIGNATION
- 2 — TYPICAL SWALE DRAINAGE AREA BOUNDARY
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL. (4)
3. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM THE GOSHAWK ENVIRONMENTAL CONSULTANTS, INC. SEPTEMBER 2010 REPORT WHICH IS INCLUDED IN PARTS I/II, APPENDIX I/IIB.

(2)

TYPICAL SWALE DRAINAGE AREA DESIGNATION	AREA (ACRES)
SW1	1.91
SW2	1.73
SW3	2.46
SW4	4.74
SW5	3.01
SW6	0.42
SW7	3.37
SW8	1.05
SW9	1.34
SW10	1.80

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SWALE DRAINAGE AREAS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

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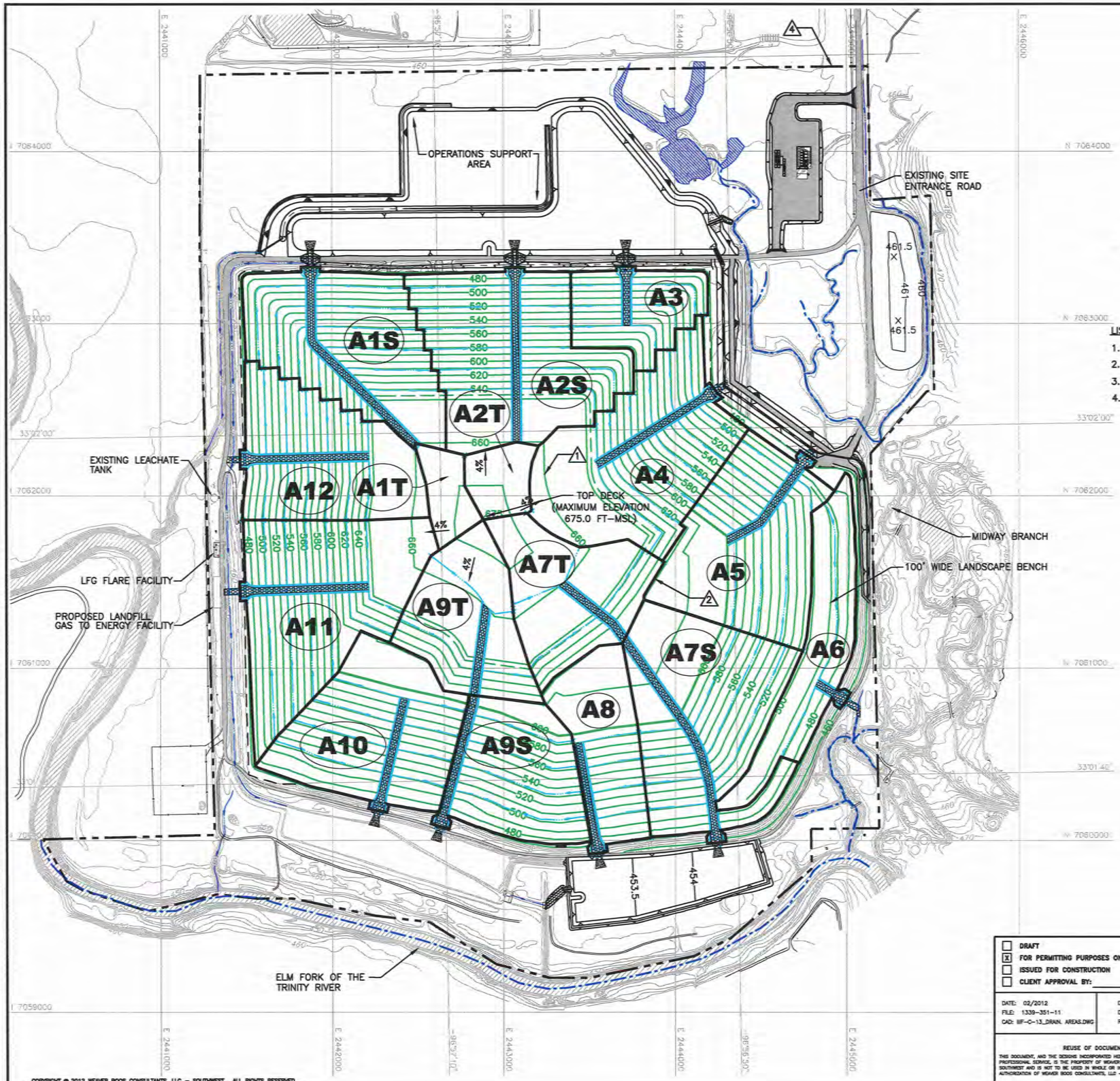

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR (SEE NOTE 1)
- REGRADED BUFFER ZONE AREA
- PROPOSED FINAL COVER CONTOUR
- PROPOSED LETDOWN STRUCTURE
- DRAINAGE SWALE
- USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 3)
- USACE JURISDICTIONAL WETLANDS
- DRAINAGE AREA BOUNDARY
- A3 DRAINAGE AREA DESIGNATION
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. UPDATED DRAINAGE AREAS.
3. REVISED NOTE 2.
4. UPDATED PERMIT BOUNDARY INFORMATION.

DRAINAGE AREA DESIGNATION	AREA (ACRES)
A1T	3.07
A1S	18.86
A2T	3.35
A2S	22.03
A3	8.06
A4	21.68
A5	18.65
A6	10.99
A7S	22.24
A7T	13.02
A8	10.29
A9T	12.33
A9S	13.06
A10	17.87
A11	21.60
A12	16.48

DRAFT

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
3. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM THE GOSHAWK ENVIRONMENTAL CONSULTANTS, INC. SEPTEMBER 2010 REPORT WHICH IS INCLUDED IN PARTS I/II, APPENDIX I/IIB.

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DESIGN BY: CRM
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REVISIONS

NO.	DATE	DESCRIPTION
1	02/2016	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT LETDOWN STRUCTURE DRAINAGE AREAS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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APPENDIX IIIF-D

EROSION LAYER EVALUATION

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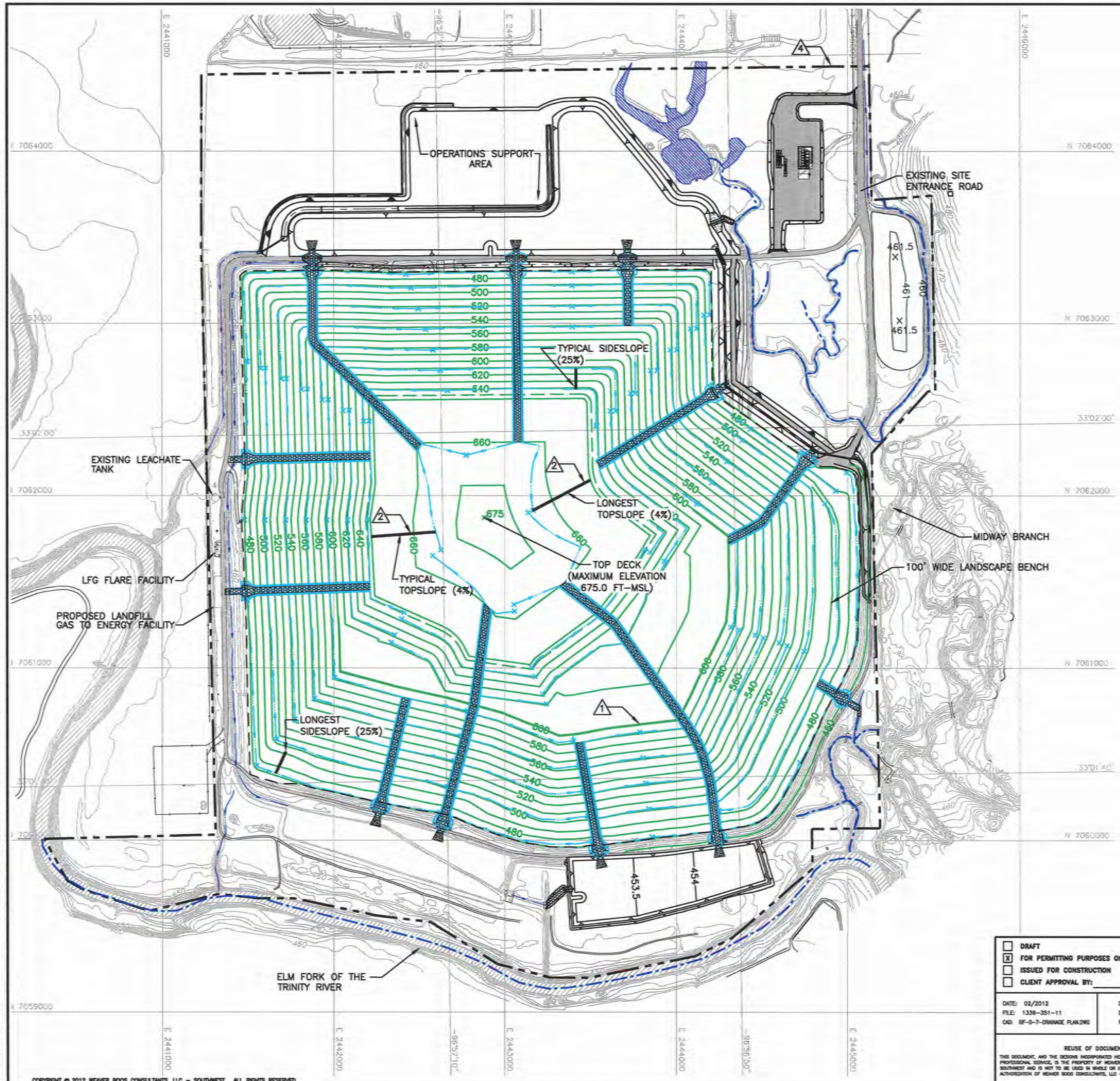
Includes pages IIIF-D-1 through IIIF-D-37

3.24 ft/sec for the drainage swales. The supporting calculations are presented on pages IIIF-C-3 through IIIF-C-7.

4. Vegetation for the site will be native and introduced grasses with root depths of 6 inches to 8 inches. The erosion layer shall also include a mixture of Bermuda, vetch, rye, wheat grass, wild flowers, and flowering plants. The seeding is specified on the attached pages IIIF-D-26 through IIIF-D-37. The seeding included on pages IIIF-D-26 through IIIF-D-37 is specified by TxDOT for temporary and permanent erosion control for Denton County, Texas (Fort Worth District).
5. Native and introduced grasses will be hydroseeded with fertilizer on the disked (parallel to contours) erosion layer upon final grading. Temporary cold weather vegetation will be established if needed. Irrigation will be employed for 6 to 8 weeks or until vegetation is well established. Erosion control measures such as silt fences and straw bales will be used to minimize erosion until the vegetation is established. Areas that experience erosion or do not readily vegetate after hydroseeding will be reseeded until vegetation is established or the soil will be replaced with soil that will support the grasses.
6. Slope stability information is included in Appendix IIIJ.



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR (SEE NOTE 1)
- REGRADED BUFFER ZONE AREA
- PROPOSED FINAL COVER CONTOUR
- PROPOSED LETDOWN STRUCTURE
- DRAINAGE SWALE
- USACE SECTION 404 JURISDICTIONAL WATERS OF THE U.S. (SEE NOTE 4)
- USACE JURISDICTIONAL WETLANDS
- INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988.
2. PERMIT BOUNDARY WAS PREPARED BY PEISER SUREYING CO. IN AUGUST 2016.
3. MAXIMUM FINAL COVER ELEVATION IS 675 FT-MSL. MAXIMUM TOP OF WASTE ELEVATION IS 671.5 FT-MSL.
4. SECTION 404 JURISDICTIONAL WATERS OF THE U.S. AND WETLANDS REPRODUCED FROM THE GOSHAWK ENVIRONMENTAL CONSULTANTS, INC. SEPTEMBER 2010 REPORT WHICH IS INCLUDED IN PARTS I/II, APPENDIX I/IIB.

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.
2. UPDATED SLOPE LENGTHS.
3. REVISED NOTE 3.
4. UPDATED PERMIT BOUNDARY INFORMATION.

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DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
DRAINAGE STRUCTURE PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

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Table 1
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
1 (Paris) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.2	Bermudagrass	1.5
	Bermudagrass	1.8	Bahiagrass (Pensacola)	6.0
	Little Bluestem (Native)	1.7	Sand Lovegrass	0.6
	Illinois Bundleflower	1.0	Weeping Lovegrass (Ermelo)	0.8
			Partridge Pea	1.0
2 (Ft. Worth) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Sand Lovegrass	0.5
	Bermudagrass	0.9	Bermudagrass	1.8
	Little Bluestem (Native)	1.0	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.4
	Illinois Bundleflower	1.0	Partridge Pearl	1.0
3 (Wichita Falls) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Bermudagrass	1.2
	Bermudagrass	0.9	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Sand Bluestem	2.4
	Western Wheatgrass	2.1	Sand Lovegrass	0.3
	Blue Grama (Hachita)	0.6	Weeping Lovegrass (Ermelo)	0.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
4 (Amarillo) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairieclover	0.5
5 (Lubbock) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairieclover	0.5

See Note 1

Notes:
1.The erosion layer shall also include Bermuda, vetch, rye, wheat grass, wild flowers, and flowering plants.

Table 2
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
1 (Paris) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
2 (Ft. Worth) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	3.6
	Bermudagrass	2.4	Bermudagrass	2.1
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
3 (Wichita Falls) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	4.5	Sideoats Grama (El Reno)	3.6
	Bermudagrass	1.8	Bermudagrass	1.8
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
4 (Amarillo) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
			Buffalograss (Texoka)	1.6
5 (Lubbock) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
			Buffalograss (Texoka)	1.6
6 (Odessa) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Sideoats Grama (Haskell)	2.7
	Blue Grama (Hachita)	1.2	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6
7 (San Angelo) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	7.2	Sideoats Grama (Haskell)	3.2
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
			Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6

See Note 1

Notes:
1. The erosion layer shall also include Bermuda, vetch, rye, wheat grass, wild flowers, and flowering plants.

Table 3
Temporary Cool Season Seeding

Districts	Dates	Seed Mix and Rates (lb./ac.)	
Paris (1), Amarillo (4), Lubbock (5), Dallas (18)	September 1 – November 30	Tall Fescue Western Wheatgrass Wheat (Red, Winter)	4.5 5.6 34
Odessa (6), San Angelo (7), El Paso (24)	September 1 – November 30	Western Wheatgrass Wheat (Red, Winter)	8.4 50
Waco (9), Tyler (10), Lufkin (11), Austin (14), San Antonio (15), Bryan (17), Atlanta (19)	September 1 – November 30	Tall Fescue Oats Wheat	4.5 24 34
Houston (12), Yoakum (13), Corpus Christi (16), Beaumont (20), Pharr (21), Laredo (22)	September 1 – November 30	Oats	72
Ft. Worth (2), Wichita Falls (3), Abilene (8), Brownwood (23), Childress (25)	September 1 – November 30	Tall Fescue Western Wheatgrass Cereal Rye	4.5 5.6 34

See Note 1

Table 4
Temporary Warm Season Seeding

Districts	Dates	Seed Mix and Rates (lb./ac.)	
All	May 1 – August 31	Foxtail Millet	34

See Note 1

B. **Fertilizer.** Use fertilizer in conformance with Article 166.2, "Materials."

C. **Vegetative Watering.** Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

D. **Mulch.**

1. **Straw or Hay Mulch.** Use straw or hay mulch in conformance with Article 162.2.E, "Mulch."

2. **Cellulose Fiber Mulch.** Use only cellulose fiber mulches that are on the approved list published in "Field Performance of Erosion Control Products," available from the Maintenance Division. Submit 1 full set of manufacturer's literature for the selected material. Keep mulch dry until applied. Do not use molded or rotted material.

E. **Tacking Methods.** Use a tacking agent applied in accordance with the manufacturer's recommendations or a crimping method on all straw or

Notes:
1. The erosion layer shall also include Bermuda, vetch, rye, wheat grass, wild flowers, and flowering plants.

APPENDIX IIIF-E

PERMITTED LANDFILL CONDITION HYDROLOGIC CALCULATIONS

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-14

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BIDDING, OR PERMIT PURPOSES.

Includes pages IIIF-E-1 through IIIF-E-120

Prep By: CRM
Date: 8/5/2016

Chkd By: ____
Date: _____

CAMELOT LANDFILL
1339-351-11-02-01
UNIT HYDROGRAPH DATA
UPDATED PERMITTED CONDITION

Snyder's Hydrograph Coefficients (Espey's 10 Minute Method)

Updated Permitted Conditions

Area No.	Area (acres)	Max. Flow Length (L) (ft)	S (ft/ft)	I (%)	Manning "n"	Φ[1]	T_r[2] (min)	T_{lag}[3] (min)	T_{lag} (hr)	Area[4] (sq mi)	q_p[5] (cfs/sq mi)	C_p[6]
O1	~~87.47~~ 117.94	3,580	0.0101	23	0.04	0.80	25.7	23.2	0.39	~~0.1367~~ 0.1843	~~1059.5~~ 1046.9	~~0.64~~ 0.63
O1A	23.42	2,285	0.0132	4	0.04	0.85	32.7	30.2	0.50	0.0366	864.1	0.68
O2	1008.38	14,770	0.0050	18	0.04	0.81	45.3	42.8	0.71	1.5756	524.7	0.58
O3	16.18	835	0.0611	2	0.04	0.86	20.4	17.9	0.30	0.0253	1452.4	0.68
O4	86.04	3,840	0.0180	10	0.04	0.84	28.4	25.9	0.43	0.1344	954.1	0.64
O5	116.47	2,140	0.0121	2	0.04	0.86	38.0	35.5	0.59	0.1820	690.4	0.64
S1	~~10.40~~ 9.73	908	0.0022	2	0.04	0.86	47.7	45.2	0.75	~~0.0163~~ 0.0152	~~595.4~~ 596.9	0.70
S2	~~31.53~~ 29.76	1,538	0.0040	2	0.04	0.86	46.4	43.9	0.73	~~0.0493~~ 0.0465	~~586.8~~ 588.1	0.67
S3	~~20.21~~ 20.17	1,076	0.0019	2	0.04	0.86	51.8	49.3	0.82	~~0.0316~~ 0.0315	~~531.3~~ 531.4	0.68
S4	~~57.41~~ 48.43	2,475	0.0024	2	0.04	0.86	58.7	56.2	0.94	~~0.0897~~ 0.0757	~~445.7~~ 448.8	~~0.65~~ 0.66
S5	0.67	165	0.0363	2	0.04	0.86	16.0	13.5	0.23	0.0010	2137.5	0.75
N1	11.26	880	0.0273	2	0.04	0.86	25.3	22.8	0.38	0.0176	1172.1	0.70
N12	7.96	700	0.0214	2	0.04	0.86	25.5	23.0	0.38	0.0124	1179.0	0.71
N13	18.73	1,368	0.0117	2	0.04	0.86	34.6	32.1	0.53	0.0293	821.8	0.69
N14	26.06	861	0.0279	2	0.04	0.86	25.0	22.5	0.38	0.0407	1146.5	0.67
N15	19.93	1,078	0.0148	2	0.04	0.86	30.8	28.3	0.47	0.0311	926.1	0.68
N16	2.72	351	0.0627	2	0.04	0.86	16.6	14.1	0.24	0.0042	1943.8	0.71
N17	4.32	60	0.1000	2	0.04	0.86	9.8	7.3	0.12	0.0068	3339.4	0.64

1 Conveyance efficiency coefficient from Dodson & Associates Inc., *ProHec-1 Program Documentation*, 1995, pages 6-19 and 6-20.

2 $T_r = 3.1(L^{0.23})(S^{-0.25})(I^{-0.18})(\Phi^{1.57})$

3 $T_{lag} = T_r - \Delta t/2$

4 From area summary sheet

5 $q_p = 31600(A^{-0.04})(T_r^{-1.07})$

6 $C_p = 49.375(A^{-0.04})(T_r^{-1.07})(T_{lag})$

T_r = surface runoff to unit hydrograph peak (min)
L = distance along main channel from study point to watershed boundary (ft)
S = main channel slope (ft/ft)
I = impervious cover within the watershed (%)
T_{lag} = watershed lag time (min)
Δt= computation interval (minutes)
q_p = unit hydrograph peak discharge (cfs/sq mi)
C_p = Snyder's peaking coefficient

Snyder Unit Hydrograph uses lag time (T_{lag}) and peaking coefficient accounting for flood wave and watershed storage conditions.

Drainage area "O1" is used in this example.

Estimated Watershed specific parameters

A =	~~87.47~~ 117.94	acres	watershed area
L =	3580	feet	maximum flow length with this watershed
S =	0.0101	feet/feet	watershed slope
I =	23	percent (%)	watershed imperviousness
n =	0.04		Manning's coefficient

Calculate Tr: time beginning of surface runoff to the unit hydrograph peak in minutes

$T_r = 3.1(L^{0.23})(S^{-0.25})(I^{-0.18})(\Phi^{1.57})$

Estimate : conveyance efficiency coefficient
See figure 6.12 on page IIIF-E-18 for estimating
Φ = for 23 percent impervious cover and n = 0.04

Φ= 0.80

$T_r = \cancel{3.1(3580^{0.23})(.010^{-0.25})(23^{-0.18})(0.8^{1.57})}$ $3.1(3580^{0.23})(.0101^{-0.25})(23^{-0.18})(0.80^{1.57})$

T_r= 25.7 min

Calculate T_{lag}: watershed lag time

T_{lag}= Tr - (Δt/2) — Δt is calculation interval, and 5 minutes is used in the HEC - 1 modeling in this project

T_{lag}= 23.2 minutes

T_{lag}= 0.39 hours

A= A/640

A= ~~0.1367~~ 0.1843 square miles

Calculate q_p: peak discharge of unit hydrograph per unit area (cfs/sq. mi).

$q_p = 31600(A^{-0.04})(T_r^{-1.07})$

$q_p = \cancel{31600(0.1367^{-0.04})(25.7^{-1.07})}$ $31600(0.1843^{-0.04})(25.7^{-1.0})$

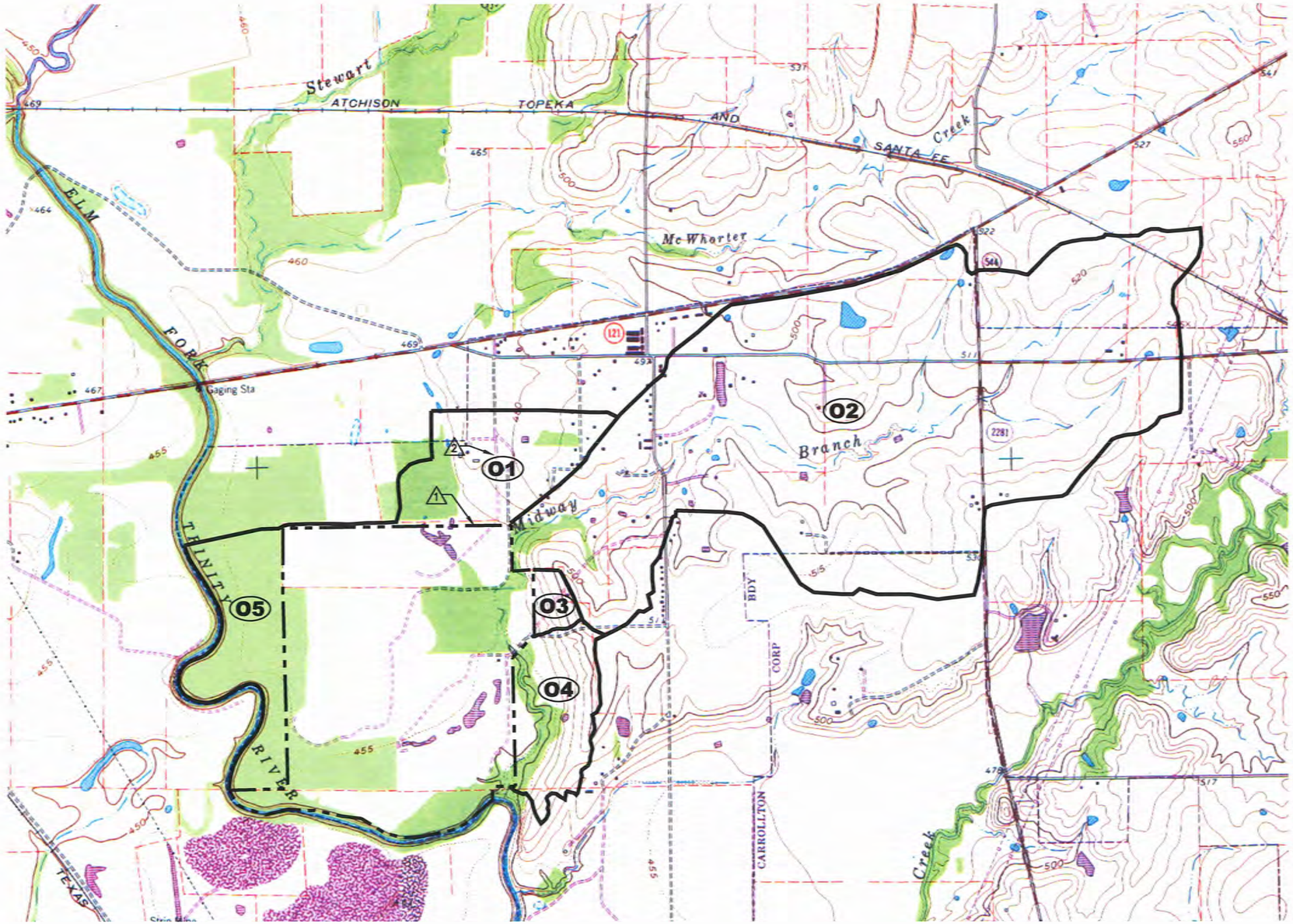
q_p= ~~1059.5~~ 1046.9 cfs/sq. mi

Calculate Peaking coefficient C_p:

$C_p = 49.375(A^{-0.04})(T_r^{-1.07})(T_{lag})$

$C_p = \cancel{49.375(0.1367^{-0.04})(25.7^{-1.07})(0}$ $49.375(0.1843^{-0.04})(25.7^{-1.07})(0.39)$

C_p= ~~0.64~~ 0.63



N

0 1000 2000
SCALE IN FEET

LEGEND

PERMIT BOUNDARY

DRAINAGE AREA BOUNDARY

02 DRAINAGE AREA LABEL

△1 INDICATES REVISION (SEE LIST OF REVISIONS)

DRAINAGE AREA NO.	AREA (ACRES)
01	120.7
02	1,008.4
03	16.2
04	86.0
05	116.5
PB	459.8
TOTAL	1,807.6

△2

ROAD CLASSIFICATION

Heavy-duty — Light-duty

Medium-duty — Unimproved dirt

Interstate Route — U.S. Route — State Route

LEWISVILLE EAST, TEX.
SW/4 FRISCO 15' QUADRANGLE
N3300—W9652.5/7.5

1960
PHOTOREVISED 1968
AMS 6650 III SW-SERIES V882

DRAFT

NOTES:

1. DRAINAGE AREA DELINEATION WITHIN THE PERMIT BOUNDARY IS SHOWN ON DRAWING IIIF-E-16.
2. TOPOGRAPHY REPRODUCED FROM USGS 7.5 MINUTE QUADRANGLE TOPOGRAPHIC MAP (LEWISVILLE EAST, TX, PHOTO REVISED 1981).

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED DRAINAGE INFORMATION.

☐ DRAFT
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 02/2012
FILE: 1339-351-11
CAD: IIIF-E-17 OFFSITE DRAINAGE.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
UPDATED PERMITTED
OFFSITE DRAINAGE AREAS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

SHEET IIIF-E-17

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIF\IIIF-E\IIIF-E-17 OFFSITE DRAINAGE.dwg, jwilson, 1:2

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1****************************************
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 *                                     *                                                  *
*
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                  *    U.S. ARMY CORPS OF ENGINEERS
*
 *              JUN   1998             *                                                  *    HYDROLOGIC ENGINEERING CENTER
*
 *           VERSION 4.1               *                                                  *          609 SECOND STREET
*
 *                                     *                                                  *       DAVIS, CALIFORNIA 95616
*
 *  RUN DATE   05AUG16  TIME  09:25:45   *                                                  *           (916) 756-1104
*
 *                                     *                                                  *
*
 ****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                    HEC-1 INPUT                                                    PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                        *DIAGRAM
             1          ID          CAMELOT LANDFILL
             2          ID          MAJOR PERMIT AMENDMENT APPLICATION
             3          ID          UPDATED PERMITTED CONDITION
             4          ID          25-YEAR, 24-HOUR STORM EVENT
             5          ID  FILE:\SOLID WASTE\CITY OF FARMERS BRANCH\EXPANSION\
             6          ID  PARTIII-SDP\APPENDIX IIIF\IIIFE\UPDATE25---8-16.IH1
             7          IT       5       0    2400     416       0       0
             8          IO       3       0       0
                        *       NORTHEAST AREA

             9          KK      O1
            10          KM        OFFSITE AREA O1
            11          KO       0       0       0       7      21
            12          BA  0.1838
            13          PH       4             .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44
            14          LS              86
            15          US    0.39    0.64
                        *

            16          KK      O2
            17          KM  OFFSITE AREA O2
            18          KO       0       0       0       7      21
            19          BA  1.5756
            20          LS              85
            21          US    0.71    0.58
                        *

            22          KK      S4
            23          KM  RUNOFF AREA S4
            24          KO       0       0       0       7      21
            25          BA  0.0757
            26          LS       0      84
            27          US    0.94    0.65
                        *

            28          KK     CS4
            29          KM  COMBINE AREAS PRIOR TO POND P1 OUTLET
            30          KO       0       0       0       7      21
            31          HC       3
                        *

            32          KK      N1
            33          KM  RUNOFF AREA N1
            34          KO       0       0       0       7      21
            35          BA   .0176
            36          LS              84
            37          US    0.38     0.7
```

```
                    *
1                                                HEC-1 INPUT                                                PAGE  2

          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            38      KK      O3
            39      KM  OFFSITE AREA O3
            40      KO       0       0       0       7      21
            41      BA  0.0253
            42      LS              84
            43      US     0.3    0.68
                    *

            44      KK   C1MWY
            45      KM  COMBINE AREAS N1, O1, O2, O3, AND S4
            46      KO       0       0       0       7      21
            47      HC       3
                    *

            48      KK      S3
            49      KM  RUNOFF AREA S3
            50      KO       0       0       0       7      21
            51      BA  0.0315
            52      LS              84
            53      US    0.82    0.68
                    *

            54      KK     N20
            55      KM  RUNOFF AREA N20
            56      KO       0       0       0       7      21
            57      BA   .0041
            58      LS              84
            59      UK   31.95    .188     .35     100
            60      RD  1832.1   .0018     .03            TRAP       6       3     YES
                    *

            61      KK   C2MWY
            62      KM  COMBINE AREAS O1, O2, O3, N1, S4, S3, AND N20
            63      KO       0       0       0       7      21
            64      HC       2
                    *
                    * NORTH CENTRAL AREA OF LANDFILL TO POND 1 (UPPER POND)
                    *

            65      KK    N11T
            66      KM  RUNOFF AREA N11T
            67      KO       0       0       0       7      21
            68      BA   .0047
            69      LS              84
            70      UK  415.07     .02     .35     100
            71      RD  427.05    .003     .03            TRAP       0       4      NO
                    *

            72      KK    N11S
            73      KM  RUNOFF AREA N11S
            74      KO       0       0       0       7      21
            75      BA   .0069
            76      LS              86
            77      UK   73.21     .20     .35     100
1                                                HEC-1 INPUT                                                PAGE  3

          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            78      RD  733.86    .007     .03            TRAP       0       4      NO
                    *

            79      KK    CN11
            80      KM  COMBINE N11 AREAS
            81      KO       0       0       0       7      21
            82      HC       2
                    *

            83      KK    CH11
            84      KM  RUNOFF AREA CH11
            85      KO       0       0       0       7      21
            86      BA   .0046
            87      LS              84
            88      UK   84.04     .33     .35     100
            89      RD    1487    .001     .03            TRAP      10       3     YES
                    *

            90      KK     N2T
            91      KM  RUNOFF AREA N2T
            92      KO       0       0       0       7      21
            93      BA   .0141
            94      LS              84
            95      UK  553.17     .02     .35     100
            96      RD  644.44    .003     .03            TRAP       0       4      NO
                    *

            97      KK     N2S
            98      KM  RUNOFF AREA N2S
            99      KO       0       0       0       7      21
           100      BA   .0049
```

```
 101          LS              86
 102          UK   80.24     .20     .35     100
 103          RD  379.06     .01     .03            TRAP       0       4      NO
              *

 104          KK     CN2
 105          KM  COMBINE N2 AREAS
 106          KO       0       0       0       7      21
 107          HC       2
              *

 108          KK    CCH2
 109          KM  COMBINE AREAS UPSTREAM OF CH2
 110          KO       0       0       0       7      21
 111          HC       2
              *

 112          KK     CH2
 113          KM  RUNOFF AREA CH2
 114          KO       0       0       0       7      21
 115          BA   .0024
 116          LS              84
 117          UK  102.63     .18     .35     100
 118          RD  576.18    .001     .03            TRAP      10       3     YES
              *
1                                              HEC-1 INPUT                                                PAGE  4

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 119          KK     N12
 120          KM  RUNOFF AREA N12
 121          KO       0       0       0       7      21
 122          BA   .0124
 123          LS              84
 124          US    0.38    0.71
              *

 125          KK     N3T
 126          KM  RUNOFF AREA N3T
 127          KO       0       0       0       7      21
 128          BA   .0531
 129          LS              84
 130          UK  512.17     .02     .35     100
 131          RD  691.59    .003     .03            TRAP       0       4      NO
              *

 132          KK     N3S
 133          KM  RUNOFF AREA N3S
 134          KO       0       0       0       7      21
 135          BA   .0054
 136          LS              86
 137          UK   89.87     .20     .35     100
 138          RD  581.49    .003     .03            TRAP       0       4      NO
              *

 139          KK     CN3
 140          KM  COMBINE N3S, N3T, N12
 141          KO       0       0       0       7      21
 142          HC       3
              *

 143          KK    CCH3
 144          KM  COMBINE AREAS N11, N2, N12, N3 AT CH3
 145          KO       0       0       0       7      21
 146          HC       2
              *

 147          KK     CH3
 148          KM  RUNOFF AREA CH3
 149          KO       0       0       0       7      21
 150          BA   .0037
 151          LS              84
 152          UK  152.72    .275     .35     100
 153          RD  697.69    .001     .03            TRAP      20       3     YES
              *

 154          KK     N4T
 155          KM  RUNOFF AREA N4T
 156          KO       0       0       0       7      21
 157          BA   .0116
 158          LS              84
 159          UK  746.35     .02     .35     100
 160          RD  608.13     .01     .03            TRAP       0       4      NO
              *
1                                              HEC-1 INPUT                                                PAGE  5

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 161          KK     N4S
 162          KM  RUNOFF AREA N4S
 163          KO       0       0       0       7      21
 164          BA   .0079
 165          LS              86
```

```
166          UK   77.51     .20     .35     100
167          RD  640.53    .003     .03            TRAP       0       4      NO
             *

168          KK     CN4
169          KM  COMBINE N4 AREAS
170          KO       0       0       0       7      21
171          HC       2
             *

172          KK     CH4
173          KM  RUNOFF AREA CH4
174          KO       0       0       0       7      21
175          BA   .0049
176          LS              84
177          UK  100.82    .198     .35     100
178          RD  1278.5    .005     .03            TRAP      10       4     YES
             *

179          KK  C1CH4A
180          KM  COMBINE AREAS N11, N2, N3, N4 AT CHANNEL CH4A
181          KO       0       0       0       7      21
182          HC       2
             *

183          KK    CH4A
184          KM  RUNOFF AREA CH4A
185          KO       0       0       0       7      21
186          BA   .0011
187          LS              84
188          UK   40.38     .33     .35     100
189          RD  519.75   .0035     .03            TRAP      20       3     YES
             *

190          KK     N13
191          KM  RUNOFF AREA N13
192          KO       0       0       0       7      21
193          BA   .0293
194          LS              84
195          US    0.53    0.69
             *

196          KK      W1
197          KM  RUNOFF AREA W1 (POND 1)
198          KO       0       0       0       7      21
199          BA   .0130
200          LS             100
201          UD       0
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

202          KK  PND1IN
203          KM  COMBINE ALL FLOWS INTO POND 1
204          KO       0       0       0       7      21
205          HC       3
             *

206          KK  PND1OU       T
207          KM  ROUTE THROUGH UPPER DET. POND (POND 1) 3-42" AT 451
208          KO       0       0       0       7      21
209          RS       1    ELEV   455.2
210          SA       0  7.7727  7.9131  8.0441  8.1759
211          SE   455.2   455.5     456   456.5     457
212          SS     456      25     2.6     1.5
213          SL  452.77 19.6350      .8      .5
             *

214          KK     N16
215          KM  RUNOFF AREA N16
216          KO       0       0       0       7      21
217          BA   .0042
218          LS              84
219          US    0.24    0.71
             *

220          KK    CHW1
221          KM  RUNOFF AREA CHW1
222          KO       0       0       0       7      21
223          BA   .0014
224          LS              84
225          UK   41.87     .33     .35     100
226          RD  551.13    .001     .03            TRAP      20       3     YES
             *

227          KK   MIDRD
228          KM  COMBINE ALL FLOWS U/S OF ENTRANCE ROAD
229          KO       0       0       0       7      21
230          HC       3
             *

231          KK      S5
232          KM  RUNOFF AREA S5
```

```
233          KO       0       0       0       7      21
234          BA   .0010
235          LS              84
236          US    0.23    0.75
             *

237          KK     CS5
238          KM  COMBINE ALL FLOWS U/S OF ENTRANCE ROAD WITH S5
239          KO       0       0       0       7      21
240          HC       2
             *
1                                   HEC-1 INPUT                                                    PAGE  7

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


241          KK      O4
242          KM  OFFSITE AREA O4
243          KO       0       0       0       7      21
244          BA  0.1344
245          LS              84
246          US    0.43    0.64
             *

247          KK   C4MWY
248          KM  COMBINE ALL FLOWS UPSTREAM OF N10
249          KO       0       0       0       7      21
250          HC       2
             * EAST AND SOUTHSIDE TO MIDWAY BRANCH

251          KK    N10T
252          KM  RUNOFF AREA N10T
253          KO       0       0       0       7      21
254          BA   .0186
255          LS              84
256          UK  733.01     .02     .35     100
257          RK  618.87    .002     .03            TRAP       0       4      NO
             *

258          KK    N10S
259          KM  RUNOFF AREA N10S
260          KO       0       0       0       7      21
261          BA   .0115
262          LS              86
263          UK   99.77     .20     .35     100
264          RK  717.21    .013     .03            TRAP       0       4      NO
             *

265          KK    CN10
266          KM  COMBINE N10 AREAS
267          KO       0       0       0       7      21
268          HC       2
             *

269          KK    CH10
270          KM  RUNOFF AREA CH10
271          KO       0       0       0       7      21
272          BA   .0131
273          LS              84
274          UK   88.40    .015     .35     100
275          RD  1453.8    .011     .03            TRAP      10       3     YES
             *

276          KK  CABELM
277          KM  COMBINE AREAS UPSTREAM OF ELM FORK
278          KO       0       0       0       7      21
279          HC       2
             * SOUTHEAST CORNER INTO POND 2
1                                   HEC-1 INPUT                                                    PAGE  8

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


280          KK     N9T
281          KM  RUNOFF AREA N9T
282          KO       0       0       0       7      21
283          BA   .0177
284          LS              84
285          UK  566.18     .02     .35     100
286          RK  696.09    .003     .03            TRAP       0       4      NO
             *

287          KK     N9S
288          KM  RUNOFF AREA N9S
289          KO       0       0       0       7      21
290          BA   .0148
291          LS              86
292          UK   83.55      .2     .35     100
293          RK  791.65    .014     .03            TRAP       0       4      NO
             *

294          KK     CN9
295          KM  COMBINE N9 AREAS
296          KO       0       0       0       7      21
297          HC       2
```

```
                 *

298              KK     CH9
299              KM  RUNOFF AREA CH9
300              KO       0       0       0       7      21
301              BA   .0054
302              LS              84
303              UK   84.85    .157     .35     100
304              RD  1689.3    .001     .03            TRAP      10       3     YES
                 * NORTHWEST CORNER TO POND 2

305              KK     N5T
306              KM  RUNOFF AREA N5T
307              KO       0       0       0       7      21
308              BA   .0315
309              LS              84
310              UK  1133.6     .02     .35     100
311              RK  154.15    .002     .03            TRAP       0       4      NO
                 *

312              KK     N5S
313              KM  RUNOFF AREA N5S
314              KO       0       0       0       7      21
315              BA    .007
316              LS              86
317              UK  126.10    .140     .35     100
318              RK   628.8     .01     .03            TRAP       0       4      NO
                 *
1                                                HEC-1 INPUT                                                PAGE  9

            LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


319              KK     CN5
320              KM  COMBINE N5 AREAS
321              KO       0       0       0       7      21
322              HC       2
                 *

323              KK     CH5
324              KM  RUNOFF AREA CH5
325              KO       0       0       0       7      21
326              BA   .0051
327              LS              84
328              UK   100.8    .198     .35     100
329              RD  1358.6    .001     .03            TRAP      10       3     YES
                 *

330              KK     N6T
331              KM  RUNOFF AREA N6T
332              KO       0       0       0       7      21
333              BA   .0086
334              LS              84
335              UK  476.08     .02     .35     100
336              RK  652.91    .005     .03            TRAP       0       4      NO
                 *

337              KK     N6S
338              KM  RUNOFF AREA N6S
339              KO       0       0       0       7      21
340              BA   .0064
341              LS              86
342              UK   85.77     .20     .35     100
343              RK  641.29    .005     .03            TRAP       0       4      NO
                 *

344              KK     CN6
345              KM  COMBINE N6 AREAS
346              KO       0       0       0       7      21
347              HC       2
                 *

348              KK    CCH6
349              KM  COMBINE AREAS N5 AND N6 AT CH6
350              KO       0       0       0       7      21
351              HC       2
                 *

352              KK     CH6
353              KM  RUNOFF AREA CH6
354              KO       0       0       0       7      21
355              BA   .0046
356              LS              84
357              UK  101.19     .17     .35     100
358              RD  1371.2    .001     .03            TRAP      20       3     YES
                 *
1                                                HEC-1 INPUT                                                PAGE 10

            LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


359              KK    N7AT
360              KM  RUNOFF AREA N7AT
361              KO       0       0       0       7      21
362              BA   .0189
```

```
363          LS              84
364          UK  582.87     .02     .35     100
365          RK  408.17    .003     .03            TRAP       0       4      NO
             *

366          KK    N7AS
367          KM  RUNOFF AREA N7AS
368          KO       0       0       0       7      21
369          BA   .0068
370          LS              86
371          UK   91.73     .20     .35     100
372          RK  467.36    .011     .03            TRAP       0       4      NO
             *

373          KK    CN7A
374          KM  COMBINE N7A AREAS
375          KO       0       0       0       7      21
376          HC       2
             *

377          KK   CCH7A
378          KM  COMBINE AREAS N5, N6, N7A AT CH7A
379          KO       0       0       0       7      21
380          HC       2
             *

381          KK    CH7A
382          KM  RUNOFF AREA CH7A
383          KO       0       0       0       7      21
384          BA   .0036
385          LS              84
386          UK   78.31    .203     .35     100
387          RD  885.29    .001     .03            TRAP      40       3     YES
             *

388          KK    N7BT
389          KM  RUNOFF AREA N7BT
390          KO       0       0       0       7      21
391          BA   .0085
392          LS              84
393          UK  562.87     .02     .35     100
394          RK  410.19    .003     .03            TRAP       0       4      NO
             *

395          KK    N7BS
396          KM  RUNOFF AREA N7BS
397          KO       0       0       0       7      21
398          BA   .0052
399          LS              86
400          UK   86.46     .20     .35     100
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

401          RK  405.33    .014     .03            TRAP       0       4      NO
             *

402          KK    CN7B
403          KM  COMBINE N7B AREAS
404          KO       0       0       0       7      21
405          HC       2
             *

406          KK   CCH7B
407          KM  COMBINE AREAS N5, N6, N7A, N7B AT CH7B
408          KO       0       0       0       7      21
409          HC       2
             *

410          KK    CH7B
411          KM  RUNOFF AREA CH7B
412          KO       0       0       0       7      21
413          BA   .0057
414          LS              84
415          UK  109.04    .177     .35     100
416          RD    1127    .001     .03            TRAP      40       3     YES
             *

417          KK     N8T
418          KM  RUNOFF AREA N8T
419          KO       0       0       0       7      21
420          BA   .0258
421          LS              84
422          UK  551.92     .02     .35     100
423          RK  667.70    .003     .03            TRAP       0       4      NO
             *

424          KK     N8S
425          KM  RUNOFF AREA N8S
426          KO       0       0       0       7      21
427          BA   .0160
428          LS              86
429          UK   91.71     .20     .35     100
430          RK  924.50    .018     .03            TRAP       0       4      NO
             *
```

```
431          KK     CN8
432          KM  COMBINE N8 AREAS
433          KO       0       0       0       7      21
434          HC       2
             *

435          KK    C2W2
436          KM  COMBINE AREAS N5-N9 INTO POND 2
437          KO       0       0       0       7      21
438          HC       3
             *
1                                        HEC-1 INPUT                                                    PAGE 12

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


439          KK      W2
440          KM  RUNOFF WITHIN POND 2
441          KO       0       0       0       7      21
442          BA   .0154
443          LS             100
444          UD       0
             *

445          KK  PND2IN
446          KM  COMBINE AREAS INTO POND 2
447          KO       0       0       0       7      21
448          HC       2
             *

449          KK  PD2OUT
450          KM  ROUTE THROUGH POND W2
451          KO       0       0       0       7      21
452          RS       1    ELEV     454
453          SA       0  4.4466  6.7860  8.2567  8.3782  8.5005  8.6236  8.8721  9.1240
454          SE     454   454.5     455   455.5     456   456.5     457     458     459
455          SS     458      25     2.6     1.5
456          SL     456 28.2743      .8      .5
             *

457          KK     N14
458          KM  RUNOFF AREA N14
459          KO       0       0       0       7      21
460          BA   .0407
461          LS             84
462          US    0.38    0.67
             *

463          KK     N15
464          KM  RUNOFF AREA N15
465          KO       0       0       0       7      21
466          BA   .0311
467          LS             84
468          US    0.47    0.68
             *

469          KK   C1N14
470          KM  COMBINE AREAS N14, N15 & POND 2
471          KO       0       0       0       7      21
472          HC       3
             *

473          KK      S2
474          KM  RUNOFF AREA S2
475          KO       0       0       0       7      21
476          BA  0.0465
477          LS             84
478          US    0.73    0.67
             *
1                                        HEC-1 INPUT                                                    PAGE 13

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


479          KK     N19
480          KM  RUNOFF AREA N19
481          KO       0       0       0       7      21
482          BA   .0028
483          LS             84
484          UK   43.65     .33     .35     100
485          RD    1305  0.0016     .03            TRAP      10       3     YES
             *

486          KK     N18
487          KM  RUNOFF AREA N18
488          KO       0       0       0       7      21
489          BA   .0064
490          LS             84
491          UK   41.18     .33     .35     100
492          RD  1123.4  0.0016     .03            TRAP      15       3     YES
             *

493          KK      O5
494          KM  OFFSITE AREA O5
```

```
495          KO       0       0       0       7      21
496          BA   0.182
497          LS              84
498          US    0.59    0.64
             *

499          KK      S1
500          KM  RUNOFF AREA S1
501          KO       0       0       0       7      21
502          BA  0.0152
503          LS              84
504          US    0.75     0.7
             *

505          KK     N17
506          KM  RUNOFF AREA N17
507          KO       0       0       0       7      21
508          BA   .0068
509          LS              84
510          US    0.12    0.64
             *

511          KK    C1O7
512          KM  COMBINE AREAS S1, O6, AND N17-19
513          KO       0       0       0       7      21
514          HC       4
             *
515          ZZ
```

1

```
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     9          O1
                 .
                 .
    16           .           O2
                 .            .
                 .            .
    22           .            .           S4
                 .            .            .
                 .            .            .
    28         CS4........................
                 .
                 .
    32           .           N1
                 .            .
                 .            .
    38           .            .           O3
                 .            .            .
                 .            .            .
    44       C1MWY........................
                 .
                 .
    48           .           S3
                 .            V
                 .            V
    54           .          N20 ***
                 .            .
                 .            .
    61       C2MWY............
                 .
                 .
    65           .         N11T
                 .            .
                 .            .
    72           .            .         N11S
                 .            .            .
                 .            .            .
    79           .         CN11............
                 .            V
                 .            V
    83           .         CH11 ***
                 .            .
                 .            .
    90           .            .          N2T
```

```
                .           .           .
                .           .           .
 97             .           .           .         N2S
                .           .           .           .
                .           .           .           .
104             .           .         CN2............
                .           .           .
                .           .           .
108             .        CCH2............
                .           V
                .           V
112             .         CH2 ***
                .           .
                .           .
119             .           .         N12
                .           .           .
                .           .           .
125             .           .           .         N3T
                .           .           .           .
                .           .           .           .
132             .           .           .           .         N3S
                .           .           .           .           .
                .           .           .           .           .
139             .           .         CN3........................
                .           .           .
                .           .           .
143             .        CCH3............
                .           V
                .           V
147             .         CH3 ***
                .           .
                .           .
154             .           .         N4T
                .           .           .
                .           .           .
161             .           .           .         N4S
                .           .           .           .
                .           .           .           .
168             .           .         CN4............
                .           .           V
                .           .           V
172             .           .         CH4 ***
                .           .           .
                .           .           .
179             .      C1CH4A............
                .           V
                .           V
183             .        CH4A ***
                .           .
                .           .
190             .           .         N13
                .           .           .
                .           .           .
196             .           .           .           W1
                .           .           .           .
                .           .           .           .
202             .      PND1IN........................
                .           V
                .           V
206             .      PND1OU
                .           .
                .           .
214             .           .         N16
                .           .           V
                .           .           V
220             .           .        CHW1 ***
                .           .           .
                .           .           .
227        MIDRD........................
                .
                .
```

```
231          .          S5
             .           .
             .           .
237        CS5............
             .
             .
241          .          O4
             .           .
             .           .
247      C4MWY............
             .
             .
251          .        N10T
             .           .
             .           .
258          .           .        N10S
             .           .           .
             .           .           .
265          .        CN10............
             .           V
             .           V
269          .        CH10 ***
             .           .
             .           .
276     CABELM............
             .
             .
280          .         N9T
             .           .
             .           .
287          .           .         N9S
             .           .           .
             .           .           .
294          .         CN9............
             .           V
             .           V
298          .         CH9 ***
             .           .
             .           .
305          .           .         N5T
             .           .           .
             .           .           .
312          .           .           .         N5S
             .           .           .           .
             .           .           .           .
319          .           .         CN5............
             .           .           V
             .           .           V
323          .           .         CH5 ***
             .           .           .
             .           .           .
330          .           .           .         N6T
             .           .           .           .
             .           .           .           .
337          .           .           .           .         N6S
             .           .           .           .           .
             .           .           .           .           .
344          .           .           .         CN6............
             .           .           .           .
             .           .           .           .
348          .           .        CCH6............
             .           .           V
             .           .           V
352          .           .         CH6 ***
             .           .           .
             .           .           .
359          .           .           .        N7AT
             .           .           .           .
             .           .           .           .
366          .           .           .           .        N7AS
             .           .           .           .           .
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```
                .          .          .          .          .
373             .          .          .       CN7A...........
                .          .          .          .
                .          .          .          .
377             .          .      CCH7A...........
                .          .          V
                .          .          V
381             .          .       CH7A ***
                .          .          .
                .          .          .
388             .          .          .       N7BT
                .          .          .          .
                .          .          .          .
395             .          .          .          .        N7BS
                .          .          .          .           .
                .          .          .          .           .
402             .          .          .       CN7B...........
                .          .          .          .
                .          .          .          .
406             .          .      CCH7B...........
                .          .          V
                .          .          V
410             .          .       CH7B ***
                .          .          .
                .          .          .
417             .          .          .        N8T
                .          .          .          .
                .          .          .          .
424             .          .          .          .         N8S
                .          .          .          .           .
                .          .          .          .           .
431             .          .          .        CN8...........
                .          .          .          .
                .          .          .          .
435             .       C2W2........................
                .          .
                .          .
439             .          .         W2
                .          .          .
                .          .          .
445             .     PND2IN............
                .          V
                .          V
449             .     PD2OUT
                .          .
                .          .
457             .          .        N14
                .          .          .
                .          .          .
463             .          .          .        N15
                .          .          .          .
                .          .          .          .
469             .      C1N14........................
                .          .
                .          .
473             .          .         S2
                .          .          V
                .          .          V
479             .          .        N19 ***
                .          .          V
                .          .          V
486             .          .        N18 ***
                .          .          .
                .          .          .
493             .          .          .         O5
                .          .          .          .
                .          .          .          .
499             .          .          .          .          S1
                .          .          .          .           .
                .          .          .          .           .
505             .          .          .          .           .          N17
```

```
                    .            .            .            .            .            .
                    .            .            .            .            .            .
   511              .            .         C1O7.....................................
```

```
 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *                                                *
*
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                *    U.S. ARMY CORPS OF ENGINEERS
*
 *              JUN   1998              *                                                *    HYDROLOGIC ENGINEERING CENTER
*
 *           VERSION 4.1                *                                                *          609 SECOND STREET
*
 *                                      *                                                *       DAVIS, CALIFORNIA 95616
*
 *  RUN DATE   05AUG16  TIME  09:25:45  *                                                *           (916) 756-1104
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                                CAMELOT LANDFILL
                                MAJOR PERMIT AMENDMENT APPLICATION
                                UPDATED PERMITTED CONDITION
                                25-YEAR, 24-HOUR STORM EVENT
                           FILE:\SOLID WASTE\CITY OF FARMERS BRANCH\EXPANSION\
                           PARTIII-SDP\APPENDIX IIIF\IIIFE\UPDATE25---8-16.IH1

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           5  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         416  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      3    0  ENDING DATE
                       NDTIME        1035  ENDING TIME
                       ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   34.58 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT


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            *            *
    9 KK    *        O1  *
            *            *
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                                OFFSITE AREA O1

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

   12 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .18  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
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                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .18

  14 LS         SCS LOSS RATE
                      STRTL         .33  INITIAL ABSTRACTION
                     CRVNBR       86.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  15 US         SNYDER UNITGRAPH
                         TP         .39  LAG
                         CP         .64  PEAKING COEFFICIENT

                SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                                ***

                                                     UNIT HYDROGRAPH PARAMETERS
                                              CLARK   TC=   .45 HR,       R=   .34 HR
                                             SNYDER   TP=   .39 HR,      CP=   .65

                                                          UNIT HYDROGRAPH
                                                     25 END-OF-PERIOD ORDINATES
               17.       62.      120.      170.      194.      182.      147.      115.       90.       71.
               55.       43.       34.       27.       21.       16.       13.       10.        8.        6.
                5.        4.        3.        2.        2.

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                        HYDROGRAPH AT STATION       O1

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     394.     12.42                     92.         28.         20.          20.
                       (INCHES)      4.651       5.762       5.762        5.762
                        (AC-FT)        46.         56.         56.          56.

                       CUMULATIVE AREA =     .18 SQ MI


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            *            *
  16 KK     *        O2  *
            *            *
            **************
                         OFFSITE AREA O2

  18 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  Ppunch COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

  19 BA         SUBBASIN CHARACTERISTICS
                      TAREA        1.58  SUBBASIN AREA

                PRECIPITATION DATA

  13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =    1.58

  20 LS         SCS LOSS RATE
                      STRTL         .35  INITIAL ABSTRACTION
                     CRVNBR       85.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  21 US         SNYDER UNITGRAPH
                         TP         .71  LAG
                         CP         .58  PEAKING COEFFICIENT

                SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

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                                        UNIT HYDROGRAPH PARAMETERS
                                  CLARK   TC=   .79 HR,       R=   .76 HR
                                 SNYDER   TP=   .71 HR,      CP=   .58

                                            UNIT HYDROGRAPH
                                        54 END-OF-PERIOD ORDINATES
              31.      115.      232.      367.      512.      648.      752.      817.      841.      808.
             733.      657.      589.      528.      473.      424.      380.      341.      306.      274.
             246.      220.      197.      177.      159.      142.      127.      114.      102.       92.
              82.       74.       66.       59.       53.       48.       43.       38.       34.       31.
              28.       25.       22.       20.       18.       16.       14.       13.       11.       10.
               9.        8.        7.        7.

     ***            ***            ***            ***            ***

                      HYDROGRAPH AT STATION       O2

    TOTAL RAINFALL =    7.42, TOTAL LOSS =    1.77, TOTAL EXCESS =    5.66

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+    2171.     12.75                767.        239.        166.         166.
                        (INCHES)    4.524       5.632       5.632        5.632
                         (AC-FT)     380.        473.        473.         473.

                        CUMULATIVE AREA =    1.58 SQ MI


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            *            *
   22 KK    *        S4  *
            *            *
            **************
                          RUNOFF AREA S4

   24 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

   25 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .08  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .08

   26 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

   27 US          SNYDER UNITGRAPH
                          TP         .94  LAG
                          CP         .65  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                     ***

                                        UNIT HYDROGRAPH PARAMETERS
                                  CLARK   TC=  1.04 HR,       R=   .82 HR
                                 SNYDER   TP=   .93 HR,      CP=   .65

                                            UNIT HYDROGRAPH
                                        59 END-OF-PERIOD ORDINATES
               1.        3.        7.       11.       15.       20.       25.       29.       32.       34.
              35.       35.       33.       30.       27.       24.       22.       20.       18.       16.
              15.       13.       12.       11.       10.        9.        8.        7.        6.        6.
               5.        5.        4.        4.        4.        3.        3.        3.        2.        2.
               2.        2.        2.        1.        1.        1.        1.        1.        1.        1.
               1.        1.        1.        1.        0.        0.        0.        0.        0.
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                        HYDROGRAPH AT STATION       S4

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)        (HR)
                           (CFS)
+      96.     13.00                36.         11.          8.           8.
                        (INCHES)     4.456       5.532       5.532        5.532
                         (AC-FT)      18.         22.         22.          22.

                        CUMULATIVE AREA =     .08 SQ MI


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   28 KK    *       CS4  *
            *            *
            **************
                          COMBINE AREAS PRIOR TO POND P1 OUTLET

   30 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


   31 HC          HYDROGRAPH COMBINATION
                        ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

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                        HYDROGRAPH AT STATION      CS4

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)        (HR)
                           (CFS)
+    2547.     12.75                894.        278.        193.         193.
                        (INCHES)     4.531       5.641       5.641        5.641
                         (AC-FT)      443.        552.        552.         552.

                        CUMULATIVE AREA =    1.84 SQ MI


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            *            *
   32 KK    *        N1  *
            *            *
            **************
                          RUNOFF AREA N1

   34 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

   35 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .02  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
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                .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .02

  36 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  37 US          SNYDER UNITGRAPH
                         TP         .38  LAG
                         CP         .70  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                            CLARK   TC=   .46 HR,       R=   .28 HR
                                           SNYDER   TP=   .38 HR,      CP=   .70

                                                      UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 2.        7.       13.       18.       21.       19.       15.       11.        8.        6.
                 4.        3.        2.        2.        1.        1.        1.        1.        0.        0.
                 0.

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                        HYDROGRAPH AT STATION       N1

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      39.     12.42                 9.          3.          2.          2.
                        (INCHES)    4.495       5.535       5.535       5.535
                         (AC-FT)      4.          5.          5.          5.

                        CUMULATIVE AREA =     .02 SQ MI


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            *            *
  38 KK     *        O3  *
            *            *
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                          OFFSITE AREA O3

  40 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  41 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .03

  42 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  43 US          SNYDER UNITGRAPH
                         TP         .30  LAG
                         CP         .68  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

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                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .35 HR,       R=   .23 HR
                                         SNYDER   TP=   .30 HR,      CP=   .68

                                                    UNIT HYDROGRAPH
                                                 18 END-OF-PERIOD ORDINATES
                 5.       17.       30.       36.       32.       23.       16.       11.        8.        5.
                 4.        3.        2.        1.        1.        1.        0.        0.

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                        HYDROGRAPH AT STATION       O3

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      62.     12.33                 12.          4.          3.          3.
                        (INCHES)    4.500       5.539       5.539       5.539
                         (AC-FT)      6.          7.          7.          7.

                        CUMULATIVE AREA =     .03 SQ MI


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            *            *
   44 KK    *     C1MWY  *
            *            *
            **************
                          COMBINE AREAS N1, O1, O2, O3, AND S4

   46 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


   47 HC          HYDROGRAPH COMBINATION
                        ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION    C1MWY

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+    2606.     12.75                915.        285.        198.        198.
                        (INCHES)    4.530       5.639       5.639       5.639
                         (AC-FT)    454.        565.        565.        565.

                        CUMULATIVE AREA =    1.88 SQ MI


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            *            *
   48 KK    *        S3  *
            *            *
            **************
                          RUNOFF AREA S3

   50 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA
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 51 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .03  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .03

 52 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 53 US          SNYDER UNITGRAPH
                         TP         .82  LAG
                         CP         .68  PEAKING COEFFICIENT

                SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                            CLARK   TC=   .94 HR,       R=   .65 HR
                                           SNYDER   TP=   .82 HR,      CP=   .68

                                                      UNIT HYDROGRAPH
                                                 48 END-OF-PERIOD ORDINATES
                1.       2.       4.       6.       9.      12.      14.      16.      17.      17.
               17.      16.      14.      12.      11.       9.       8.       7.       6.       6.
                5.       4.       4.       3.       3.       3.       2.       2.       2.       2.
                1.       1.       1.       1.       1.       1.       1.       1.       0.       0.
                0.       0.       0.       0.       0.       0.       0.       0.

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                        HYDROGRAPH AT STATION       S3

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      45.     12.83                 15.          5.          3.          3.
                         (INCHES)  4.472       5.533       5.533       5.533
                          (AC-FT)     8.          9.          9.          9.

                         CUMULATIVE AREA =     .03 SQ MI


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            *            *
 54 KK      *       N20  *
            *            *
            **************
                      RUNOFF AREA N20

 56 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          3  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 57 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00

 58 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
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                    CRVNBR       84.00  CURVE NUMBER
                     RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
  59 UK           OVERLAND-FLOW ELEMENT NO. 1
                          L         32.  OVERLAND FLOW LENGTH
                          S      .1880  SLOPE
                          N       .350  ROUGHNESS COEFFICIENT
                         PA      100.0  PERCENT OF SUBBASIN
                      DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
  60 RD           MAIN CHANNEL
                          L      1832.  CHANNEL LENGTH
                          S      .0018  SLOPE
                          N       .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .00  CONTRIBUTING AREA
                      SHAPE       TRAP  CHANNEL SHAPE
                         WD       6.00  BOTTOM WIDTH OR DIAMETER
                          Z       3.00  SIDE SLOPE
                     RUPSTQ        YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                        COMPUTATION TIME STEP
                   ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                   PLANE1       1.85      1.67        .42      6.39     20.57    724.93      5.56       .33
                   MAIN          .70      1.38       5.00    610.70     46.38    780.00      5.53      2.57


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9296E+01  EXCESS= .1215E+01 OUTFLOW= .1049E+02 BASIN STORAGE= .2173E-02 PERCENT ERROR=
.2


                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                   MAIN          .70      1.38       5.00               46.38    780.00      5.53

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N20

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      46.     13.00                 17.          5.          4.          4.
                       (INCHES)    4.468       5.527       5.527       5.527
                        (AC-FT)       8.         10.         10.         10.

                       CUMULATIVE AREA =     .04 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  61 KK     *     C2MWY  *
            *            *
            **************
                        COMBINE AREAS O1, O2, O3, N1, S4, S3, AND N20

  63 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


  64 HC          HYDROGRAPH COMBINATION
                      ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION    C2MWY

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
```

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+    2647.     12.75                  932.        290.        201.        201.
                        (INCHES)     4.529       5.637       5.637       5.637
                         (AC-FT)      462.        575.        575.        575.

                        CUMULATIVE AREA =    1.91 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
   65 KK    *      N11T  *
            *            *
            **************
                      RUNOFF AREA N11T

   67 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

   68 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00

   69 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
   70 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        415.  OVERLAND FLOW LENGTH
                            S       .0200  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
   71 RD            MAIN CHANNEL
                            L        427.  CHANNEL LENGTH
                            S       .0030  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .00  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD         .00  BOTTOM WIDTH OR DIAMETER
                            Z        4.00  SIDE SLOPE
                       RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                     PLANE1       .60      1.67       4.05     83.01     12.12    734.95      5.54       .35
                     MAIN        1.06      1.33       3.26    213.52     11.91    733.23      5.53      2.18


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1393E+01 OUTFLOW= .1385E+01 BASIN STORAGE= .1876E-02 PERCENT ERROR=
.4


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                     MAIN        1.06      1.33       5.00               11.86    735.00      5.53

       ***            ***            ***            ***            ***

                           HYDROGRAPH AT STATION     N11T

     TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.88, TOTAL EXCESS =     5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
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                                    6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      12.     12.25                 2.          1.          0.          0.
                       (INCHES)    4.492       5.521       5.528       5.528
                        (AC-FT)      1.          1.          1.          1.

                       CUMULATIVE AREA =     .00 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
   72 KK    *      N11S  *
            *            *
            **************
                      RUNOFF AREA N11S

   74 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

   75 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

   76 LS          SCS LOSS RATE
                        STRTL         .33  INITIAL ABSTRACTION
                       CRVNBR       86.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
   77 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L         73.  OVERLAND FLOW LENGTH
                            S       .2000  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
   78 RD            MAIN CHANNEL
                            L        734.  CHANNEL LENGTH
                            S       .0070  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .01  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD         .00  BOTTOM WIDTH OR DIAMETER
                            Z        4.00  SIDE SLOPE
                      RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        1.90      1.67        .65     14.64     35.28    724.53      5.79       .48
                    MAIN          1.62      1.33       3.12    366.93     34.59    724.20      5.65      3.92


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2130E+01 OUTFLOW= .2077E+01 BASIN STORAGE= .4285E-03 PERCENT ERROR=
2.5


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN          1.62      1.33       5.00               32.23    725.00      5.64

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     N11S
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     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                            (CFS)
+      32.     12.08                 3.          1.          1.          1.
                         (INCHES)     4.623       5.639       5.639       5.639
                          (AC-FT)       2.          2.          2.          2.

                          CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
   79 KK     *      CN11  *
             *            *
             **************
                           COMBINE N11 areas

   81 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


   82 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     CN11

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                            (CFS)
+      41.     12.08                 6.          2.          1.          1.
                         (INCHES)     4.559       5.589       5.594       5.594
                          (AC-FT)       3.          3.          3.          3.

                          CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
   83 KK     *      CH11  *
             *            *
             **************
                           RUNOFF AREA CH11

   85 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

   86 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00
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 87 LS          SCS LOSS RATE
                     STRTL         .38  INITIAL ABSTRACTION
                    CRVNBR       84.00  CURVE NUMBER
                     RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 88 UK            OVERLAND-FLOW ELEMENT NO. 1
                         L         84.  OVERLAND FLOW LENGTH
                         S       .3300  SLOPE
                         N        .350  ROUGHNESS COEFFICIENT
                        PA       100.0  PERCENT OF SUBBASIN
                     DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 89 RD            MAIN CHANNEL
                         L       1487.  CHANNEL LENGTH
                         S       .0010  SLOPE
                         N        .030  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .00  CONTRIBUTING AREA
                     SHAPE        TRAP  CHANNEL SHAPE
                        WD       10.00  BOTTOM WIDTH OR DIAMETER
                         Z        3.00  SIDE SLOPE
                    RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                        ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                      COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                CELERITY
                                                   (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                  PLANE1        2.45     1.67        .49     16.81     22.92   724.87      5.56       .58
                  MAIN           .44     1.42       5.00    743.50     40.46   735.00      5.42      2.19

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3461E+01  EXCESS= .1364E+01 OUTFLOW= .4683E+01 BASIN STORAGE= .2406E-02 PERCENT ERROR=
2.9

                                      INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                  MAIN           .44     1.42       5.00               40.46   735.00      5.42

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     CH11

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      40.     12.25                8.          2.          2.          2.
                       (INCHES)    4.475       5.417       5.421       5.421
                        (AC-FT)      4.          5.          5.          5.

                       CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 90 KK      *      N2T   *
            *            *
            **************
                          RUNOFF AREA N2T

 92 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 93 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00
```

```
                                                STORM AREA =     .01

  94 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
  95 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        553.  OVERLAND FLOW LENGTH
                           S       .0200  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
  96 RD            MAIN CHANNEL
                           L        644.  CHANNEL LENGTH
                           S       .0030  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .01  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD         .00  BOTTOM WIDTH OR DIAMETER
                           Z        4.00  SIDE SLOPE
                     RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                         COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                    PLANE1       .60      1.67       4.23     92.19     32.17   737.61      5.54       .37
                    MAIN        1.06      1.33       3.86    322.22     31.70   737.41      5.49      2.78


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .4180E+01 OUTFLOW= .4128E+01 BASIN STORAGE= .7392E-02 PERCENT ERROR=
1.1


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN        1.06      1.33       5.00              31.34   735.00      5.49

       ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION      N2T

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      31.     12.25                 7.          2.          1.          1.
                        (INCHES)   4.483       5.486       5.492       5.492
                         (AC-FT)      3.          4.          4.          4.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  97 KK     *      N2S   *
            *            *
            **************
                          RUNOFF AREA N2S

  99 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 100 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
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                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .00

  101 LS          SCS LOSS RATE
                       STRTL         .33  INITIAL ABSTRACTION
                      CRVNBR       86.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  102 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L         80.  OVERLAND FLOW LENGTH
                           S       .2000  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  103 RD            MAIN CHANNEL
                           L        379.  CHANNEL LENGTH
                           S       .0100  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .00  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD         .00  BOTTOM WIDTH OR DIAMETER
                           Z        4.00  SIDE SLOPE
                     RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                                  ***


          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1


                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX        PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                     PEAK                CELERITY
                                                     (MIN)      (FT)      (CFS)    (MIN)       (IN)      (FPS)

                     PLANE1      1.90      1.67       .56     16.05      24.97   724.49      5.79       .49
                     MAIN        1.93      1.33      1.54    189.53      24.45   723.94      5.68      4.11

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1513E+01 OUTFLOW= .1483E+01 BASIN STORAGE= .2001E-03 PERCENT ERROR=
2.0


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                     MAIN        1.93      1.33      5.00                23.72   725.00      5.69

        ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION      N2S

      TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      24.     12.08                 2.          1.          1.          1.
                         (INCHES)  4.647       5.686       5.687       5.687
                          (AC-FT)    1.          1.          1.          1.

                         CUMULATIVE AREA =     .00 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  104 KK      *       CN2  *
              *            *
              **************
                          COMBINE N2 AREAS

  106 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS
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 107 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION      CN2

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      47.     12.08                  9.          3.          2.           2.
                       (INCHES)     4.513       5.535       5.542        5.542
                        (AC-FT)        5.          6.          6.           6.

                       CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 108 KK     *      CCH2  *
            *            *
            **************
                         COMBINE AREAS UPSTREAM OF CH2

 110 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


 111 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION     CCH2

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      82.     12.17                 17.          5.          4.           4.
                       (INCHES)     4.494       5.481       5.486        5.486
                        (AC-FT)        8.         10.         10.          10.

                       CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 112 KK     *       CH2  *
            *            *
            **************
                         RUNOFF AREA CH2

 114 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 115 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .00  SUBBASIN AREA

                 PRECIPITATION DATA
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 13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .00

 116 LS           SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
 117 UK             OVERLAND-FLOW ELEMENT NO. 1
                             L       103.  OVERLAND FLOW LENGTH
                             S      .1800  SLOPE
                             N       .350  ROUGHNESS COEFFICIENT
                            PA      100.0  PERCENT OF SUBBASIN
                         DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
 118 RD             MAIN CHANNEL
                             L       576.  CHANNEL LENGTH
                             S      .0010  SLOPE
                             N       .030  CHANNEL ROUGHNESS COEFFICIENT
                            CA        .00  CONTRIBUTING AREA
                         SHAPE       TRAP  CHANNEL SHAPE
                            WD      10.00  BOTTOM WIDTH OR DIAMETER
                             Z       3.00  SIDE SLOPE
                        RUPSTQ        YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                     COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                            COMPUTATION TIME STEP
                      ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                     PEAK                CELERITY
                                                       (MIN)      (FT)     (CFS)     (MIN)      (IN)      (FPS)

                      PLANE1      1.81      1.67        .80     20.53     11.58    724.49      5.56       .51
                      MAIN         .44      1.42       3.94    576.18     84.60    733.28      5.48      2.44


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1030E+02  EXCESS= .7115E+00 OUTFLOW= .1099E+02 BASIN STORAGE= .1160E-02 PERCENT ERROR=
.2


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                      MAIN         .44      1.42       5.00               84.05    735.00      5.48

        ***            ***            ***            ***            ***

                            HYDROGRAPH AT STATION      CH2

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                             (CFS)
+      84.     12.25            18.          6.          4.          4.
                         (INCHES)     4.495       5.477       5.482       5.482
                          (AC-FT)        9.         11.         11.         11.

                         CUMULATIVE AREA =     .04 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 119 KK     *       N12  *
            *            *
            **************
                          RUNOFF AREA N12

 121 KO           OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 122 BA           SUBBASIN CHARACTERISTICS
                       TAREA        .01  SUBBASIN AREA
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                PRECIPITATION DATA

 13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .01

123 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

124 US          SNYDER UNITGRAPH
                         TP         .38  LAG
                         CP         .71  PEAKING COEFFICIENT

                SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                        ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .46 HR,       R=   .27 HR
                                         SNYDER   TP=   .38 HR,      CP=   .70

                                                    UNIT HYDROGRAPH
                                              21 END-OF-PERIOD ORDINATES
                1.        5.        9.       13.       15.       13.       10.        8.        6.        4.
                3.        2.        2.        1.        1.        1.        0.        0.        0.        0.
                0.

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      N12

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      28.     12.42                    6.          2.          1.          1.
                       (INCHES)     4.498       5.538       5.538       5.538
                        (AC-FT)        3.          4.          4.          4.

                       CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 125 KK     *       N3T  *
            *            *
            **************
                      RUNOFF AREA N3T

 127 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 128 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .05

129 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
130 UK            OVERLAND-FLOW ELEMENT NO. 1
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```
                    L        512.  OVERLAND FLOW LENGTH
                    S       .0200  SLOPE
                    N        .350  ROUGHNESS COEFFICIENT
                   PA       100.0  PERCENT OF SUBBASIN
                DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
            MUSKINGUM-CUNGE
 131 RD       MAIN CHANNEL
                    L        692.  CHANNEL LENGTH
                    S       .0030  SLOPE
                    N        .030  CHANNEL ROUGHNESS COEFFICIENT
                   CA         .05  CONTRIBUTING AREA
                SHAPE        TRAP  CHANNEL SHAPE
                   WD         .00  BOTTOM WIDTH OR DIAMETER
                    Z        4.00  SIDE SLOPE
              RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                   ***
                          COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                  COMPUTATION TIME STEP
                ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                              PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                PLANE1       .60      1.67       4.73    102.43    124.46    733.59      5.54       .36
                MAIN        1.06      1.33       2.95    691.59    122.61    737.11      5.07      3.91

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1574E+02 OUTFLOW= .1436E+02 BASIN STORAGE= .2430E-01 PERCENT ERROR=
8.6

                                      INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN        1.06      1.33       5.00              122.18    735.00      5.07

      ***          ***          ***          ***          ***

                     HYDROGRAPH AT STATION      N3T

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     122.     12.25        25.         7.          5.          5.
                      (INCHES)     4.309       5.069       5.073       5.073
                       (AC-FT)       12.         14.         14.         14.

                      CUMULATIVE AREA =     .05 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 132 KK     *      N3S   *
            *            *
            **************
                      RUNOFF AREA N3S

 134 KO         OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                      IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        .083  TIME INTERVAL IN HOURS

               SUBBASIN RUNOFF DATA

 135 BA         SUBBASIN CHARACTERISTICS
                     TAREA         .01  SUBBASIN AREA

                PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .01

 136 LS         SCS LOSS RATE
                     STRTL         .33  INITIAL ABSTRACTION
                    CRVNBR       86.00  CURVE NUMBER
                     RTIMP         .00  PERCENT IMPERVIOUS AREA
```

```
                 KINEMATIC WAVE
  137 UK           OVERLAND-FLOW ELEMENT NO. 1
                           L         90.  OVERLAND FLOW LENGTH
                           S       .2000  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
  138 RD           MAIN CHANNEL
                           L        581.  CHANNEL LENGTH
                           S       .0030  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .01  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD         .00  BOTTOM WIDTH OR DIAMETER
                           Z        4.00  SIDE SLOPE
                     RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                       COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        1.90      1.67        .60     17.97     27.38    724.55      5.79       .51
                    MAIN          1.06      1.33       3.63    290.74     25.94    725.04      5.73      2.67


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1667E+01 OUTFLOW= .1650E+01 BASIN STORAGE= .4547E-03 PERCENT ERROR=
1.0


                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN          1.06      1.33       5.00               25.88    725.00      5.78

       ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION      N3S

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      26.     12.08                    3.          1.          1.          1.
                       (INCHES)     4.711       5.775       5.775       5.775
                        (AC-FT)        1.          2.          2.          2.

                        CUMULATIVE AREA =     .01 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  139 KK     *       CN3  *
             *            *
             **************
                          COMBINE N3S, N3T, N12

  141 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


  142 HC          HYDROGRAPH COMBINATION
                       ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

       ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION      CN3

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     156.     12.25                   33.         10.          7.          7.
                       (INCHES)     4.368       5.203       5.208       5.208
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                    (AC-FT)       17.         20.         20.          20.

                    CUMULATIVE AREA =     .07 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  143 KK    *      CCH3  *
            *            *
            **************
                     COMBINE AREAS N11, N2, N12, N3 AT CH3

  145 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


  146 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     CCH3

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     240.     12.25                  51.         15.         11.          11.
                        (INCHES)    4.412       5.298       5.303        5.303
                         (AC-FT)      26.         31.         31.          31.

                        CUMULATIVE AREA =     .11 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
  147 KK    *       CH3  *
            *            *
            **************
                     RUNOFF AREA CH3

  149 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  150 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .00

  151 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  152 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        153.  OVERLAND FLOW LENGTH
```

```
                 S        .2750  SLOPE
                 N         .350  ROUGHNESS COEFFICIENT
                PA        100.0  PERCENT OF SUBBASIN
             DXMIN            5  MINIMUM NUMBER OF DX INTERVALS
          MUSKINGUM-CUNGE
153 RD      MAIN CHANNEL
                 L         698.  CHANNEL LENGTH
                 S        .0010  SLOPE
                 N         .030  CHANNEL ROUGHNESS COEFFICIENT
                CA          .00  CONTRIBUTING AREA
             SHAPE         TRAP  CHANNEL SHAPE
                WD        20.00  BOTTOM WIDTH OR DIAMETER
                 Z         3.00  SIDE SLOPE
            RUPSTQ          YES  ROUTE UPSTREAM HYDROGRAPH

                                                      ***
                              COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                     COMPUTATION TIME STEP
            ELEMENT   ALPHA      M        DT        DX       PEAK    TIME TO    VOLUME    MAXIMUM
                                                                      PEAK               CELERITY
                                         (MIN)     (FT)     (CFS)    (MIN)      (IN)      (FPS)

            PLANE1     2.23     1.67       .90     30.54     17.58   725.17     5.56        .67
            MAIN        .30     1.48      3.74    697.69    238.09   737.52     5.30       3.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3069E+02  EXCESS= .1097E+01 OUTFLOW= .3170E+02 BASIN STORAGE= .3574E-02 PERCENT ERROR=
.2

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


            MAIN        .30     1.48      5.00              237.19   740.00     5.30

    ***            ***            ***             ***            ***

                         HYDROGRAPH AT STATION      CH3

  TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.88, TOTAL EXCESS =     5.56

 PEAK FLOW     TIME                     MAXIMUM AVERAGE FLOW
                              6-HR        24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                       (CFS)
+     237.     12.33              53.         16.         11.         11.
                    (INCHES)   4.407       5.294       5.299       5.299
                     (AC-FT)      26.         32.         32.         32.

                    CUMULATIVE AREA =      .11 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

          **************
          *            *
154 KK    *       N4T  *
          *            *
          **************
                    RUNOFF AREA N4T

156 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

157 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .01  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                            DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                      STORM AREA =      .01

158 LS          SCS LOSS RATE
                      STRTL        .38  INITIAL ABSTRACTION
                     CRVNBR      84.00  CURVE NUMBER
                      RTIMP        .00  PERCENT IMPERVIOUS AREA
```

```
                KINEMATIC WAVE
 159 UK           OVERLAND-FLOW ELEMENT NO. 1
                          L        746.  OVERLAND FLOW LENGTH
                          S       .0200  SLOPE
                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
                      DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 160 RD           MAIN CHANNEL
                          L        608.  CHANNEL LENGTH
                          S       .0100  SLOPE
                          N        .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .01  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD         .00  BOTTOM WIDTH OR DIAMETER
                          Z        4.00  SIDE SLOPE
                     RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                  ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                       COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                PEAK                CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1       .60      1.67       4.67    106.62     22.94    743.34      5.54       .39
                  MAIN        1.93      1.33       2.52    304.07     22.88    740.50      5.47      4.02

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .3439E+01 OUTFLOW= .3387E+01 BASIN STORAGE= .8891E-02 PERCENT ERROR=
1.3

                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                  MAIN        1.93      1.33       5.00                22.84    740.00      5.47

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      N4T

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      23.     12.33                 6.          2.          1.          1.
                        (INCHES)   4.467       5.466       5.474       5.474
                         (AC-FT)      3.          3.          3.          3.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
 161 KK     *       N4S  *
            *            *
            **************
                          RUNOFF AREA N4S

 163 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS

                SUBBASIN RUNOFF DATA

 164 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .01

 165 LS          SCS LOSS RATE
                      STRTL         .33  INITIAL ABSTRACTION
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                    CRVNBR       86.00  CURVE NUMBER
                     RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 166 UK           OVERLAND-FLOW ELEMENT NO. 1
                          L         78.  OVERLAND FLOW LENGTH
                          S      .2000  SLOPE
                          N       .350  ROUGHNESS COEFFICIENT
                         PA      100.0  PERCENT OF SUBBASIN
                      DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 167 RD           MAIN CHANNEL
                          L        641.  CHANNEL LENGTH
                          S      .0030  SLOPE
                          N       .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .01  CONTRIBUTING AREA
                      SHAPE       TRAP  CHANNEL SHAPE
                         WD        .00  BOTTOM WIDTH OR DIAMETER
                          Z       4.00  SIDE SLOPE
                     RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                        COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1       1.90      1.67        .57     15.50     40.56    724.99       5.79       .48
                  MAIN         1.06      1.33       3.62    320.27     35.90    723.22       5.68      2.95


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2439E+01 OUTFLOW= .2392E+01 BASIN STORAGE= .5147E-03 PERCENT ERROR=
1.9


                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN         1.06      1.33       5.00                33.64    725.00       5.65

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      N4S

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      34.     12.08                 4.          1.          1.          1.
                        (INCHES)   4.607       5.649       5.649       5.649
                         (AC-FT)      2.          2.          2.          2.

                        CUMULATIVE AREA =     .01 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 168 KK     *       CN4  *
            *            *
            **************
                       COMBINE N4 AREAS

 170 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


 171 HC          HYDROGRAPH COMBINATION
                      ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      CN4

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
```

```
+      50.     12.08                    9.          3.          2.          2.
                       (INCHES)     4.500       5.536       5.545       5.545
                        (AC-FT)        5.          6.          6.          6.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  172 KK    *       CH4  *
            *            *
            **************
                      RUNOFF AREA CH4

  174 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  175 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00

  176 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  177 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        101.  OVERLAND FLOW LENGTH
                            S       .1980  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  178 RD            MAIN CHANNEL
                            L       1279.  CHANNEL LENGTH
                            S       .0050  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .00  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD       10.00  BOTTOM WIDTH OR DIAMETER
                            Z        4.00  SIDE SLOPE
                       RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        1.89      1.67        .69     20.16     23.91    724.62      5.56       .52
                    MAIN           .97      1.40       5.00    639.25     62.27    730.00      5.53      3.83


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5767E+01  EXCESS= .1453E+01 OUTFLOW= .7200E+01 BASIN STORAGE= .1358E-02 PERCENT ERROR=
.3


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN           .97      1.40       5.00               62.27    730.00      5.53

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      CH4

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
```

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                                        6-HR       24-HR       72-HR     34.58-HR
+   (CFS)        (HR)
                          (CFS)
+      62.      12.17                   12.          4.          3.          3.
                        (INCHES)     4.503       5.526       5.533       5.533
                         (AC-FT)        6.          7.          7.          7.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  179 KK    *    C1CH4A  *
            *            *
            **************
                          COMBINE AREAS N11, N2, N3, N4 AT CHANNEL CH4A

  181 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  182 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION   C1CH4A

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     34.58-HR
+   (CFS)        (HR)
                          (CFS)
+     288.      12.25                   65.         20.         14.         14.
                        (INCHES)     4.424       5.335       5.340       5.340
                         (AC-FT)       32.         39.         39.         39.

                        CUMULATIVE AREA =     .14 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  183 KK    *      CH4A  *
            *            *
            **************
                          RUNOFF AREA CH4A

  185 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  186 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .00

  187 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
```

```
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 188 UK           OVERLAND-FLOW ELEMENT NO. 1
                          L         40.  OVERLAND FLOW LENGTH
                          S       .3300  SLOPE
                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
                      DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 189 RD           MAIN CHANNEL
                          L        520.  CHANNEL LENGTH
                          S       .0035  SLOPE
                          N        .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .00  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD       20.00  BOTTOM WIDTH OR DIAMETER
                          Z        3.00  SIDE SLOPE
                     RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                       COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1        2.45      1.67        .34      8.08      5.52    724.98      5.56       .43
                  MAIN           .57      1.48       1.73    519.75    287.49    737.40      5.34      5.00


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3891E+02  EXCESS= .3261E+00 OUTFLOW= .3920E+02 BASIN STORAGE= .2158E-02 PERCENT ERROR=
.1


                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN           .57      1.48       5.00              286.30    735.00      5.34

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     CH4A

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     286.     12.25        66.         20.         14.          14.
                       (INCHES)     4.424       5.334       5.339        5.339
                        (AC-FT)       32.         39.         39.          39.

                       CUMULATIVE AREA =     .14 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 190 KK     *       N13  *
            *            *
            **************
                          RUNOFF AREA N13

 192 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 193 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .03
```

```
 194 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 195 US          SNYDER UNITGRAPH
                         TP         .53  LAG
                         CP         .69  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .64 HR,       R=   .39 HR
                                        SNYDER   TP=   .53 HR,      CP=   .69

                                                    UNIT HYDROGRAPH
                                               30 END-OF-PERIOD ORDINATES
                 1.       5.       10.       16.       21.       24.       25.       23.       20.       16.
                13.      10.        8.        7.        5.        4.        4.        3.        2.        2.
                 2.       1.        1.        1.        1.        1.        0.        0.        0.        0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N13

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      55.     12.58        14.          4.          3.          3.
                       (INCHES)     4.490       5.535       5.535       5.535
                        (AC-FT)       7.          9.          9.          9.

                       CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 196 KK     *        W1  *
            *            *
            **************
                          RUNOFF AREA W1 (POND 1)

 198 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 199 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .01

 200 LS          SCS LOSS RATE
                      STRTL         .00  INITIAL ABSTRACTION
                     CRVNBR      100.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 201 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .00  LAG

                                                          ***

                                                    UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
                 75.      21.        4.        1.        0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       W1
```

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    TOTAL RAINFALL =    7.44, TOTAL LOSS =     .00, TOTAL EXCESS =    7.44

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      67.     12.08                 8.          3.          2.           2.
                        (INCHES)   5.468       7.437       7.440        7.440
                         (AC-FT)      4.          5.          5.           5.

                         CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  202 KK    *    PND1IN  *
            *            *
            **************
                          COMBINE ALL FLOWS INTO POND 1

  204 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


  205 HC          HYDROGRAPH COMBINATION
                        ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION   PND1IN

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     352.     12.25                87.         27.         19.          19.
                        (INCHES)   4.493       5.496       5.522        5.522
                         (AC-FT)      43.         53.         53.          53.

                         CUMULATIVE AREA =     .18 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  206 KK    *    PND1OU  *            T
            *            *
            **************
                          ROUTE THROUGH UPPER DET. POND (POND 1) 3-42" AT 451

  208 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                HYDROGRAPH ROUTING DATA

  209 RS          STORAGE ROUTING
                        NSTPS          1  NUMBER OF SUBREACHES
                         ITYP       ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC     455.20  INITIAL CONDITION
                            X        .00 WORKING R AND D COEFFICIENT

  210 SA                AREA         .0       7.8       7.9       8.0       8.2

  211 SE          ELEVATION     455.20    455.50    456.00    456.50    457.00

  213 SL          LOW-LEVEL OUTLET
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                    ELEVL      452.77  ELEVATION AT CENTER OF OUTLET
                    CAREA       19.64  CROSS-SECTIONAL AREA
                     COQL         .80  COEFFICIENT
                     EXPL         .50  EXPONENT OF HEAD

 212 SS          SPILLWAY
                     CREL      456.00  SPILLWAY CREST ELEVATION
                    SPWID       25.00  SPILLWAY WIDTH
                     COQW        2.60  WEIR COEFFICIENT
                     EXPW        1.50  EXPONENT OF HEAD

                                                        ***

                                          COMPUTED STORAGE-ELEVATION DATA

           STORAGE        .00       .78      4.70      8.69     12.74
         ELEVATION     455.20    455.50    456.00    456.50    457.00

                                          COMPUTED OUTFLOW-ELEVATION DATA

           OUTFLOW        .00    199.32    202.35    205.47    208.68    212.00    215.43    218.97    222.63    226.41
         ELEVATION     455.20    455.27    455.35    455.43    455.51    455.60    455.69    455.79    455.89    456.00

           OUTFLOW     237.55    242.13    247.75    254.50    262.48    271.78    282.50    294.73    308.57    324.10
         ELEVATION     456.18    456.24    456.30    456.38    456.46    456.55    456.65    456.76    456.88    457.00


                                       COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

           STORAGE        .00       .01       .10       .35       .78       .89      1.57      2.29      3.05      3.85
           OUTFLOW     196.38    199.32    202.35    205.47    208.15    208.68    212.00    215.43    218.97    222.63
         ELEVATION     455.20    455.27    455.35    455.43    455.50    455.51    455.60    455.69    455.79    455.89

           STORAGE       4.70      6.12      6.59      7.12      7.72      8.38      8.69      9.12      9.92     10.79
           OUTFLOW     226.41    237.55    242.13    247.75    254.50    262.48    266.29    271.78    282.50    294.73
         ELEVATION     456.00    456.18    456.24    456.30    456.38    456.46    456.50    456.55    456.65    456.76

           STORAGE      11.73     12.74
           OUTFLOW     308.57    324.10
         ELEVATION     456.88    457.00

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION   PND1OU

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     229.     12.75                 202.        198.        197.         197.
                        (INCHES)   10.427      40.858      58.751       58.751
                         (AC-FT)     100.        392.        564.         564.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     34.58-HR
+  (AC-FT)      (HR)
        5.     12.75                   0.          0.          0.          -1.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     34.58-HR
+   (FEET)      (HR)
    456.04     12.75                455.34      455.24      455.23       455.23

                        CUMULATIVE AREA =     .18 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
 214 KK     *       N16  *
            *            *
            **************
                          RUNOFF AREA N16

 216 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           3  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                     IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 217 BA          SUBBASIN CHARACTERISTICS
                    TAREA         .00  SUBBASIN AREA
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                PRECIPITATION DATA

 13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .00

218 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

219 US          SNYDER UNITGRAPH
                         TP         .24  LAG
                         CP         .71  PEAKING COEFFICIENT

                SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                        ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .31 HR,       R=   .14 HR
                                         SNYDER   TP=   .24 HR,      CP=   .70

                                                   UNIT HYDROGRAPH
                                              11 END-OF-PERIOD ORDINATES
                1.        5.        8.        8.        5.        3.        1.        1.        0.        0.
                0.

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      N16

   TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                        (CFS)
+      12.     12.25                  2.          1.          0.          0.
                      (INCHES)     4.498       5.534       5.534       5.534
                       (AC-FT)        1.          1.          1.          1.

                      CUMULATIVE AREA =     .00 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
 220 KK     *      CHW1  *
            *            *
            **************
                        RUNOFF AREA CHW1

 222 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS

               SUBBASIN RUNOFF DATA

 223 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .00

224 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
225 UK            OVERLAND-FLOW ELEMENT NO. 1
                         L         42.  OVERLAND FLOW LENGTH
                         S       .3300  SLOPE
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                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
                      DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
 226 RD             MAIN CHANNEL
                          L        551.  CHANNEL LENGTH
                          S       .0010  SLOPE
                          N        .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .00  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD       20.00  BOTTOM WIDTH OR DIAMETER
                          Z        3.00  SIDE SLOPE
                     RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                       COMPUTATION TIME STEP
                   ELEMENT    ALPHA       M         DT        DX        PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                   PLANE1        2.45      1.67        .39      8.37      7.02   724.78      5.56       .44
                   MAIN           .30      1.48       5.00    275.57     13.02   740.00      5.49      1.25

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1240E+01  EXCESS= .4150E+00 OUTFLOW= .1639E+01 BASIN STORAGE= .1476E-02 PERCENT ERROR=
.9

                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                   MAIN           .30      1.48       5.00               13.02   740.00      5.49

       ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION     CHW1

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      13.     12.33                     3.          1.          1.          1.
                        (INCHES)     4.490       5.487       5.487       5.487
                         (AC-FT)        1.          2.          2.          2.

                        CUMULATIVE AREA =     .01 SQ MI


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            *            *
 227 KK     *     MIDRD  *
            *            *
            **************
                          COMBINE ALL FLOWS U/S OF ENTRANCE ROAD

 229 KO           OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  Ppunch COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS

 230 HC           HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

       ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION    MIDRD

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+    2883.     12.75                  1137.        489.        399.        399.
                        (INCHES)     5.034       8.657      10.191      10.191
                         (AC-FT)      564.        969.       1141.       1141.

                        CUMULATIVE AREA =    2.10 SQ MI
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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  231 KK      *        S5  *
              *            *
              **************
                            RUNOFF AREA S5

  233 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  234 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .00

  235 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  236 US          SNYDER UNITGRAPH
                          TP         .23  LAG
                          CP         .75  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                            CLARK   TC=   .30 HR,       R=   .12 HR
                                           SNYDER   TP=   .23 HR,      CP=   .74

                                                       UNIT HYDROGRAPH
                                                   10 END-OF-PERIOD ORDINATES
                  0.        1.        2.        2.        1.        1.        0.        0.        0.        0.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION       S5

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+       3.     12.25                      0.          0.          0.          0.
                        (INCHES)     4.499       5.535       5.535       5.535
                         (AC-FT)        0.          0.          0.          0.

                        CUMULATIVE AREA =     .00 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  237 KK      *       CS5  *
              *            *
              **************
                            COMBINE ALL FLOWS U/S OF ENTRANCE ROAD WITH S5

  239 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
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                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .083  TIME INTERVAL IN HOURS


  240 HC          HYDROGRAPH COMBINATION
                    ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      CS5

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+    2884.     12.75                1137.        489.        399.         399.
                       (INCHES)     5.034       8.655      10.188       10.188
                        (AC-FT)      564.        969.       1141.        1141.

                       CUMULATIVE AREA =    2.10 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  241 KK    *        O4  *
            *            *
            **************
                         OFFSITE AREA O4

  243 KO          OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                     IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  244 BA          SUBBASIN CHARACTERISTICS
                    TAREA         .13  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .13

  245 LS          SCS LOSS RATE
                    STRTL         .38  INITIAL ABSTRACTION
                   CRVNBR       84.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  246 US          SNYDER UNITGRAPH
                       TP         .43  LAG
                       CP         .64  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                            CLARK   TC=   .51 HR,       R=   .36 HR
                                           SNYDER   TP=   .43 HR,      CP=   .64

                                                      UNIT HYDROGRAPH
                                                 27 END-OF-PERIOD ORDINATES
                 10.       36.       71.      105.      126.      131.      115.       92.       73.       58.
                 46.       37.       29.       23.       18.       15.       12.        9.        7.        6.
                  5.        4.        3.        2.        2.        1.        1.

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION       O4

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
```

```
                        (CFS)
+     269.     12.50                  65.         20.         14.          14.
                      (INCHES)     4.491       5.534       5.534        5.534
                       (AC-FT)      32.         40.         40.          40.

                      CUMULATIVE AREA =     .13 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  247 KK    *     C4MWY  *
            *            *
            **************
                        COMBINE ALL FLOWS UPSTREAM OF N10

  249 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


  250 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION    C4MWY

  PEAK FLOW     TIME                           MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+    3103.     12.67                1202.        509.        413.         413.
                      (INCHES)     5.001       8.467       9.909        9.909
                       (AC-FT)      596.       1009.       1181.        1181.

                      CUMULATIVE AREA =    2.23 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  251 KK    *      N10T  *
            *            *
            **************
                        RUNOFF AREA N10T

  253 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  254 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

  255 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA
```

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                KINEMATIC WAVE
 256 UK           OVERLAND-FLOW ELEMENT NO. 1
                          L       733.  OVERLAND FLOW LENGTH
                          S      .0200  SLOPE
                          N       .350  ROUGHNESS COEFFICIENT
                         PA      100.0  PERCENT OF SUBBASIN
                      DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

                KINEMATIC WAVE
 257 RK           MAIN CHANNEL
                          L       619.  CHANNEL LENGTH
                          S      .0020  SLOPE
                          N       .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .02  CONTRIBUTING AREA
                      SHAPE       TRAP  CHANNEL SHAPE
                         WD        .00  BOTTOM WIDTH OR DIAMETER
                          Z       4.00  SIDE SLOPE
                     NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                     RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                  ***
                                  COMPUTED KINEMATIC PARAMETERS
                                       VARIABLE TIME STEP
                                     (DT SHOWN IS A MINIMUM)

                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                  PLANE1       .60      1.67       4.49    104.72     37.16    741.60      5.54       .39
                  MAIN         .87      1.33       1.23    206.29     36.95    741.58      5.53      3.19

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .5514E+01 OUTFLOW= .5490E+01 BASIN STORAGE= .1379E-01 PERCENT ERROR=
.2

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                  MAIN         .87      1.33       5.00               36.82    745.00      5.55

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION     N10T

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      37.     12.42                   9.          3.          2.          2.
                       (INCHES)     4.484       5.535       5.546       5.546
                        (AC-FT)        4.          5.          6.          6.

                       CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 258 KK     *      N10S  *
            *            *
            **************
                         RUNOFF AREA N10S

 260 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS

               SUBBASIN RUNOFF DATA

 261 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .01  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00
```

```
                                                STORM AREA =      .01

 262 LS          SCS LOSS RATE
                      STRTL         .33  INITIAL ABSTRACTION
                     CRVNBR       86.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 263 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L        100.  OVERLAND FLOW LENGTH
                          S       .2000  SLOPE
                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
                      DXMIN           5  MINIMUM NUMBER OF DX INTERVALS

                 KINEMATIC WAVE
 264 RK            MAIN CHANNEL
                          L        717.  CHANNEL LENGTH
                          S       .0130  SLOPE
                          N        .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .01  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD         .00  BOTTOM WIDTH OR DIAMETER
                          Z        4.00  SIDE SLOPE
                     NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS
                     RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                     COMPUTED KINEMATIC PARAMETERS
                                          VARIABLE TIME STEP
                                       (DT SHOWN IS A MINIMUM)

                   ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                   PLANE1      1.90      1.67        .79     19.95     57.51    724.48      5.79       .53
                   MAIN        2.21      1.33        .62    239.07     55.67    725.10      5.79      7.10

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .3551E+01 OUTFLOW= .3550E+01 BASIN STORAGE= .1045E-03 PERCENT ERROR=
.0

                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                   MAIN        2.21      1.33       5.00               55.40    725.00      5.79

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     N10S

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      55.     12.08                 6.          2.          1.          1.
                        (INCHES)   4.686       5.794       5.795       5.795
                         (AC-FT)      3.          4.          4.          4.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 265 KK     *      CN10  *
            *            *
            **************
                          COMBINE N10 AREAS

 267 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


 268 HC          HYDROGRAPH COMBINATION
                      ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE
                                                          ***
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      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     CN10

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                            (CFS)
+      78.     12.08                15.          5.          3.           3.
                         (INCHES)     4.539       5.629       5.641        5.641
                          (AC-FT)       7.          9.          9.           9.

                         CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  269 KK    *      CH10  *
            *            *
            **************
                          RUNOFF AREA CH10

  271 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  272 BA          SUBBASIN CHARACTERISTICS
                       TAREA        .01  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

  273 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  274 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L         88.  OVERLAND FLOW LENGTH
                            S      .0150  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                       DXMIN          5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  275 RD            MAIN CHANNEL
                            L       1454.  CHANNEL LENGTH
                            S      .0110  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .01  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD      10.00  BOTTOM WIDTH OR DIAMETER
                            Z       3.00  SIDE SLOPE
                      RUPSTQ        YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        .52      1.67       1.45     17.68     51.95    725.99      5.56       .21
                    MAIN         1.45      1.42       3.89    726.90    120.07    728.17      5.59      6.22


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9055E+01  EXCESS= .3884E+01 OUTFLOW= .1288E+02 BASIN STORAGE= .2546E-02 PERCENT ERROR=
.4


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN         1.45      1.42       5.00              114.78    730.00      5.59
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     ***              ***              ***              ***              ***

                             HYDROGRAPH AT STATION     CH10

      TOTAL RAINFALL =     7.44, TOTAL LOSS =     1.88, TOTAL EXCESS =     5.56

   PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                         6-HR        24-HR       72-HR     34.58-HR
 +   (CFS)       (HR)
                               (CFS)
 +     115.     12.17                     21.          6.          5.           5.
                             (INCHES)    4.522       5.577       5.586        5.586
                              (AC-FT)     10.         13.         13.          13.

                             CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
   276 KK     *    CABELM  *
              *            *
              **************
                              COMBINE AREAS UPSTREAM OF ELM FORK

   278 KO          OUTPUT CONTROL VARIABLES
                         IPRNT          3  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                          IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .083  TIME INTERVAL IN HOURS


   279 HC          HYDROGRAPH COMBINATION
                         ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                         ***

     ***              ***              ***              ***              ***

                             HYDROGRAPH AT STATION   CABELM

   PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                         6-HR        24-HR       72-HR     34.58-HR
 +   (CFS)       (HR)
                               (CFS)
 +    3155.     12.67                   1223.        515.        418.         418.
                             (INCHES)    4.991       8.412       9.827        9.827
                              (AC-FT)     606.       1022.       1194.        1194.

                             CUMULATIVE AREA =    2.28 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
   280 KK     *       N9T  *
              *            *
              **************
                              RUNOFF AREA N9T

   282 KO          OUTPUT CONTROL VARIABLES
                         IPRNT          3  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                          IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

   283 BA          SUBBASIN CHARACTERISTICS
                         TAREA        .02  SUBBASIN AREA

                   PRECIPITATION DATA

    13 PH                               DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                   ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
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           5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
             .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                            STORM AREA =       .02

 284 LS          SCS LOSS RATE
                       STRTL          .38  INITIAL ABSTRACTION
                      CRVNBR        84.00  CURVE NUMBER
                       RTIMP          .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 285 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L         566.  OVERLAND FLOW LENGTH
                           S        .0200  SLOPE
                           N         .350  ROUGHNESS COEFFICIENT
                          PA        100.0  PERCENT OF SUBBASIN
                       DXMIN            5  MINIMUM NUMBER OF DX INTERVALS

                 KINEMATIC WAVE
 286 RK            MAIN CHANNEL
                           L         696.  CHANNEL LENGTH
                           S        .0030  SLOPE
                           N         .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA          .02  CONTRIBUTING AREA
                       SHAPE         TRAP  CHANNEL SHAPE
                          WD          .00  BOTTOM WIDTH OR DIAMETER
                           Z         4.00  SIDE SLOPE
                     NDXMIN            2  MINIMUM NUMBER OF DX INTERVALS
                      RUPSTQ           NO  ROUTE UPSTREAM HYDROGRAPH

                                                         ***
                                  COMPUTED KINEMATIC PARAMETERS
                                        VARIABLE TIME STEP
                                      (DT SHOWN IS A MINIMUM)

                ELEMENT   ALPHA      M        DT       DX      PEAK    TIME TO     VOLUME    MAXIMUM
                                                                          PEAK                CELERITY
                                            (MIN)     (FT)     (CFS)    (MIN)       (IN)      (FPS)

               PLANE1       .60     1.67      4.26    94.36     40.09    734.99      5.54        .37
               MAIN        1.06     1.33      1.05   232.03     39.81    739.00      5.54       3.75

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .5247E+01 OUTFLOW= .5229E+01 BASIN STORAGE= .8873E-02 PERCENT ERROR=
 .2

                                     INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

               MAIN        1.06     1.33      5.00              39.58    740.00      5.54

     ***             ***             ***              ***             ***

                        HYDROGRAPH AT STATION       N9T

    TOTAL RAINFALL =      7.44, TOTAL LOSS =      1.88, TOTAL EXCESS =      5.56

  PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR         24-HR         72-HR      34.58-HR
 +   (CFS)       (HR)
                            (CFS)
 +      40.     12.33                  9.            3.            2.            2.
                          (INCHES)  4.481         5.528         5.537         5.537
                           (AC-FT)     4.            5.            5.            5.

                        CUMULATIVE AREA =      .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
 287 KK      *       N9S  *
             *            *
             **************
                          RUNOFF AREA N9S

 289 KO          OUTPUT CONTROL VARIABLES
                       IPRNT            3  PRINT CONTROL
                       IPLOT            0  PLOT CONTROL
                       QSCAL           0.  HYDROGRAPH PLOT SCALE
                       IPNCH            7  PUNCH COMPUTED HYDROGRAPH
                        IOUT           21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2          416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT         .083  TIME INTERVAL IN HOURS

               SUBBASIN RUNOFF DATA
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290 BA          SUBBASIN CHARACTERISTICS
                      TAREA          .01  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                            DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                 STORM AREA =       .01

291 LS          SCS LOSS RATE
                      STRTL          .33  INITIAL ABSTRACTION
                     CRVNBR        86.00  CURVE NUMBER
                      RTIMP          .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
292 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L          84.  OVERLAND FLOW LENGTH
                          S        .2000  SLOPE
                          N         .350  ROUGHNESS COEFFICIENT
                         PA        100.0  PERCENT OF SUBBASIN
                      DXMIN            5  MINIMUM NUMBER OF DX INTERVALS

                KINEMATIC WAVE
293 RK            MAIN CHANNEL
                          L         792.  CHANNEL LENGTH
                          S        .0140  SLOPE
                          N         .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA          .01  CONTRIBUTING AREA
                      SHAPE         TRAP  CHANNEL SHAPE
                         WD          .00  BOTTOM WIDTH OR DIAMETER
                          Z         4.00  SIDE SLOPE
                     NDXMIN            2  MINIMUM NUMBER OF DX INTERVALS
                     RUPSTQ           NO  ROUTE UPSTREAM HYDROGRAPH

                                                         ***
                                  COMPUTED KINEMATIC PARAMETERS
                                        VARIABLE TIME STEP
                                      (DT SHOWN IS A MINIMUM)

                   ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                               PEAK                 CELERITY
                                                  (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                  PLANE1        1.90     1.67       .71     16.71     74.98    724.42      5.79        .50
                  MAIN          2.29     1.33       .57    263.88     73.17    725.45      5.79       7.77

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .4570E+01 OUTFLOW= .4568E+01 BASIN STORAGE= .1143E-03 PERCENT ERROR=
.0

                                     INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                  MAIN          2.29     1.33      5.00               72.83    725.00      5.80

      ***           ***           ***            ***            ***

                          HYDROGRAPH AT STATION       N9S

    TOTAL RAINFALL =      7.44, TOTAL LOSS =     1.65, TOTAL EXCESS =      5.79

  PEAK FLOW      TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR        72-HR      34.58-HR
+    (CFS)       (HR)
                            (CFS)
+        73.     12.08                  7.           2.           2.           2.
                         (INCHES)    4.693        5.801        5.801        5.801
                          (AC-FT)       4.           5.           5.           5.

                         CUMULATIVE AREA =      .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  294 KK     *      CN9   *
             *            *
             **************
                       COMBINE N9 AREAS

  296 KO         OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
```

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                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .083  TIME INTERVAL IN HOURS


 297 HC          HYDROGRAPH COMBINATION
                    ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                       HYDROGRAPH AT STATION      CN9

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      99.     12.08                  16.          5.          3.           3.
                      (INCHES)     4.559       5.649       5.657        5.657
                       (AC-FT)        8.         10.         10.          10.

                      CUMULATIVE AREA =     .03 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


            **************
            *            *
 298 KK     *       CH9  *
            *            *
            **************
                         RUNOFF AREA CH9

 300 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           3  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                     IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 301 BA          SUBBASIN CHARACTERISTICS
                    TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

 302 LS          SCS LOSS RATE
                    STRTL         .38  INITIAL ABSTRACTION
                   CRVNBR       84.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 303 UK            OVERLAND-FLOW ELEMENT NO. 1
                         L         85.  OVERLAND FLOW LENGTH
                         S       .1570  SLOPE
                         N        .350  ROUGHNESS COEFFICIENT
                        PA       100.0  PERCENT OF SUBBASIN
                    DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
 304 RD            MAIN CHANNEL
                         L       1689.  CHANNEL LENGTH
                         S       .0010  SLOPE
                         N        .030  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .01  CONTRIBUTING AREA
                     SHAPE        TRAP  CHANNEL SHAPE
                        WD       10.00  BOTTOM WIDTH OR DIAMETER
                         Z        3.00  SIDE SLOPE
                    RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                                  ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                         COMPUTATION TIME STEP
                   ELEMENT    ALPHA       M          DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                   PLANE1        1.69      1.67        .64     16.97     26.58   724.79       5.56       .45
                   MAIN           .44      1.42       5.00    844.65     83.50   735.00       5.58      2.65
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 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9806E+01  EXCESS= .1601E+01 OUTFLOW= .1129E+02 BASIN STORAGE= .4162E-02 PERCENT ERROR=
1.0

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                   MAIN           .44      1.42       5.00               83.50    735.00      5.58

       ***            ***             ***             ***             ***

                        HYDROGRAPH AT STATION      CH9

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      84.     12.25                 18.          6.          4.           4.
                        (INCHES)    4.525       5.576       5.584        5.584
                         (AC-FT)      9.         11.         11.          11.

                        CUMULATIVE AREA =     .04 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  305 KK    *       N5T  *
            *            *
            **************
                         RUNOFF AREA N5T

  307 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  308 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .03  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .03

  309 LS          SCS LOSS RATE
                        STRTL        .38  INITIAL ABSTRACTION
                       CRVNBR      84.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  310 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L      1134.  OVERLAND FLOW LENGTH
                            S      .0200  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

                  KINEMATIC WAVE
  311 RK            MAIN CHANNEL
                            L       154.  CHANNEL LENGTH
                            S      .0020  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .03  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       4.00  SIDE SLOPE
                       NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                       RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                                 ***
                                          COMPUTED KINEMATIC PARAMETERS
                                                VARIABLE TIME STEP
                                             (DT SHOWN IS A MINIMUM)
```

```
                ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                              PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

               PLANE1        .60      1.67       5.00    125.96     50.66    750.75      5.52       .42
               MAIN          .87      1.33        .30     51.38     50.41    754.37      5.52      3.46

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .9338E+01 OUTFLOW= .9275E+01 BASIN STORAGE= .4378E-01 PERCENT ERROR=
.2

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

               MAIN          .87      1.33       5.00               50.41    755.00      5.51

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      N5T

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      50.     12.58                15.          5.          3.          3.
                        (INCHES)   4.428       5.498       5.513       5.513
                         (AC-FT)      7.          9.          9.          9.

                        CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  312 KK    *       N5S  *
            *            *
            **************
                         RUNOFF AREA N5S

  314 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  315 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .01  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .01

  316 LS          SCS LOSS RATE
                        STRTL        .33  INITIAL ABSTRACTION
                       CRVNBR      86.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  317 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L       126.  OVERLAND FLOW LENGTH
                            S      .1400  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

                  KINEMATIC WAVE
  318 RK            MAIN CHANNEL
                            L       629.  CHANNEL LENGTH
                            S      .0100  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .01  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       4.00  SIDE SLOPE
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                    NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                    RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED KINEMATIC PARAMETERS
                                        VARIABLE TIME STEP
                                      (DT SHOWN IS A MINIMUM)

                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                 PLANE1        1.59      1.67        .94     25.22     33.64    725.19      5.79       .51
                 MAIN          1.93      1.33        .73    209.60     32.50    726.07      5.79      5.64

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2161E+01 OUTFLOW= .2161E+01 BASIN STORAGE= .1163E-03 PERCENT ERROR=
.0

                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                 MAIN          1.93      1.33       5.00               31.52    725.00      5.79

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N5S

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      32.     12.08                    4.          1.          1.          1.
                        (INCHES)     4.683       5.791       5.792       5.792
                         (AC-FT)        2.          2.          2.          2.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  319 KK    *       CN5  *
            *            *
            **************
                          COMBINE N5 AREAS

  321 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  322 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CN5

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      63.     12.08                   18.          6.          4.          4.
                        (INCHES)     4.458       5.545       5.564       5.564
                         (AC-FT)        9.         11.         11.         11.

                        CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  323 KK    *       CH5  *
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*           *
**************
              RUNOFF AREA CH5

325 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

326 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA

                PRECIPITATION DATA

 13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .01

327 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
328 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L        101.  OVERLAND FLOW LENGTH
                          S       .1980  SLOPE
                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
                      DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
329 RD            MAIN CHANNEL
                          L       1359.  CHANNEL LENGTH
                          S       .0010  SLOPE
                          N        .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .01  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD       10.00  BOTTOM WIDTH OR DIAMETER
                          Z        3.00  SIDE SLOPE
                    RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                  PLANE1        1.89      1.67        .69     20.16     24.88   724.60      5.56       .52
                  MAIN           .44      1.42       5.00    679.30     66.15   740.00      5.54      2.39


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1142E+02  EXCESS= .1512E+01 OUTFLOW= .1288E+02 BASIN STORAGE= .8477E-02 PERCENT ERROR=
.4


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN           .44      1.42       5.00               66.15   740.00      5.54

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      CH5

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      66.     12.33                 21.          6.          5.          5.
                        (INCHES)   4.444       5.521       5.538       5.538
                         (AC-FT)     10.         13.         13.         13.

                        CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              *            *
 330 KK       *       N6T  *
              *            *
              **************
                            RUNOFF AREA N6T

 332 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 333 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

 334 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 335 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        476.  OVERLAND FLOW LENGTH
                           S       .0200  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS

                 KINEMATIC WAVE
 336 RK            MAIN CHANNEL
                           L        653.  CHANNEL LENGTH
                           S       .0050  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .01  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD         .00  BOTTOM WIDTH OR DIAMETER
                           Z        4.00  SIDE SLOPE
                      NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS
                      RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                      COMPUTED KINEMATIC PARAMETERS
                                           VARIABLE TIME STEP
                                        (DT SHOWN IS A MINIMUM)

                   ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                  CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                 PLANE1         .60      1.67       4.47     95.22     20.75    732.88      5.54       .36
                 MAIN          1.37      1.33       1.02    217.64     20.70    737.48      5.54      3.88


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2550E+01 OUTFLOW= .2541E+01 BASIN STORAGE= .3798E-02 PERCENT ERROR=
.2


                                      INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                 MAIN          1.37      1.33       5.00               20.47    735.00      5.53

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N6T

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      20.     12.25                    4.          1.          1.          1.
                       (INCHES)     4.475       5.520       5.528       5.528
                        (AC-FT)        2.          3.          3.          3.

                       CUMULATIVE AREA =     .01 SQ MI
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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 337 KK     *      N6S   *
            *            *
            **************
                        RUNOFF AREA N6S

 339 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


              SUBBASIN RUNOFF DATA

 340 BA         SUBBASIN CHARACTERISTICS
                      TAREA        .01  SUBBASIN AREA

                PRECIPITATION DATA

  13 PH                           DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ..............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =      .01

 341 LS         SCS LOSS RATE
                     STRTL         .33  INITIAL ABSTRACTION
                    CRVNBR       86.00  CURVE NUMBER
                     RTIMP         .00  PERCENT IMPERVIOUS AREA

                KINEMATIC WAVE
 342 UK           OVERLAND-FLOW ELEMENT NO. 1
                         L         86.  OVERLAND FLOW LENGTH
                         S       .2000  SLOPE
                         N        .350  ROUGHNESS COEFFICIENT
                        PA       100.0  PERCENT OF SUBBASIN
                     DXMIN           5  MINIMUM NUMBER OF DX INTERVALS

                KINEMATIC WAVE
 343 RK           MAIN CHANNEL
                         L        641.  CHANNEL LENGTH
                         S       .0050  SLOPE
                         N        .030  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .01  CONTRIBUTING AREA
                     SHAPE        TRAP  CHANNEL SHAPE
                        WD         .00  BOTTOM WIDTH OR DIAMETER
                         Z        4.00  SIDE SLOPE
                    NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS
                    RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                         ***
                                      COMPUTED KINEMATIC PARAMETERS
                                            VARIABLE TIME STEP
                                          (DT SHOWN IS A MINIMUM)

                   ELEMENT    ALPHA       M          DT          DX        PEAK     TIME TO      VOLUME     MAXIMUM
                                                                                     PEAK                  CELERITY
                                                   (MIN)        (FT)      (CFS)     (MIN)        (IN)       (FPS)

                  PLANE1       1.90      1.67        .59       17.15      32.70     724.84       5.79         .50
                  MAIN         1.37      1.33        .91      213.76      30.94     725.80       5.79        4.27


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1976E+01 OUTFLOW= .1976E+01 BASIN STORAGE= .4982E-04 PERCENT ERROR=
 .0


                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                  MAIN         1.37      1.33       5.00                  30.36     725.00       5.80

      ***            ***           ***             ***             ***

                        HYDROGRAPH AT STATION       N6S

    TOTAL RAINFALL =      7.44, TOTAL LOSS =      1.65, TOTAL EXCESS =      5.79

  PEAK FLOW      TIME                              MAXIMUM AVERAGE FLOW
                                       6-HR         24-HR        72-HR      34.58-HR
 +    (CFS)        (HR)
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                          (CFS)
+      30.     12.08                    3.          1.          1.          1.
                        (INCHES)     4.692       5.800       5.801       5.801
                         (AC-FT)        2.          2.          2.          2.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  344 KK     *       CN6  *
             *            *
             **************
                          COMBINE N6 AREAS

  346 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  347 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      CN6

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      44.     12.08                    7.          2.          2.          2.
                        (INCHES)     4.554       5.637       5.644       5.644
                         (AC-FT)        4.          5.          5.          5.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  348 KK     *      CCH6  *
             *            *
             **************
                          COMBINE AREAS N5 AND N6 AT CH6

  350 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  351 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     CCH6

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     100.     12.17                   28.          9.          6.          6.
                        (INCHES)     4.464       5.549       5.565       5.565
                         (AC-FT)       14.         17.         17.         17.

                        CUMULATIVE AREA =     .06 SQ MI
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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
  352 KK      *       CH6  *
              *            *
              **************
                             RUNOFF AREA CH6

  354 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

  355 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .00

  356 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  357 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L       101.  OVERLAND FLOW LENGTH
                            S      .1700  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  358 RD            MAIN CHANNEL
                            L      1371.  CHANNEL LENGTH
                            S      .0010  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .00  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD      20.00  BOTTOM WIDTH OR DIAMETER
                            Z       3.00  SIDE SLOPE
                      RUPSTQ        YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                          COMPUTATION TIME STEP
                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                    PEAK                CELERITY
                                                       (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                    PLANE1        1.76      1.67        .74     20.24     22.15   725.13      5.56       .50
                    MAIN           .30      1.48       5.00    685.60    101.78   740.00      5.54      2.44


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1739E+02  EXCESS= .1364E+01 OUTFLOW= .1868E+02 BASIN STORAGE= .1235E-01 PERCENT ERROR=
.4


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN           .30      1.48       5.00              101.78   740.00      5.54

       ***             ***             ***             ***             ***

                           HYDROGRAPH AT STATION      CH6

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                           (CFS)
+     102.     12.33                 30.          9.          7.           7.
                        (INCHES)   4.449       5.527       5.541        5.541
                         (AC-FT)     15.         19.         19.          19.
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                    CUMULATIVE AREA =     .06 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 359 KK     *      N7AT  *
            *            *
            **************
                         RUNOFF AREA N7AT

 361 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 362 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .02  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                STORM AREA =     .02

 363 LS          SCS LOSS RATE
                      STRTL        .38  INITIAL ABSTRACTION
                     CRVNBR      84.00  CURVE NUMBER
                      RTIMP        .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 364 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L       583.  OVERLAND FLOW LENGTH
                          S      .0200  SLOPE
                          N       .350  ROUGHNESS COEFFICIENT
                         PA      100.0  PERCENT OF SUBBASIN
                      DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

                 KINEMATIC WAVE
 365 RK            MAIN CHANNEL
                          L       408.  CHANNEL LENGTH
                          S      .0030  SLOPE
                          N       .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .02  CONTRIBUTING AREA
                      SHAPE       TRAP  CHANNEL SHAPE
                         WD        .00  BOTTOM WIDTH OR DIAMETER
                          Z       4.00  SIDE SLOPE
                     NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                     RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                     COMPUTED KINEMATIC PARAMETERS
                                           VARIABLE TIME STEP
                                       (DT SHOWN IS A MINIMUM)

                   ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                   PLANE1       .60     1.67       4.35     97.14     42.01    738.86      5.54       .37
                   MAIN        1.06     1.33        .75    136.06     41.97    738.16      5.54      3.86


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .5603E+01 OUTFLOW= .5580E+01 BASIN STORAGE= .9999E-02 PERCENT ERROR=
.2


                                       INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                   MAIN        1.06     1.33       5.00                41.55    740.00      5.48

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     N7AT

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56
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  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      42.     12.33                    9.          3.          2.          2.
                        (INCHES)     4.422       5.469       5.478       5.478
                         (AC-FT)        4.          6.          6.          6.

                         CUMULATIVE AREA =     .02 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  366 KK    *      N7AS  *
            *            *
            **************
                         RUNOFF AREA N7AS

  368 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  369 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .01  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

  370 LS          SCS LOSS RATE
                        STRTL        .33  INITIAL ABSTRACTION
                       CRVNBR      86.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  371 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        92.  OVERLAND FLOW LENGTH
                            S      .2000  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

                  KINEMATIC WAVE
  372 RK            MAIN CHANNEL
                            L       467.  CHANNEL LENGTH
                            S      .0110  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .01  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       4.00  SIDE SLOPE
                       NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                       RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                     COMPUTED KINEMATIC PARAMETERS
                                          VARIABLE TIME STEP
                                       (DT SHOWN IS A MINIMUM)

                    ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                   PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                    PLANE1        1.90      1.67       .76     18.35     34.43   724.63      5.79       .52
                    MAIN          2.03      1.33       .46    155.79     33.53   725.11      5.79      5.85


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2100E+01 OUTFLOW= .2098E+01 BASIN STORAGE= .5111E-04 PERCENT ERROR=
.0


                                     INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN          2.03      1.33      5.00               33.45   725.00      5.80
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      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     N7AS

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      33.     12.08                 3.          1.          1.          1.
                        (INCHES)   4.694       5.802       5.802       5.802
                         (AC-FT)     2.          2.          2.          2.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  373 KK    *      CN7A  *
            *            *
            **************
                          COMBINE N7A AREAS

  375 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


  376 HC          HYDROGRAPH COMBINATION
                        ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     CN7A

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      61.     12.08                12.          4.          3.          3.
                        (INCHES)   4.480       5.553       5.564       5.564
                         (AC-FT)     6.          8.          8.          8.

                        CUMULATIVE AREA =     .03 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  377 KK    *     CCH7A  *
            *            *
            **************
                          COMBINE AREAS N5, N6, N7A AT CH7A

  379 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


  380 HC          HYDROGRAPH COMBINATION
                        ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    CCH7A
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  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     153.     12.33                  43.         13.          9.           9.
                        (INCHES)    4.453       5.534       5.548        5.548
                         (AC-FT)      21.         26.         26.          26.

                        CUMULATIVE AREA =     .09 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  381 KK    *      CH7A  *
            *            *
            **************
                        RUNOFF AREA CH7A

  383 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  384 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .00

  385 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  386 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L         78.  OVERLAND FLOW LENGTH
                            S       .2030  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
  387 RD            MAIN CHANNEL
                            L        885.  CHANNEL LENGTH
                            S       .0010  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .00  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD       40.00  BOTTOM WIDTH OR DIAMETER
                            Z        3.00  SIDE SLOPE
                      RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                   COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                            COMPUTATION TIME STEP
                    ELEMENT    ALPHA       M          DT        DX        PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                     PEAK                CELERITY
                                                     (MIN)      (FT)      (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        1.92      1.67        .70     15.66     17.79    724.44      5.56       .48
                    MAIN           .19      1.54       5.00    885.29    153.03    745.00      5.53      2.40


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2630E+02  EXCESS= .1067E+01 OUTFLOW= .2726E+02 BASIN STORAGE= .1321E-01 PERCENT ERROR=
.4


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                    MAIN           .19      1.54       5.00              153.03    745.00      5.53

       ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION     CH7A
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    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     153.     12.42                 44.         14.         10.          10.
                        (INCHES)    4.441       5.512       5.525        5.525
                         (AC-FT)     22.         27.         27.          27.

                        CUMULATIVE AREA =     .09 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  388 KK    *      N7BT  *
            *            *
            **************
                        RUNOFF AREA N7BT

  390 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

  391 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .01

  392 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  393 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        563.  OVERLAND FLOW LENGTH
                            S       .0200  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS

                  KINEMATIC WAVE
  394 RK            MAIN CHANNEL
                            L        410.  CHANNEL LENGTH
                            S       .0030  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .01  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD         .00  BOTTOM WIDTH OR DIAMETER
                            Z        4.00  SIDE SLOPE
                       NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS
                       RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                     COMPUTED KINEMATIC PARAMETERS
                                          VARIABLE TIME STEP
                                       (DT SHOWN IS A MINIMUM)

                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                     PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                    PLANE1        .60      1.67       4.26     93.81     19.21    734.56       5.54       .37
                    MAIN         1.06      1.33        .87    136.73     19.17    738.52       5.54      3.16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .2520E+01 OUTFLOW= .2511E+01 BASIN STORAGE= .4450E-02 PERCENT ERROR=
.2


                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL
```

```
                  MAIN          1.06      1.33       5.00               18.96    740.00      5.51

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     N7BT

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      19.     12.33                 4.          1.          1.          1.
                        (INCHES)    4.458       5.504       5.513       5.513
                         (AC-FT)      2.          2.          2.          2.

                        CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  395 KK    *      N7BS  *
            *            *
            **************
                        RUNOFF AREA N7BS

  397 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  398 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .01  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .01

  399 LS          SCS LOSS RATE
                        STRTL        .33  INITIAL ABSTRACTION
                       CRVNBR      86.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  400 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L         86.  OVERLAND FLOW LENGTH
                            S      .2000  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

                  KINEMATIC WAVE
  401 RK            MAIN CHANNEL
                            L        405.  CHANNEL LENGTH
                            S      .0140  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .01  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       4.00  SIDE SLOPE
                       NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                       RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                          COMPUTED KINEMATIC PARAMETERS
                                                VARIABLE TIME STEP
                                             (DT SHOWN IS A MINIMUM)

                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                     PEAK                CELERITY
                                                      (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                     PLANE1        1.90      1.67        .73     17.29     26.43    725.04      5.79       .51
                     MAIN          2.29      1.33        .46    135.11     26.06    725.03      5.79      6.08
```

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 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .1606E+01 OUTFLOW= .1605E+01 BASIN STORAGE= .3639E-04 PERCENT ERROR=
.0

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                    MAIN          2.29      1.33       5.00               26.03    725.00      5.80

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     N7BS

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      26.     12.08                  3.          1.          1.          1.
                        (INCHES)    4.696       5.804       5.804       5.804
                         (AC-FT)      1.          2.          2.          2.

                         CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  402 KK     *      CN7B  *
             *            *
             **************
                           COMBINE N7B AREAS

  404 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  405 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     CN7B

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      39.     12.08                  7.          2.          1.          1.
                        (INCHES)    4.530       5.614       5.624       5.624
                         (AC-FT)      3.          4.          4.          4.

                         CUMULATIVE AREA =     .01 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
  406 KK     *     CCH7B  *
             *            *
             **************
                           COMBINE AREAS N5, N6, N7A, N7B AT CH7B

  408 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS
```

```
 409 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION    CCH7B

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     178.     12.33                  51.         16.         11.          11.
                        (INCHES)    4.449       5.525       5.538        5.538
                         (AC-FT)      25.         31.         31.          31.

                        CUMULATIVE AREA =     .11 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 410 KK     *      CH7B  *
            *            *
            **************
                        RUNOFF AREA CH7B

 412 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 413 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .01

 414 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
 415 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L        109.  OVERLAND FLOW LENGTH
                           S       .1770  SLOPE
                           N        .350  ROUGHNESS COEFFICIENT
                          PA       100.0  PERCENT OF SUBBASIN
                       DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                 MUSKINGUM-CUNGE
 416 RD            MAIN CHANNEL
                           L       1127.  CHANNEL LENGTH
                           S       .0010  SLOPE
                           N        .030  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .01  CONTRIBUTING AREA
                       SHAPE        TRAP  CHANNEL SHAPE
                          WD       40.00  BOTTOM WIDTH OR DIAMETER
                           Z        3.00  SIDE SLOPE
                     RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                                  ***
                                 COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                        COMPUTATION TIME STEP
                   ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                 PEAK                  CELERITY
                                                   (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                 PLANE1        1.79      1.67        .76     21.81     27.68    724.82      5.56       .52
                 MAIN           .19      1.54       5.00   1127.00    178.99    745.00      5.50      2.53


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3137E+02  EXCESS= .1690E+01 OUTFLOW= .3283E+02 BASIN STORAGE= .1812E-01 PERCENT ERROR=
.6
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                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                   MAIN           .19      1.54       5.00              178.99    745.00      5.50

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     CH7B

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     179.     12.42                  53.         17.         11.          11.
                        (INCHES)    4.431       5.489       5.501        5.501
                         (AC-FT)      26.         33.         33.          33.

                        CUMULATIVE AREA =     .11 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  417 KK    *       N8T  *
            *            *
            **************
                      RUNOFF AREA N8T

  419 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                 SUBBASIN RUNOFF DATA

  420 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .03  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .03

  421 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  422 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        552.  OVERLAND FLOW LENGTH
                            S       .0200  SLOPE
                            N        .350  ROUGHNESS COEFFICIENT
                           PA       100.0  PERCENT OF SUBBASIN
                        DXMIN           5  MINIMUM NUMBER OF DX INTERVALS

                  KINEMATIC WAVE
  423 RK            MAIN CHANNEL
                            L        668.  CHANNEL LENGTH
                            S       .0030  SLOPE
                            N        .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .03  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD         .00  BOTTOM WIDTH OR DIAMETER
                            Z        4.00  SIDE SLOPE
                       NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS
                       RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                          ***
                                          COMPUTED KINEMATIC PARAMETERS
                                                VARIABLE TIME STEP
                                             (DT SHOWN IS A MINIMUM)

                     ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                     PEAK               CELERITY
                                                      (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)
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                    PLANE1          .60      1.67       4.22     91.99     58.94    737.44      5.54       .37
                    MAIN           1.06      1.33       1.03    222.57     58.33    737.03      5.54      4.16

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .7648E+01 OUTFLOW= .7622E+01 BASIN STORAGE= .1297E-01 PERCENT ERROR=
.2

                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                    MAIN           1.06      1.33       5.00               58.04    740.00      5.53

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION      N8T

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      58.     12.33                  12.          4.          3.           3.
                        (INCHES)    4.479       5.525       5.534        5.534
                         (AC-FT)      6.          8.          8.           8.

                         CUMULATIVE AREA =     .03 SQ MI


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            *            *
  424 KK    *       N8S  *
            *            *
            **************
                          RUNOFF AREA N8S

  426 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS

                SUBBASIN RUNOFF DATA

  427 BA          SUBBASIN CHARACTERISTICS
                        TAREA        .02  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .02

  428 LS          SCS LOSS RATE
                        STRTL        .33  INITIAL ABSTRACTION
                       CRVNBR      86.00  CURVE NUMBER
                        RTIMP        .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  429 UK            OVERLAND-FLOW ELEMENT NO. 1
                            L        92.  OVERLAND FLOW LENGTH
                            S      .2000  SLOPE
                            N       .350  ROUGHNESS COEFFICIENT
                           PA      100.0  PERCENT OF SUBBASIN
                        DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

                  KINEMATIC WAVE
  430 RK            MAIN CHANNEL
                            L       925.  CHANNEL LENGTH
                            S      .0180  SLOPE
                            N       .030  CHANNEL ROUGHNESS COEFFICIENT
                           CA        .02  CONTRIBUTING AREA
                        SHAPE       TRAP  CHANNEL SHAPE
                           WD        .00  BOTTOM WIDTH OR DIAMETER
                            Z       4.00  SIDE SLOPE
                       NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                       RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                                  ***
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                                   COMPUTED KINEMATIC PARAMETERS
                                        VARIABLE TIME STEP
                                     (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M          DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                PEAK                  CELERITY
                                                   (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                PLANE1        1.90      1.67        .76     18.34     81.00   724.62       5.79       .52
                MAIN          2.60      1.33        .67    308.17     78.07   725.64       5.79      8.74

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00  EXCESS= .4940E+01 OUTFLOW= .4939E+01 BASIN STORAGE= .1245E-03 PERCENT ERROR=
.0

                                          INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN          2.60      1.33       5.00                77.49   725.00       5.80

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N8S

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.65, TOTAL EXCESS =    5.79

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      77.     12.08                 8.          2.          2.          2.
                        (INCHES)   4.689       5.797       5.797       5.797
                         (AC-FT)     4.          5.          5.          5.

                        CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  431 KK    *       CN8  *
            *            *
            **************
                          COMBINE N8 AREAS

  433 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS

  434 HC          HYDROGRAPH COMBINATION
                        ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      CN8

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     116.     12.08                20.          6.          4.          4.
                        (INCHES)   4.543       5.626       5.635       5.635
                         (AC-FT)    10.         13.         13.         13.

                        CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  435 KK    *      C2W2  *
            *            *
            **************
                          COMBINE AREAS N5-N9 INTO POND 2
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 437 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


 438 HC          HYDROGRAPH COMBINATION
                       ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION     C2W2

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     334.     12.33                  92.         29.         20.          20.
                        (INCHES)    4.469       5.536       5.547        5.547
                         (AC-FT)      46.         57.         57.          57.

                        CUMULATIVE AREA =     .19 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
 439 KK     *        W2  *
            *            *
            **************
                         RUNOFF WITHIN POND 2

 441 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 442 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .02

 443 LS          SCS LOSS RATE
                       STRTL         .00  INITIAL ABSTRACTION
                      CRVNBR      100.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 444 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .00  LAG

                                                                  ***

                                                        UNIT HYDROGRAPH
                                                   5 END-OF-PERIOD ORDINATES
                 89.       25.        5.        1.        0.

      ***             ***             ***             ***             ***

                         HYDROGRAPH AT STATION       W2

    TOTAL RAINFALL =    7.44, TOTAL LOSS =     .00, TOTAL EXCESS =    7.44

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      79.     12.08                   9.          3.          2.           2.
                        (INCHES)    5.468       7.437       7.440        7.440
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                    (AC-FT)        4.          6.          6.          6.

                    CUMULATIVE AREA =     .02 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
 445 KK     *    PND2IN  *
            *            *
            **************
                    COMBINE AREAS INTO POND 2

 447 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  Ppunch COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


 448 HC          HYDROGRAPH COMBINATION
                      ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

      ***            ***            ***            ***            ***

                      HYDROGRAPH AT STATION   PND2IN

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+     366.     12.25                101.         31.         22.         22.
                       (INCHES)    4.523       5.645       5.688       5.688
                        (AC-FT)     50.         62.         63.         63.

                       CUMULATIVE AREA =     .21 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 449 KK     *    PD2OUT  *
            *            *
            **************
                    ROUTE THROUGH POND W2

 451 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS


                HYDROGRAPH ROUTING DATA

 452 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC     454.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

 453 SA              AREA          .0       4.4       6.8       8.3       8.4       8.5       8.6       8.9       9.1

 454 SE          ELEVATION     454.00    454.50    455.00    455.50    456.00    456.50    457.00    458.00    459.00

 456 SL          LOW-LEVEL OUTLET
                      ELEVL     456.00  ELEVATION AT CENTER OF OUTLET
                      CAREA      28.27  CROSS-SECTIONAL AREA
                       COQL        .80  COEFFICIENT
                       EXPL        .50  EXPONENT OF HEAD

 455 SS          SPILLWAY
                       CREL     458.00  SPILLWAY CREST ELEVATION
                      SPWID      25.00  SPILLWAY WIDTH
                       COQW       2.60  WEIR COEFFICIENT
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                    EXPW        1.50  EXPONENT OF HEAD

                                                  ***

                                          COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00       .74      3.53      7.28     11.44     15.66     19.94     28.69     37.69
        ELEVATION     454.00    454.50    455.00    455.50    456.00    456.50    457.00    458.00    459.00

                                          COMPUTED OUTFLOW-ELEVATION DATA

          OUTFLOW        .00       .00    284.43    280.08    275.86    271.77    267.80    263.94    260.19    256.55
        ELEVATION     454.00    456.00    458.46    458.38    458.31    458.24    458.18    458.12    458.06    458.00

          OUTFLOW     307.16    313.30    319.87    326.90    334.39    342.35    350.80    359.75    369.22    379.21
        ELEVATION     458.48    458.53    458.58    458.63    458.69    458.74    458.81    458.87    458.93    459.00


                                       COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00       .74      3.53      7.28     11.44     15.66     19.94     28.69     32.78     32.97
          OUTFLOW        .00       .00       .00       .00       .00    128.27    181.41    256.55    304.59    307.16
        ELEVATION     454.00    454.50    455.00    455.50    456.00    456.50    457.00    458.00    458.46    458.48

          STORAGE      33.40     33.86     34.34     34.85     35.37     35.92     36.48     37.07     37.69
          OUTFLOW     313.30    319.87    326.90    334.39    342.35    350.80    359.75    369.22    379.21
        ELEVATION     458.53    458.58    458.63    458.69    458.74    458.81    458.87    458.93    459.00

     ***            ***            ***            ***            ***

                     HYDROGRAPH AT STATION   PD2OUT

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     201.     13.00        88.         26.         18.          18.
                       (INCHES)     3.933       4.651       4.651        4.651
                        (AC-FT)        43.         51.         51.          51.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                   6-HR       24-HR       72-HR     34.58-HR
+  (AC-FT)      (HR)
       22.     13.00        15.         12.          9.           9.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR     34.58-HR
+   (FEET)      (HR)
    457.26     13.00       456.44      456.08      455.54       455.54

                     CUMULATIVE AREA =     .21 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
  457 KK    *       N14  *
            *            *
            **************
                      RUNOFF AREA N14

  459 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  460 BA          SUBBASIN CHARACTERISTICS
                       TAREA        .04  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .04

  461 LS          SCS LOSS RATE
                       STRTL        .38  INITIAL ABSTRACTION
                      CRVNBR      84.00  CURVE NUMBER
                       RTIMP        .00  PERCENT IMPERVIOUS AREA
```

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 462 US          SNYDER UNITGRAPH
                          TP         .38  LAG
                          CP         .67  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .45 HR,       R=   .31 HR
                                         SNYDER   TP=   .38 HR,      CP=   .67

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                  4.       15.       29.       41.       46.       42.       33.       25.       19.       14.
                 11.        8.        6.        5.        4.        3.        2.        2.        1.        1.
                  1.        1.        0.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      N14

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                            (CFS)
+      88.     12.42                 20.          6.          4.          4.
                         (INCHES)  4.495       5.536       5.536       5.536
                          (AC-FT)    10.         12.         12.         12.

                         CUMULATIVE AREA =     .04 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
 463 KK     *       N15  *
            *            *
            **************
                          RUNOFF AREA N15

 465 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 466 BA          SUBBASIN CHARACTERISTICS
                       TAREA        .03  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                   STORM AREA =     .03

 467 LS          SCS LOSS RATE
                       STRTL        .38  INITIAL ABSTRACTION
                      CRVNBR      84.00  CURVE NUMBER
                       RTIMP        .00  PERCENT IMPERVIOUS AREA

 468 US          SNYDER UNITGRAPH
                          TP         .47  LAG
                          CP         .68  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=   .56 HR,       R=   .36 HR
                                         SNYDER   TP=   .47 HR,      CP=   .69

                                                     UNIT HYDROGRAPH
                                                 27 END-OF-PERIOD ORDINATES
                  2.        7.       14.       21.       27.       29.       28.       23.       18.       15.
                 12.        9.        7.        6.        5.        4.        3.        2.        2.        1.
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                1.        1.        1.        1.        0.        0.        0.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      N15

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      61.     12.50                 15.          5.          3.           3.
                        (INCHES)    4.491       5.534       5.534        5.534
                         (AC-FT)      7.          9.          9.           9.

                        CUMULATIVE AREA =     .03 SQ MI


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            *            *
  469 KK    *     C1N14  *
            *            *
            **************
                          COMBINE AREAS N14, N15 & POND 2

  471 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


  472 HC          HYDROGRAPH COMBINATION
                        ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    C1N14

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     325.     12.58                120.         37.         25.          25.
                        (INCHES)    3.995       4.870       4.878        4.878
                         (AC-FT)     59.         72.         73.          73.

                        CUMULATIVE AREA =     .28 SQ MI


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            *            *
  473 KK    *        S2  *
            *            *
            **************
                          RUNOFF AREA S2

  475 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  476 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .05  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
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                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .05

  477 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  478 US          SNYDER UNITGRAPH
                          TP         .73  LAG
                          CP         .67  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                                 ***

                                                      UNIT HYDROGRAPH PARAMETERS
                                                 CLARK   TC=   .84 HR,       R=   .59 HR
                                                SNYDER   TP=   .74 HR,      CP=   .68

                                                          UNIT HYDROGRAPH
                                                      43 END-OF-PERIOD ORDINATES
                  1.       4.       8.      12.      17.      21.      25.      27.      28.      27.
                 25.      22.      19.      16.      14.      12.      11.       9.       8.       7.
                  6.       5.       5.       4.       3.       3.       3.       2.       2.       2.
                  1.       1.       1.       1.       1.       1.       1.       1.       0.       0.
                  0.       0.       0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       S2

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+      70.     12.75                  22.          7.          5.          5.
                        (INCHES)    4.475       5.531       5.531       5.531
                         (AC-FT)     11.         14.         14.         14.

                        CUMULATIVE AREA =     .05 SQ MI


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            *            *
  479 KK    *       N19  *
            *            *
            **************
                         RUNOFF AREA N19

  481 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  482 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .00  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                  STORM AREA =     .00

  483 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

                  KINEMATIC WAVE
  484 UK            OVERLAND-FLOW ELEMENT NO. 1
                           L         44.  OVERLAND FLOW LENGTH
                           S      .3300  SLOPE
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                        N        .350  ROUGHNESS COEFFICIENT
                       PA       100.0  PERCENT OF SUBBASIN
                    DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                MUSKINGUM-CUNGE
 485 RD           MAIN CHANNEL
                        L       1305.  CHANNEL LENGTH
                        S       .0016  SLOPE
                        N        .030  CHANNEL ROUGHNESS COEFFICIENT
                       CA         .00  CONTRIBUTING AREA
                    SHAPE        TRAP  CHANNEL SHAPE
                       WD       10.00  BOTTOM WIDTH OR DIAMETER
                        Z        3.00  SIDE SLOPE
                   RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                        ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                         COMPUTATION TIME STEP
                  ELEMENT    ALPHA       M         DT        DX        PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                  PEAK                CELERITY
                                                     (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                  PLANE1        2.45     1.67        .46      8.73     14.05   724.63      5.56       .45
                  MAIN           .55     1.42       5.00    652.50     70.96   775.00      5.53      2.68

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1372E+02  EXCESS= .8301E+00 OUTFLOW= .1453E+02 BASIN STORAGE= .2074E-02 PERCENT ERROR=
.1

                                         INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                  MAIN           .55     1.42       5.00               70.96   775.00      5.53

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N19

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      71.     12.92                 24.          7.          5.          5.
                       (INCHES)    4.472       5.525       5.525       5.525
                        (AC-FT)     12.         15.         15.         15.

                       CUMULATIVE AREA =     .05 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 486 KK     *       N18  *
            *            *
            **************
                        RUNOFF AREA N18

 488 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 489 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                                 DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .01

 490 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

                 KINEMATIC WAVE
```

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 491 UK            OVERLAND-FLOW ELEMENT NO. 1
                          L         41.  OVERLAND FLOW LENGTH
                          S       .3300  SLOPE
                          N        .350  ROUGHNESS COEFFICIENT
                         PA       100.0  PERCENT OF SUBBASIN
                      DXMIN           5  MINIMUM NUMBER OF DX INTERVALS
                  MUSKINGUM-CUNGE
 492 RD            MAIN CHANNEL
                          L       1123.  CHANNEL LENGTH
                          S       .0016  SLOPE
                          N        .030  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .01  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD       15.00  BOTTOM WIDTH OR DIAMETER
                          Z        3.00  SIDE SLOPE
                     RUPSTQ         YES  ROUTE UPSTREAM HYDROGRAPH

                                                        ***
                                COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                       COMPUTATION TIME STEP
                   ELEMENT    ALPHA       M         DT        DX        PEAK    TIME TO     VOLUME    MAXIMUM
                                                                                   PEAK                  CELERITY
                                                     (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                   PLANE1        2.45      1.67        .35      8.24     32.11    724.67      5.56       .43
                   MAIN           .45      1.45       5.00    561.70     73.68    780.00      5.52      2.58

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1453E+02  EXCESS= .1897E+01 OUTFLOW= .1640E+02 BASIN STORAGE= .2249E-02 PERCENT ERROR=
.1


                                       INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                   MAIN           .45      1.45       5.00               73.68    780.00      5.52

       ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N18

     TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                         (CFS)
+      74.     13.00                 27.          8.          6.           6.
                       (INCHES)    4.470       5.521       5.521        5.521
                        (AC-FT)     13.         16.         16.          16.

                       CUMULATIVE AREA =     .06 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 493 KK     *        O5  *
            *            *
            **************
                         OFFSITE AREA O5

 495 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               SUBBASIN RUNOFF DATA

 496 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .18  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                              DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .18

 497 LS          SCS LOSS RATE
                      STRTL         .38  INITIAL ABSTRACTION
                     CRVNBR       84.00  CURVE NUMBER
```

```
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 498 US          SNYDER UNITGRAPH
                          TP         .59  LAG
                          CP         .64  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .67 HR,       R=   .52 HR
                                        SNYDER   TP=   .59 HR,      CP=   .64

                                                     UNIT HYDROGRAPH
                                                38 END-OF-PERIOD ORDINATES
                 7.       24.       48.       74.      100.      119.      129.      129.      116.       99.
                84.       72.       61.       52.       44.       38.       32.       27.       23.       20.
                17.       14.       12.       10.        9.        7.        6.        5.        5.        4.
                 3.        3.        2.        2.        2.        1.        1.        1.

      ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION       05

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     302.     12.67                 88.         27.         19.         19.
                        (INCHES)   4.481      5.533       5.533       5.533
                         (AC-FT)     43.         54.         54.         54.

                        CUMULATIVE AREA =     .18 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 499 KK     *        S1  *
            *            *
            **************
                          RUNOFF AREA S1

 501 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

 502 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                     STORM AREA =     .02

 503 LS          SCS LOSS RATE
                       STRTL         .38  INITIAL ABSTRACTION
                      CRVNBR       84.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 504 US          SNYDER UNITGRAPH
                          TP         .75  LAG
                          CP         .70  PEAKING COEFFICIENT

                 SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .86 HR,       R=   .56 HR
                                        SNYDER   TP=   .75 HR,      CP=   .69

                                                     UNIT HYDROGRAPH
                                                42 END-OF-PERIOD ORDINATES
```

```
                0.       1.       3.       4.       6.       7.       8.       9.       9.       9.
                8.       7.       6.       5.       5.       4.       3.       3.       3.       2.
                2.       2.       1.       1.       1.       1.       1.       1.       1.       1.
                0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
                0.       0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION       S1

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                                  (CFS)
+      23.     12.75                   7.          2.          2.           2.
                              (INCHES)     4.479       5.534       5.534        5.534
                               (AC-FT)        4.          4.          4.           4.

                              CUMULATIVE AREA =     .02 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            *            *
  505 KK    *       N17  *
            *            *
            **************
                          RUNOFF AREA N17

  507 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           7  PUNCH COMPUTED HYDROGRAPH
                         IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         416  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .083  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  508 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

   13 PH                                DEPTHS FOR   4-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.57    3.19    4.18    4.52    5.47    6.43    7.44     .00     .00     .00     .00

                                                      STORM AREA =     .01

  509 LS          SCS LOSS RATE
                        STRTL         .38  INITIAL ABSTRACTION
                       CRVNBR       84.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  510 US          SNYDER UNITGRAPH
                          TP         .12  LAG
                          CP         .64  PEAKING COEFFICIENT

                  SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                             CLARK   TC=   .14 HR,       R=   .09 HR
                                            SNYDER   TP=   .12 HR,      CP=   .64

                                                      UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
                 11.       21.       13.        5.        2.        1.        0.

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION      N17

    TOTAL RAINFALL =    7.44, TOTAL LOSS =    1.88, TOTAL EXCESS =    5.56

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                                  (CFS)
+      24.     12.17                   3.          1.          1.           1.
                              (INCHES)     4.508       5.545       5.545        5.545
                               (AC-FT)        2.          2.          2.           2.
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                    CUMULATIVE AREA =     .01 SQ MI


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            **************
            *            *
  511 KK    *      C1O7  *
            *            *
            **************
                     COMBINE AREAS S1, O6, AND N17-19

  513 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          7  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        416  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .083  TIME INTERVAL IN HOURS


  514 HC          HYDROGRAPH COMBINATION
                       ICOMP          4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     C1O7

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     34.58-HR
+   (CFS)       (HR)
                          (CFS)
+     390.     12.67                125.         39.         27.          27.
                        (INCHES)    4.477       5.531       5.531        5.531
                         (AC-FT)      62.         77.         77.          77.

                       CUMULATIVE AREA =     .26 SQ MI

1
                                                   RUNOFF SUMMARY
                                              FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                        PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW    PEAK                                            AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                            O1       394.   12.42          92.         28.         20.        .18

          HYDROGRAPH AT
+                            O2      2171.   12.75         767.        239.        166.       1.58

          HYDROGRAPH AT
+                            S4        96.   13.00          36.         11.          8.        .08

          3 COMBINED AT
+                           CS4      2547.   12.75         894.        278.        193.       1.84

          HYDROGRAPH AT
+                            N1        39.   12.42           9.          3.          2.        .02

          HYDROGRAPH AT
+                            O3        62.   12.33          12.          4.          3.        .03

          3 COMBINED AT
+                         C1MWY      2606.   12.75         915.        285.        198.       1.88

          HYDROGRAPH AT
+                            S3        45.   12.83          15.          5.          3.        .03

          HYDROGRAPH AT
+                           N20        46.   13.00          17.          5.          4.        .04

          2 COMBINED AT
+                         C2MWY      2647.   12.75         932.        290.        201.       1.91

          HYDROGRAPH AT
+                          N11T        12.   12.25           2.          1.          0.        .00

          HYDROGRAPH AT
+                          N11S        32.   12.08           3.          1.          1.        .01

          2 COMBINED AT
+                          CN11        41.   12.08           6.          2.          1.        .01
```

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          HYDROGRAPH AT
+                         CH11        40.   12.25          8.          2.          2.        .02
          HYDROGRAPH AT
+                          N2T        31.   12.25          7.          2.          1.        .01
          HYDROGRAPH AT
+                          N2S        24.   12.08          2.          1.          1.        .00
          2 COMBINED AT
+                          CN2        47.   12.08          9.          3.          2.        .02
          2 COMBINED AT
+                         CCH2        82.   12.17         17.          5.          4.        .04
          HYDROGRAPH AT
+                          CH2        84.   12.25         18.          6.          4.        .04
          HYDROGRAPH AT
+                          N12        28.   12.42          6.          2.          1.        .01
          HYDROGRAPH AT
+                          N3T       122.   12.25         25.          7.          5.        .05
          HYDROGRAPH AT
+                          N3S        26.   12.08          3.          1.          1.        .01
          3 COMBINED AT
+                          CN3       156.   12.25         33.         10.          7.        .07
          2 COMBINED AT
+                         CCH3       240.   12.25         51.         15.         11.        .11
          HYDROGRAPH AT
+                          CH3       237.   12.33         53.         16.         11.        .11
          HYDROGRAPH AT
+                          N4T        23.   12.33          6.          2.          1.        .01
          HYDROGRAPH AT
+                          N4S        34.   12.08          4.          1.          1.        .01
          2 COMBINED AT
+                          CN4        50.   12.08          9.          3.          2.        .02
          HYDROGRAPH AT
+                          CH4        62.   12.17         12.          4.          3.        .02
          2 COMBINED AT
+                        C1CH4A       288.   12.25         65.         20.         14.        .14
          HYDROGRAPH AT
+                         CH4A       286.   12.25         66.         20.         14.        .14
          HYDROGRAPH AT
+                          N13        55.   12.58         14.          4.          3.        .03
          HYDROGRAPH AT
+                           W1        67.   12.08          8.          3.          2.        .01
          3 COMBINED AT
+                        PND1IN       352.   12.25         87.         27.         19.        .18
          ROUTED TO
+                        PND1OU       229.   12.75        202.        198.        197.        .18
+                                                                                          456.04       12.75
          HYDROGRAPH AT
+                          N16        12.   12.25          2.          1.          0.        .00
          HYDROGRAPH AT
+                         CHW1        13.   12.33          3.          1.          1.        .01
          3 COMBINED AT
+                         MIDRD      2883.   12.75       1137.        489.        399.       2.10
          HYDROGRAPH AT
+                           S5         3.   12.25          0.          0.          0.        .00
          2 COMBINED AT
+                          CS5      2884.   12.75       1137.        489.        399.       2.10
          HYDROGRAPH AT
+                           O4       269.   12.50         65.         20.         14.        .13
          2 COMBINED AT
+                         C4MWY      3103.   12.67       1202.        509.        413.       2.23
          HYDROGRAPH AT
+                         N10T        37.   12.42          9.          3.          2.        .02
          HYDROGRAPH AT
+                         N10S        55.   12.08          6.          2.          1.        .01
          2 COMBINED AT
```

+		CN10	78.	12.08	15.	5.	3.	.03
+	HYDROGRAPH AT	CH10	115.	12.17	21.	6.	5.	.04
+	2 COMBINED AT	CABELM	3155.	12.67	1223.	515.	418.	2.28
+	HYDROGRAPH AT	N9T	40.	12.33	9.	3.	2.	.02
+	HYDROGRAPH AT	N9S	73.	12.08	7.	2.	2.	.01
+	2 COMBINED AT	CN9	99.	12.08	16.	5.	3.	.03
+	HYDROGRAPH AT	CH9	84.	12.25	18.	6.	4.	.04
+	HYDROGRAPH AT	N5T	50.	12.58	15.	5.	3.	.03
+	HYDROGRAPH AT	N5S	32.	12.08	4.	1.	1.	.01
+	2 COMBINED AT	CN5	63.	12.08	18.	6.	4.	.04
+	HYDROGRAPH AT	CH5	66.	12.33	21.	6.	5.	.04
+	HYDROGRAPH AT	N6T	20.	12.25	4.	1.	1.	.01
+	HYDROGRAPH AT	N6S	30.	12.08	3.	1.	1.	.01
+	2 COMBINED AT	CN6	44.	12.08	7.	2.	2.	.02
+	2 COMBINED AT	CCH6	100.	12.17	28.	9.	6.	.06
+	HYDROGRAPH AT	CH6	102.	12.33	30.	9.	7.	.06
+	HYDROGRAPH AT	N7AT	42.	12.33	9.	3.	2.	.02
+	HYDROGRAPH AT	N7AS	33.	12.08	3.	1.	1.	.01
+	2 COMBINED AT	CN7A	61.	12.08	12.	4.	3.	.03
+	2 COMBINED AT	CCH7A	153.	12.33	43.	13.	9.	.09
+	HYDROGRAPH AT	CH7A	153.	12.42	44.	14.	10.	.09
+	HYDROGRAPH AT	N7BT	19.	12.33	4.	1.	1.	.01
+	HYDROGRAPH AT	N7BS	26.	12.08	3.	1.	1.	.01
+	2 COMBINED AT	CN7B	39.	12.08	7.	2.	1.	.01
+	2 COMBINED AT	CCH7B	178.	12.33	51.	16.	11.	.11
+	HYDROGRAPH AT	CH7B	179.	12.42	53.	17.	11.	.11
+	HYDROGRAPH AT	N8T	58.	12.33	12.	4.	3.	.03
+	HYDROGRAPH AT	N8S	77.	12.08	8.	2.	2.	.02
+	2 COMBINED AT	CN8	116.	12.08	20.	6.	4.	.04
+	3 COMBINED AT	C2W2	334.	12.33	92.	29.	20.	.19
+	HYDROGRAPH AT	W2	79.	12.08	9.	3.	2.	.02
+	2 COMBINED AT	PND2IN	366.	12.25	101.	31.	22.	.21

```
          ROUTED TO
+                         PD2OUT       201.   13.00          88.         26.         18.        .21
+                                                                                                          457.26       13.00

          HYDROGRAPH AT
+                           N14        88.   12.42          20.          6.          4.        .04

          HYDROGRAPH AT
+                           N15        61.   12.50          15.          5.          3.        .03

          3 COMBINED AT
+                         C1N14       325.   12.58         120.         37.         25.        .28

          HYDROGRAPH AT
+                            S2        70.   12.75          22.          7.          5.        .05

          HYDROGRAPH AT
+                           N19        71.   12.92          24.          7.          5.        .05

          HYDROGRAPH AT
+                           N18        74.   13.00          27.          8.          6.        .06

          HYDROGRAPH AT
+                            O5       302.   12.67          88.         27.         19.        .18

          HYDROGRAPH AT
+                            S1        23.   12.75           7.          2.          2.        .02

          HYDROGRAPH AT
+                           N17        24.   12.17           3.          1.          1.        .01

          4 COMBINED AT
+                          C1O7       390.   12.67         125.         39.         27.        .26
1
                                        SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                            (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                   INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                     PEAK

                                (MIN)      (CFS)     (MIN)      (IN)     (MIN)      (CFS)     (MIN)       (IN)

                N20  MANE        5.00      46.38    780.00      5.53      5.00      46.38    780.00       5.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9296E+01 EXCESS= .1215E+01 OUTFLOW= .1049E+02 BASIN STORAGE= .2173E-02 PERCENT ERROR=
.2

               N11T  MANE        3.26      11.91    733.23      5.53      5.00      11.86    735.00       5.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1393E+01 OUTFLOW= .1385E+01 BASIN STORAGE= .1876E-02 PERCENT ERROR=
.4

               N11S  MANE        3.12      34.59    724.20      5.65      5.00      32.23    725.00       5.64

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2130E+01 OUTFLOW= .2077E+01 BASIN STORAGE= .4285E-03 PERCENT ERROR=
2.5

               CH11  MANE        5.00      40.46    735.00      5.42      5.00      40.46    735.00       5.42

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3461E+01 EXCESS= .1364E+01 OUTFLOW= .4683E+01 BASIN STORAGE= .2406E-02 PERCENT ERROR=
2.9

                N2T  MANE        3.86      31.70    737.41      5.49      5.00      31.34    735.00       5.49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4180E+01 OUTFLOW= .4128E+01 BASIN STORAGE= .7392E-02 PERCENT ERROR=
1.1

                N2S  MANE        1.54      24.45    723.94      5.68      5.00      23.72    725.00       5.69

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1513E+01 OUTFLOW= .1483E+01 BASIN STORAGE= .2001E-03 PERCENT ERROR=
2.0

                CH2  MANE        3.94      84.60    733.28      5.48      5.00      84.05    735.00       5.48

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1030E+02 EXCESS= .7115E+00 OUTFLOW= .1099E+02 BASIN STORAGE= .1160E-02 PERCENT ERROR=
.2

                N3T  MANE        2.95     122.61    737.11      5.07      5.00     122.18    735.00       5.07
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1574E+02 OUTFLOW= .1436E+02 BASIN STORAGE= .2430E-01 PERCENT ERROR= 8.6

N3S	MANE	3.63	25.94	725.04	5.73	5.00	25.88	725.00	5.78

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1667E+01 OUTFLOW= .1650E+01 BASIN STORAGE= .4547E-03 PERCENT ERROR= 1.0

CH3	MANE	3.74	238.09	737.52	5.30	5.00	237.19	740.00	5.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3069E+02 EXCESS= .1097E+01 OUTFLOW= .3170E+02 BASIN STORAGE= .3574E-02 PERCENT ERROR= .2

N4T	MANE	2.52	22.88	740.50	5.47	5.00	22.84	740.00	5.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3439E+01 OUTFLOW= .3387E+01 BASIN STORAGE= .8891E-02 PERCENT ERROR= 1.3

N4S	MANE	3.62	35.90	723.22	5.68	5.00	33.64	725.00	5.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2439E+01 OUTFLOW= .2392E+01 BASIN STORAGE= .5147E-03 PERCENT ERROR= 1.9

CH4	MANE	5.00	62.27	730.00	5.53	5.00	62.27	730.00	5.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5767E+01 EXCESS= .1453E+01 OUTFLOW= .7200E+01 BASIN STORAGE= .1358E-02 PERCENT ERROR= .3

CH4A	MANE	1.73	287.49	737.40	5.34	5.00	286.30	735.00	5.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3891E+02 EXCESS= .3261E+00 OUTFLOW= .3920E+02 BASIN STORAGE= .2158E-02 PERCENT ERROR= .1

CHW1	MANE	5.00	13.02	740.00	5.49	5.00	13.02	740.00	5.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1240E+01 EXCESS= .4150E+00 OUTFLOW= .1639E+01 BASIN STORAGE= .1476E-02 PERCENT ERROR= .9

N10T	MANE	1.23	36.95	741.58	5.53	5.00	36.82	745.00	5.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5514E+01 OUTFLOW= .5490E+01 BASIN STORAGE= .1379E-01 PERCENT ERROR= .2

N10S	MANE	.62	55.67	725.10	5.79	5.00	55.40	725.00	5.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3551E+01 OUTFLOW= .3550E+01 BASIN STORAGE= .1045E-03 PERCENT ERROR= .0

CH10	MANE	3.89	120.07	728.17	5.59	5.00	114.78	730.00	5.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9055E+01 EXCESS= .3884E+01 OUTFLOW= .1288E+02 BASIN STORAGE= .2546E-02 PERCENT ERROR= .4

N9T	MANE	1.05	39.81	739.00	5.54	5.00	39.58	740.00	5.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5247E+01 OUTFLOW= .5229E+01 BASIN STORAGE= .8873E-02 PERCENT ERROR= .2

N9S	MANE	.57	73.17	725.45	5.79	5.00	72.83	725.00	5.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4570E+01 OUTFLOW= .4568E+01 BASIN STORAGE= .1143E-03 PERCENT ERROR= .0

CH9	MANE	5.00	83.50	735.00	5.58	5.00	83.50	735.00	5.58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9806E+01 EXCESS= .1601E+01 OUTFLOW= .1129E+02 BASIN STORAGE= .4162E-02 PERCENT ERROR= 1.0

```
                N5T  MANE          .30     50.41    754.37      5.52      5.00     50.41    755.00        5.51

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9338E+01 OUTFLOW= .9275E+01 BASIN STORAGE= .4378E-01 PERCENT ERROR=
.2

                N5S  MANE          .73     32.50    726.07      5.79      5.00     31.52    725.00        5.79

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2161E+01 OUTFLOW= .2161E+01 BASIN STORAGE= .1163E-03 PERCENT ERROR=
.0

                CH5  MANE         5.00     66.15    740.00      5.54      5.00     66.15    740.00        5.54

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1142E+02 EXCESS= .1512E+01 OUTFLOW= .1288E+02 BASIN STORAGE= .8477E-02 PERCENT ERROR=
.4

                N6T  MANE         1.02     20.70    737.48      5.54      5.00     20.47    735.00        5.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2550E+01 OUTFLOW= .2541E+01 BASIN STORAGE= .3798E-02 PERCENT ERROR=
.2

                N6S  MANE          .91     30.94    725.80      5.79      5.00     30.36    725.00        5.80

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1976E+01 OUTFLOW= .1976E+01 BASIN STORAGE= .4982E-04 PERCENT ERROR=
.0

                CH6  MANE         5.00    101.78    740.00      5.54      5.00    101.78    740.00        5.54

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1739E+02 EXCESS= .1364E+01 OUTFLOW= .1868E+02 BASIN STORAGE= .1235E-01 PERCENT ERROR=
.4

               N7AT  MANE          .75     41.97    738.16      5.54      5.00     41.55    740.00        5.48

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5603E+01 OUTFLOW= .5580E+01 BASIN STORAGE= .9999E-02 PERCENT ERROR=
.2

               N7AS  MANE          .46     33.53    725.11      5.79      5.00     33.45    725.00        5.80

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2100E+01 OUTFLOW= .2098E+01 BASIN STORAGE= .5111E-04 PERCENT ERROR=
.0

               CH7A  MANE         5.00    153.03    745.00      5.53      5.00    153.03    745.00        5.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2630E+02 EXCESS= .1067E+01 OUTFLOW= .2726E+02 BASIN STORAGE= .1321E-01 PERCENT ERROR=
.4

               N7BT  MANE          .87     19.17    738.52      5.54      5.00     18.96    740.00        5.51

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2520E+01 OUTFLOW= .2511E+01 BASIN STORAGE= .4450E-02 PERCENT ERROR=
.2

               N7BS  MANE          .46     26.06    725.03      5.79      5.00     26.03    725.00        5.80

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1606E+01 OUTFLOW= .1605E+01 BASIN STORAGE= .3639E-04 PERCENT ERROR=
.0

               CH7B  MANE         5.00    178.99    745.00      5.50      5.00    178.99    745.00        5.50

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3137E+02 EXCESS= .1690E+01 OUTFLOW= .3283E+02 BASIN STORAGE= .1812E-01 PERCENT ERROR=
.6

                N8T  MANE         1.03     58.33    737.03      5.54      5.00     58.04    740.00        5.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7648E+01 OUTFLOW= .7622E+01 BASIN STORAGE= .1297E-01 PERCENT ERROR=
.2

                N8S  MANE          .67     78.07    725.64      5.79      5.00     77.49    725.00        5.80
```

```
 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4940E+01 OUTFLOW= .4939E+01 BASIN STORAGE= .1245E-03 PERCENT ERROR=
.0

                N19  MANE         5.00     70.96    775.00      5.53      5.00     70.96    775.00        5.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1372E+02 EXCESS= .8301E+00 OUTFLOW= .1453E+02 BASIN STORAGE= .2074E-02 PERCENT ERROR=
.1

                N18  MANE         5.00     73.68    780.00      5.52      5.00     73.68    780.00        5.52

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1453E+02 EXCESS= .1897E+01 OUTFLOW= .1640E+02 BASIN STORAGE= .2249E-02 PERCENT ERROR=
.1



 *** NORMAL END OF HEC-1 ***
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CAMELOT LANDFILL
1339-351-11-02-01
25-YEAR EXCESS RAINFALL
VOLUME CALCULATIONS

Required: Determine the 25-year 24-hour storm volume generated by the site and offsite areas using the excess rainfall calculated in the HEC-1 analysis of the permitted site conditions.

Method: 1. Use the excessive rainfall data generated by the HEC-1 analysis (pages IIIF-E-20 through IIIF-E-108) to determine the volume produced by the site for the permitted conditions.

Updated Permitted Conditions

1. Volume Discharging Southeast Downstream of Entrance Road

1a. Volume Upstream of Entrance Road

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
O1	**0.1367**	**5.90**	**~~87.47~~ 122.35**	**~~43~~ 60**
~~O1A~~	**~~0.0366~~**	**~~5.67~~**	**~~23.42~~**	**~~11~~**
O2	**1.5754**	**5.66**	**1,008.23**	**476**
S4	**0.0897**	**5.56**	**~~57.41~~ 48.43**	**~~27~~ 22**
			Total Volume Upstream of Entrance Road	**~~556~~ 558**

1b. Non-Landfill Areas Downstream of Entrance Road

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
N1	**0.0176**	**5.56**	**11.26**	**5**
O3	**0.0253**	**5.56**	**16.18**	**7**
S3	**0.0316**	**5.56**	**~~20.21~~ 20.17**	**9**
N20	**0.0041**	**5.56**	**2.62**	**1**
			Total Volume of Non-Landfill Areas D.S. of Entrance Road	**23**

1c. Landfill Areas Discharging into Pond W1 and Flowing under Entrance Road

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
N11T	**0.0047**	**5.56**	**3.03**	**1**
N11S	**0.0069**	**5.79**	**4.40**	**2**
CH11	**0.0046**	**5.56**	**2.97**	**1**
N2T	**0.0141**	**5.56**	**9.05**	**4**
N2S	**0.0049**	**5.79**	**3.16**	**2**
CH2	**0.0024**	**5.56**	**1.56**	**1**
N12	**0.0124**	**5.56**	**7.96**	**4**
N3T	**0.0531**	**5.56**	**34.01**	**16**
N3S	**0.0054**	**5.79**	**3.47**	**2**
CH3	**0.0037**	**5.56**	**2.39**	**1**
N4T	**0.0116**	**5.56**	**7.45**	**3**
N4S	**0.0079**	**5.79**	**5.05**	**2**
CH4	**0.0049**	**5.56**	**3.11**	**1**
CH4A	**0.0011**	**5.56**	**0.68**	**0**
N13	**0.0293**	**5.56**	**18.73**	**9**
W1	**0.0130**	**7.44**	**8.30**	**5**
N16	**0.0043**	**5.56**	**2.72**	**1**
CHW1	**0.0014**	**5.56**	**0.89**	**0**
S5	**0.0010**	**5.56**	**0.67**	**0**
			Total Volume Flowing under Entrance Road	**57**

Total Volume Discharging Southeast Downstream of Entrance Road = **~~637~~ 638 ac-ft**

2. Volume in Midway Branch Exiting Permit Boundary

2a. Volume in Midway Branch Entering Permit Boundary

Offsite Area Entering Midway Branch	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
O4	**0.1344**	**5.56**	**86.04**	**40**
Total Volume in Midway Branch Entering Permit Boundary				**40**

2b. Landfill Areas Flowing East into Midway Branch

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
N10T	**0.0186**	**5.56**	**11.93**	**6**
N10S	**0.0115**	**5.79**	**7.39**	**4**
CH10	**0.0131**	**5.56**	**8.41**	**4**
Total Volume Flowing East into Midway Branch				**13**

Total Volume in Midway Branch Excluding Section 1 Discharge Volume = **53** **ac-ft**

Total Volume in Midway Branch Exiting Permit Boundary = **689** **ac-ft**

3. Volume Discharging South into Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
N9T	**0.0177**	**5.56**	**11.35**	**5**
N9S	**0.0148**	**5.79**	**9.50**	**5**
CH9	**0.0054**	**5.56**	**3.48**	**2**
N5T	**0.0315**	**5.56**	**20.18**	**9**
N5S	**0.0070**	**5.79**	**4.50**	**2**
CH5	**0.0051**	**5.56**	**3.26**	**2**
N6T	**0.0086**	**5.56**	**5.48**	**3**
N6S	**0.0064**	**5.79**	**4.10**	**2**
CH6	**0.0046**	**5.56**	**2.95**	**1**
N7AT	**0.0189**	**5.56**	**12.08**	**6**
N7AS	**0.0068**	**5.79**	**4.36**	**2**
CH7A	**0.0036**	**5.56**	**2.30**	**1**
N7BT	**0.0085**	**5.56**	**5.45**	**3**
N7BS	**0.0052**	**5.79**	**3.34**	**2**
CH7B	**0.0057**	**5.56**	**3.66**	**2**
N8T	**0.0258**	**5.56**	**16.52**	**8**
N8S	**0.0160**	**5.79**	**10.27**	**5**
W2	**0.0154**	**7.44**	**9.83**	**6**
Total Volume Discharging South into Elm Fork				**64**

4. Volume Discharging Southeast into Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
N15	**0.0311**	**5.56**	**19.93**	**9**
Total Volume Discharging Southeast into Elm Fork				**9**

5. Volume Discharging Southwest into Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
N14	**0.0407**	**5.56**	**26.06**	**12**
Total Volume Discharging Southwest into Elm Fork				**12**

6. Southern Volume Discharging Southwest Towards Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
N17	**0.0068**	**5.56**	**4.32**	**2**
Total Southern Volume Discharging Southwest Towards Elm Fork				**2**

7. Northern Volume Discharging West Towards Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
S2	**0.0493**	**5.56**	**~~31.53~~ 29.76**	**~~15~~ 14**
N19	**0.0028**	**5.56**	**1.82**	**1**
N18	**0.0064**	**5.56**	**4.12**	**2**
Total Northern Volume Discharging West Towards Elm Fork				**17**

8. Volume Discharging from Northwest Corner Towards Elm Fork

Area No.	Area (sq mi)	Total Excess Rainfall (in)	Area (ac)	Volume (ac-ft)
S1	**0.0163**	**5.56**	**~~10.40~~ 9.73**	**5**
Total Volume Discharging from NW Corner Towards Elm Fork				**5**

Total Volume Exiting Permit Boundary = ~~799~~ 781 ac-ft

Required: Determine the flow velocities entering and exiting the permit boundary using HYDROCALC HYDRAULICS (Version 1.2a, 1996) for the flows calculated for the 25-year storm event in the HEC-1 analysis. HEC-RAS is used to determine the velocity in Elm Fork.

Method:

1. Use the flow data generated by the HEC-1 analysis to determine velocity of runoff entering the landfill permit boundary.

2. Use the flow data generated by the HEC-1 analysis to determine velocity of runoff exiting the landfill permit boundary.

1. Flow Velocity entering the landfill permit boundary

DP1

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 2171 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	2171	0.010	0.03	4.00	20.00	60.00	2.85	8.08

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP2

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 62 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	62	0.090	0.03	4.00	6.00	87.00	0.16	4.38

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP4

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~2887~~ 3103 cfs

Storm Year	Flow Rate (cfs)		Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)		Flow Vel. (fps)	
25	~~2887~~	3103	0.005	0.03	10.00	2.00	22.00	~~6.00~~	6.21	~~8.29~~	8.44

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP12

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~298~~ 394 cfs

Storm Year	Flow Rate (cfs)		Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)		Flow Vel. (fps)	
25	~~298~~	394	0.001	0.03	77.00	83.00	0.00	~~1.65~~	1.83	~~1.38~~	1.48

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

~~DP13~~

- ~~Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.~~

~~Q_{25} = 70 cfs~~

~~Storm Year~~	~~Flow Rate (cfs)~~	~~Bottom Slope (ft/ft)~~	~~Manning's n~~	~~Side Slope (left)~~	~~Side Slope (right)~~	~~Bottom Width (ft)~~	~~Normal Depth (ft)~~	~~Flow Vel. (fps)~~
~~25~~	~~70~~	~~0.019~~	~~0.03~~	~~50.00~~	~~48.00~~	~~0.00~~	~~0.66~~	~~3.27~~

~~Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).~~

2. Flow Velocity exiting the landfill permit boundary

DP3

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~2674~~ 2884 cfs

Storm Year	Flow Rate (cfs)		Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)		Flow Vel. (fps)	
25	~~2674~~	2884	0.008	0.03	16.00	17.00	27.00	~~3.86~~	3.99	~~7.64~~	7.79

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP5

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~2933~~ 3155 cfs

Storm Year	Flow Rate (cfs)		Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)		Flow Vel. (fps)	
25	~~2933~~	3155	0.008	0.03	2.00	2.00	9.00	~~8.75~~	9.04	~~12.64~~	12.88

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP6

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 201 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	201	0.030	0.03	1.00	2.00	1.00	3.17	11.00

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP7

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 61 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	61	0.010	0.03	24.00	29.00	0.00	0.89	2.89

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP8

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 88 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	88	0.083	0.03	4.50	5.00	0.00	1.32	10.64

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP9

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = 24 cfs

Storm Year	Flow Rate (cfs)	Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)	Flow Vel. (fps)
25	24	0.089	0.03	99.00	100.00	0.00	0.25	3.76

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP10

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~78~~ 75 cfs

Storm Year	Flow Rate (cfs)		Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)		Flow Vel. (fps)	
25	~~78~~	75	0.001	0.03	3.00	3.00	20.00	~~1.64~~	1.60	~~1.91~~	1.88

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

DP11

- Flow for the 25-year storm event was obtained from the HEC-1 files included in this Appendix and are summarized below.

Q_{25} = ~~25~~ 24 cfs

Storm Year	Flow Rate (cfs)		Bottom Slope (ft/ft)	Manning's n	Side Slope (left)	Side Slope (right)	Bottom Width (ft)	Normal Depth (ft)		Flow Vel. (fps)	
25	~~25~~	24	0.001	0.03	100.00	100.00	0.00	~~0.60~~	0.59	~~0.70~~	0.69

Note: Calculations were performed using the HYDROCALC HYDRAULICS for Windows program developed by Dodson and Associates (Version 1.2a, 1996).

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

VOLUME 4 OF 6

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014

Revised August 2016

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8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B

This document is intended for permitting purposes only.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIG
GEOLOGY REPORT

Prepared for

City of Farmers Branch

February 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014

Revised August 2016

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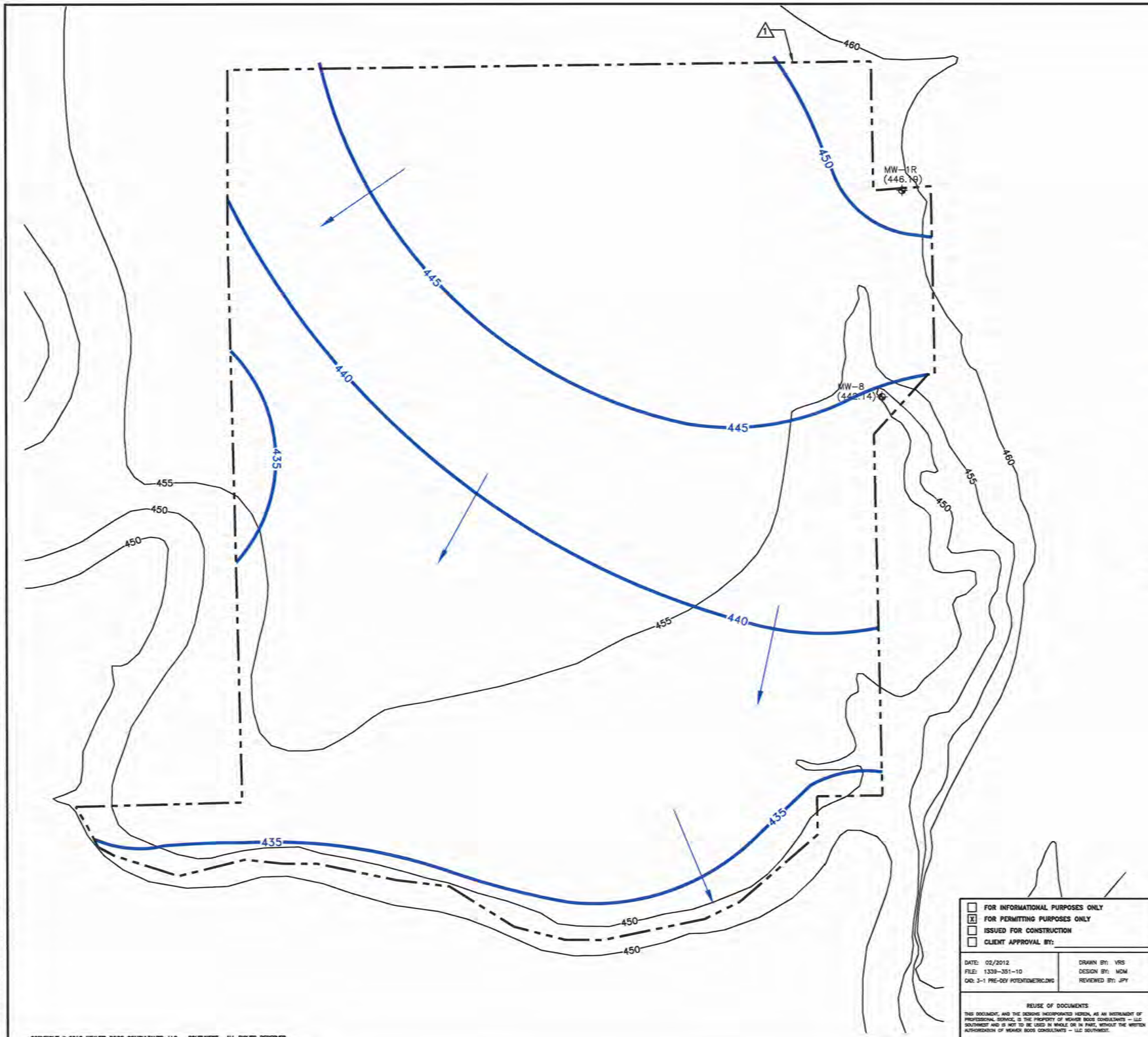
Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-7C



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 510 EXISTING CONTOUR
- 7054000 STATE PLANE COORDINATE SYSTEM
- 33°02'00" GEODETIC COORDINATE SYSTEM
- MW-8 (442.14) GROUNDWATER MONITORING WELL WITH WATER LEVELS POSTED IN FT-MSL
- 430 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (SEE NOTE 3)
- GROUNDWATER FLOW DIRECTION
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

NOTES:

1. CONTOURS AND ELEVATIONS REPRODUCED FROM USGS TOPOGRAPHIC MAP DEVELOPED FROM AERIAL PHOTOGRAPH TAKEN IN 1957.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC SURFACE CONTOURS ESTIMATED FROM MONITOR WELL MEASUREMENTS AND TOP OF SHALE STRATA ELEVATION TRENDS.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] FOR INFORMATIONAL PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 02/2012
FILE: 1339-351-10
CAD: 3-1 PRE-DEV POTENTIOMETRIC.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
ESTIMATED GROUNDWATER POTENTIOMETRIC SURFACE PRIOR TO LANDFILL DEVELOPMENT
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE 3-1

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\3-1 PRE-DEVELOPMENT POTENTIOMETRIC.dwg, sfor4, 1:2

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMITS OF WASTE (PERMIT NO. 1312A)
- PROPOSED LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- EXISTING TOPOGRAPHIC CONTOUR
- 430 GROUNDWATER ELEVATION CONTOUR (FT-MSL)
- 422 AS-BUILT TOP OF SUBTITLE D CLAY LINER (SEE NOTE 5)
- 433 APPROXIMATE BOTTOM OF WASTE CONTOUR IN PRE-SUBTITLE D AREA (SEE NOTE 4)
- 440 TOP OF SHALE ELEVATION CONTOUR IN FT-MSL
- MW-3R (442.64) EXISTING MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10 (438.36) OBSERVATION WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-18 (431.01) FORMER MONITORING WELL
- WB-1 (443.80) EXISTING EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- STANDING WATER
- GROUNDWATER FLOW DIRECTION
- AREA WHERE THE LANDFILL FOOTPRINT IS FOUNDED IN THE UNWEATHERED SHALE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. WATER LEVEL MEASUREMENTS COLLECTED BY CAREL CORPORATION ON DECEMBER 21, 2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. APPROXIMATE BOTTOM OF WASTE CONTOURS IN THE PRE-SUBTITLE D AREA WERE DEVELOPED FROM HISTORICAL SLER INFORMATION AND THE LOCATION OF TO TOP OF UNWEATHERED SHALE ZONE.
5. NOTED CONTOURS REPRESENT THE TOP OF CLAY FOR THE EXISTING SUBTITLE D LINERS.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

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- ☐ ISSUED FOR CONSTRUCTION
- ☐ CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-10
CAD: 3-2 EXIST. GW POT.DWG

DRAWN BY: VRS
DESIGN BY: RSF
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
EXISTING GROUNDWATER POTENTIOMETRIC SURFACE MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO
FORT WORTH, TX (817) 735-0770
GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 3-2

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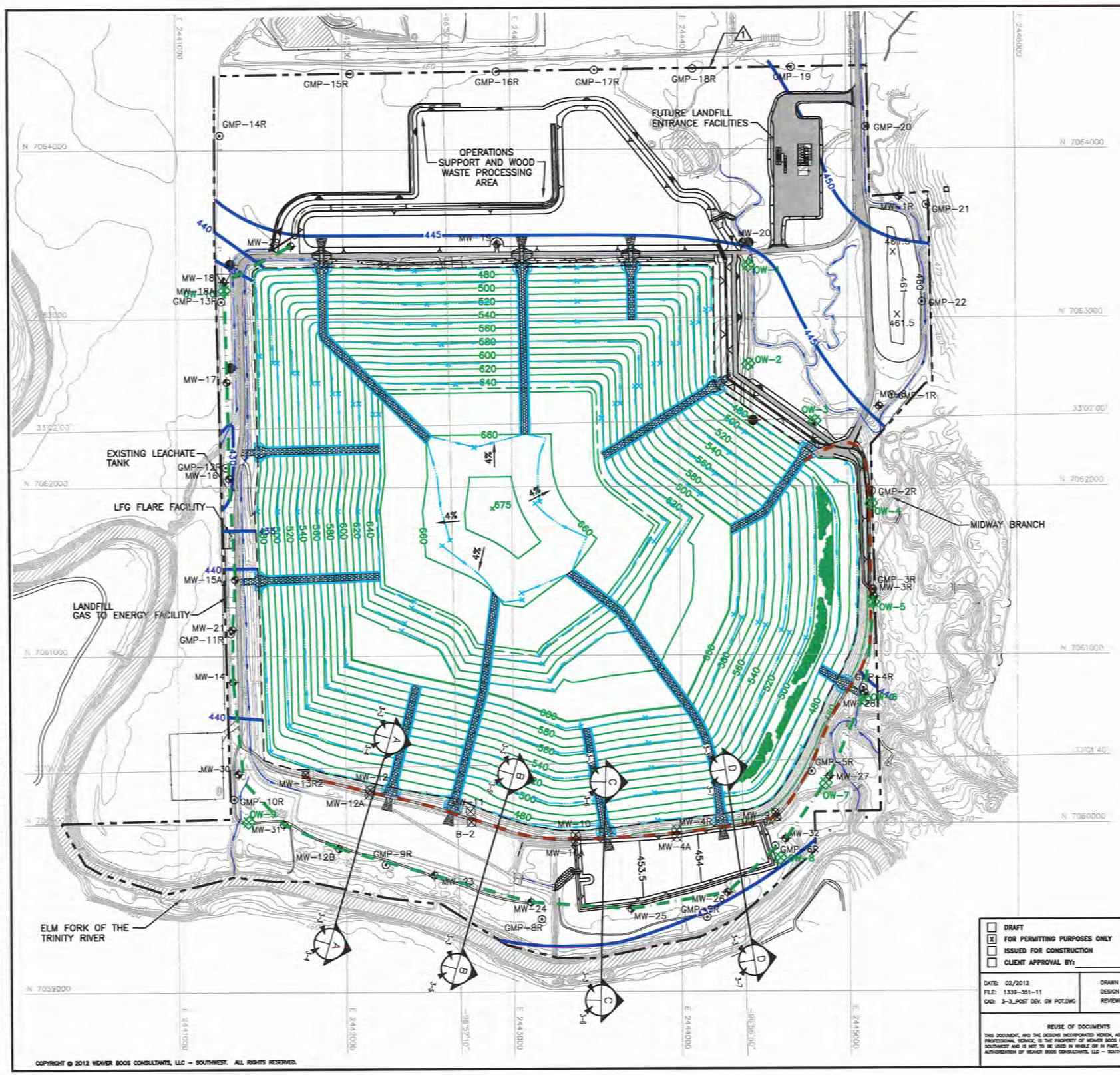
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\3-2 EXISTING POTEN SURFACE.dwg, sfor4, 1:2



LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- REGRADED BUFFER ZONE AREA
- FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- LANDSCAPE BENCH
- EASEMENT
- MW-8 EXISTING GROUNDWATER MONITORING WELL
- GMP-13 EXISTING LANDFILL GAS MONITORING PROBE
- MW-10 OBSERVATION/MONITOR WELL
- 430 GROUNDWATER CONTOUR (SEE NOTE 3)
- APPROXIMATE LOCATION OF PROPOSED SLURRY WALL
- POINT OF COMPLIANCE (SEE NOTE 4)
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC SURFACE CONTOURS ESTIMATED FROM MONITOR WELL MEASUREMENTS AND TO ACCOUNT FOR THE COMPLETELY DEVELOPED CONDITION OF THE LANDFILL.
4. REFER TO SECTION 2 OF APPENDIX IIIH FOR A DESCRIPTION OF THE GROUNDWATER MONITORING SYSTEM.

DRAFT

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
CAD: 3-3_POST DEV. GW POT.DWG

DRAWN BY: VRS
DESIGN BY: RSF
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT POST-DEVELOPMENT GROUNDWATER POTENTIOMETRIC SURFACE MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 3-3

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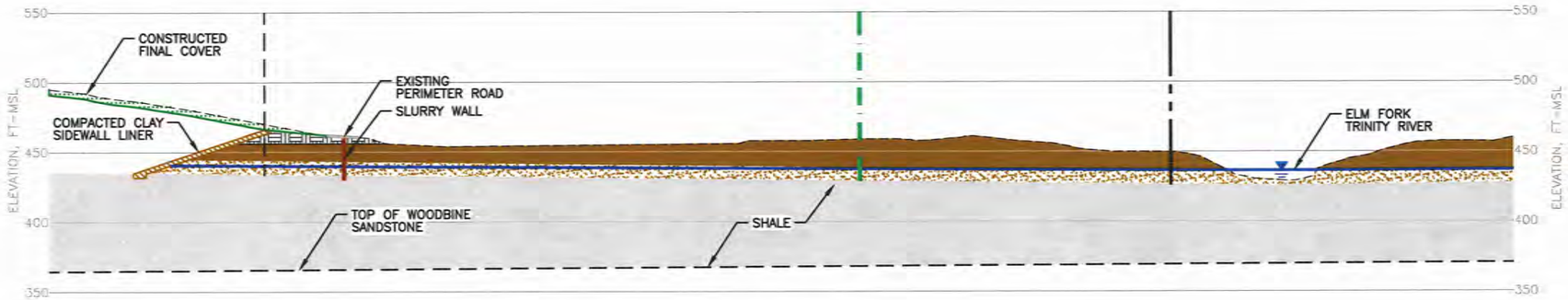
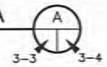
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\3-3 POST POTEN.dwg, sford, 1:2



SECTION A



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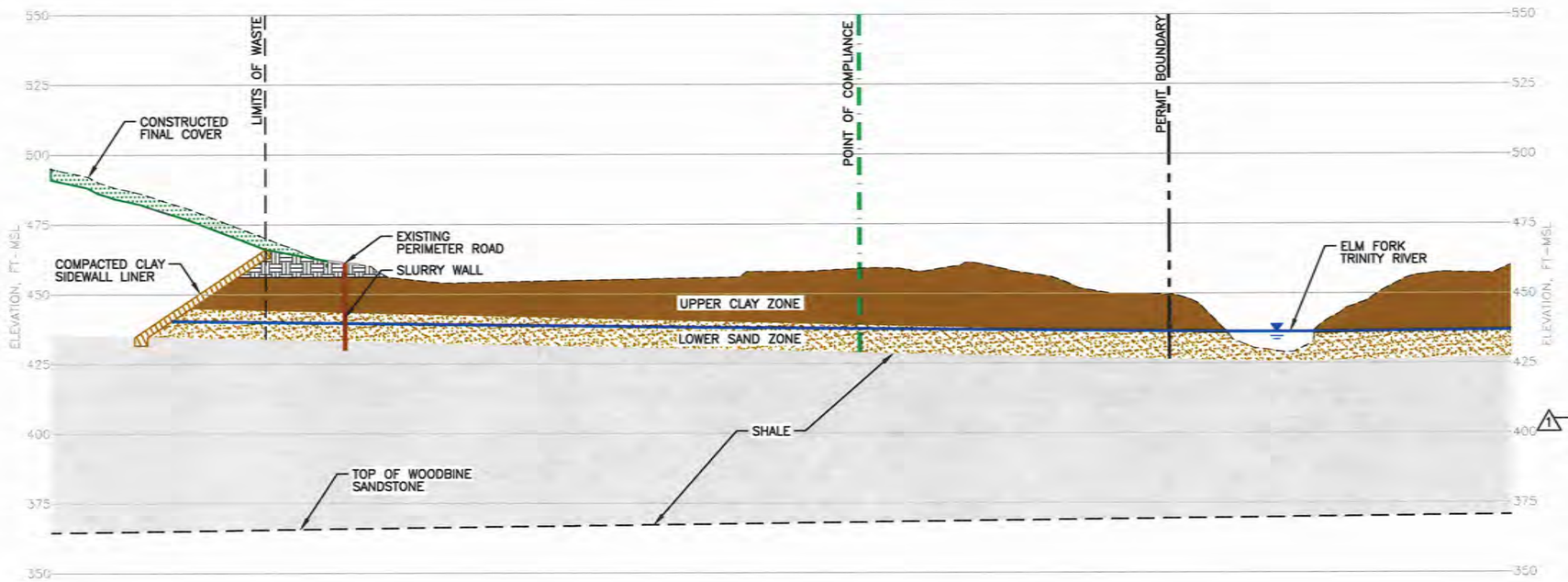
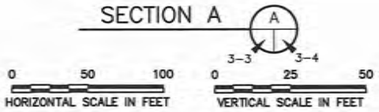
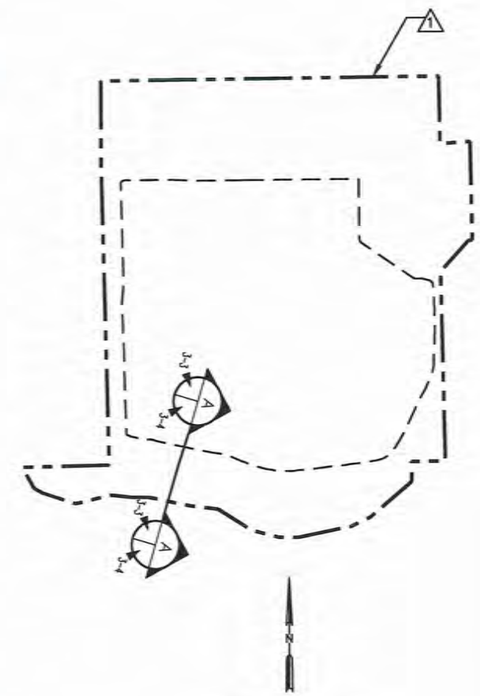


SECTION A





SECTION LOCATION MAP
(NTS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88. BOTTOM OF THE RIVER GRADES HAVE BEEN OBTAINED FROM AN EFFECTIVE HYDRAULIC MODEL PROVIDED BY FEMA IN MAY 2010. THIS INFORMATION WAS INCLUDED IN THE CONDITIONAL LETTER OF MAP REVISION REQUEST (CLOMR) PRODUCED BY WBC IN JUNE 2011 AND APPROVED BY FEMA ON JANUARY 27, 2012.
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4. THE STATIGRAPHIC RELATIONSHIPS SHOWN ARE BASED ON THE GEOLOGIC CROSS-SECTIONS PRESENTED IN APPENDIX IIIG-C. STATIGRAPHIC RELATIONSHIPS SHOWN SOUTH OF THE POINT OF COMPLIANCE HAVE BEEN EXTRAPOLATED.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- POTENTIOMETRIC SURFACE (SEE NOTE 3)
- EXISTING GRADE (SEE NOTE 1)
- APPROXIMATE LOCATION OF SLURRY WALL
- POINT OF COMPLIANCE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

SUBSURFACE SOILS INFORMATION

- UPPER CLAY
  (HORIZ. $K_{AVG}=2.7 \times 10^{-7}$ cm/s)
  (VERT. $K_{AVG}=1.8 \times 10^{-8}$ cm/s)
- LOWER SAND
  (HORIZ. $K_{AVG}=5.2 \times 10^{-4}$ cm/s)
  (VERT. $K_{AVG}=2.3 \times 10^{-4}$ cm/s)
- SHALE
  (HORIZ. $K_{AVG}=1.6 \times 10^{-8}$ cm/s)
  (VERT. $K_{AVG}=2.5 \times 10^{-8}$ cm/s)

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CAD: 8G-3-4-SECTION.DWG
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DESIGN BY: RJS
REVIEWED BY: RSF

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SOUTH AREA CROSS SECTION A

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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DENVER, CO
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GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 3-4

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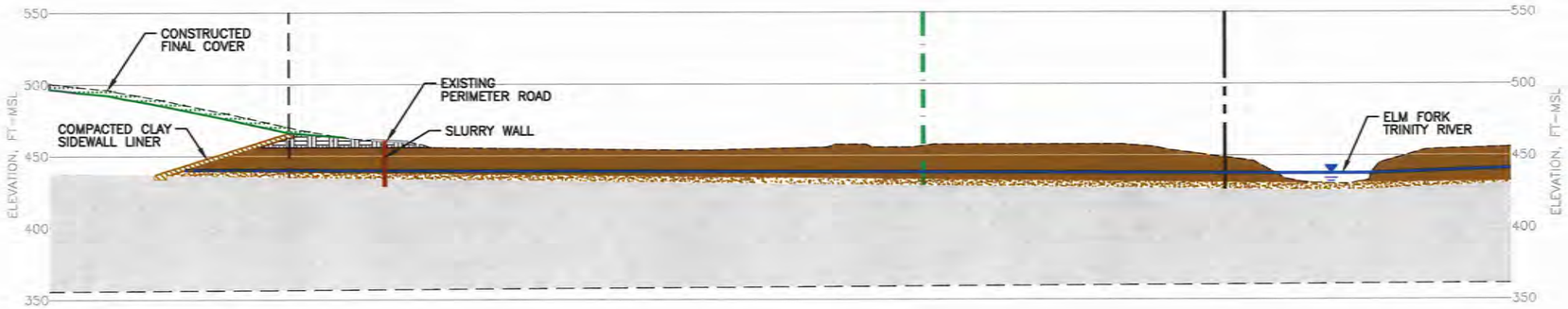
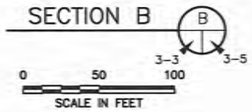
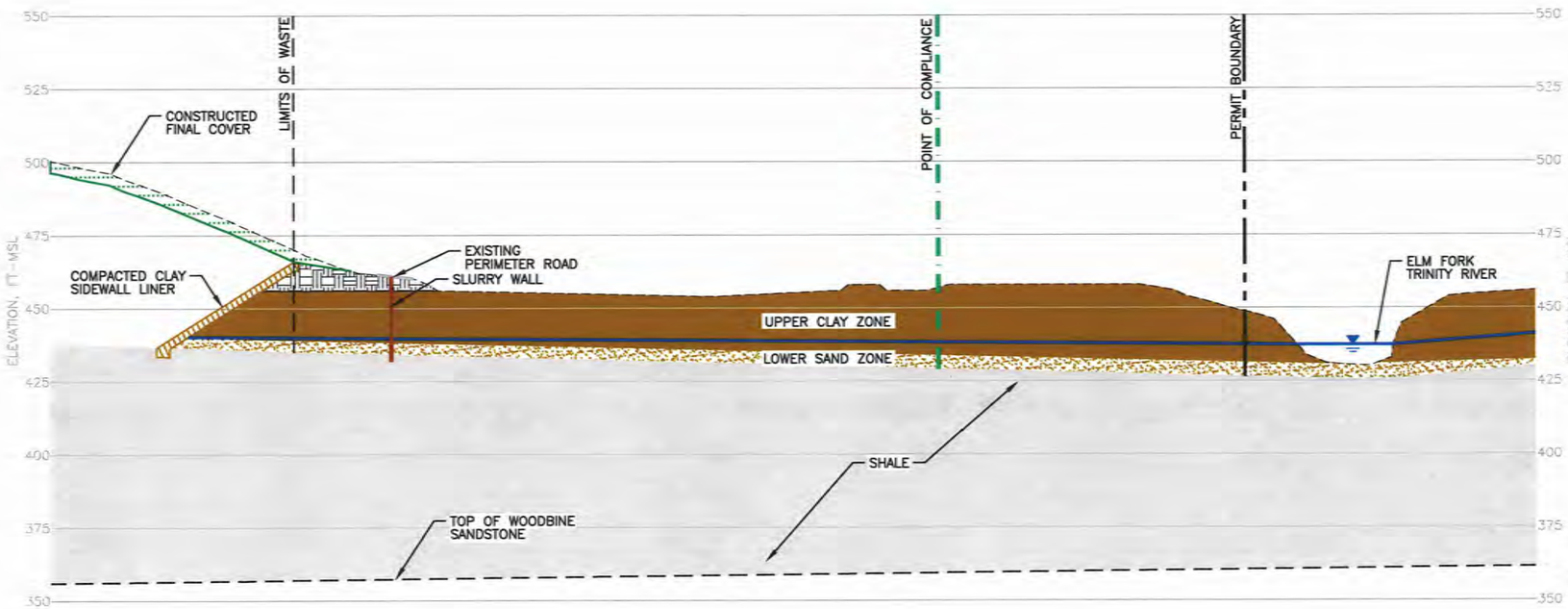


SECTION B





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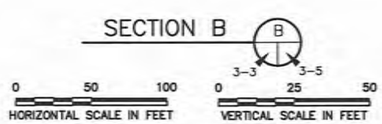

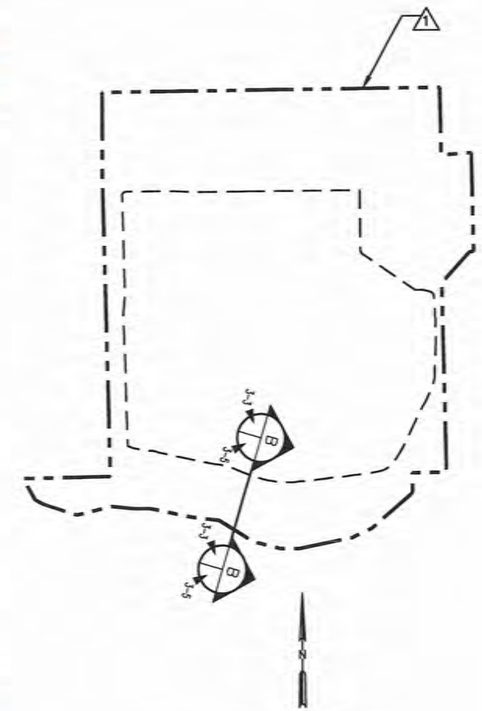

SECTION LOCATION MAP
(NTS)

NOTES:

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LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- POTENTIOMETRIC SURFACE (SEE NOTE 3)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

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DESIGN BY: RJS
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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SOUTH AREA CROSS SECTION B

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 3-5

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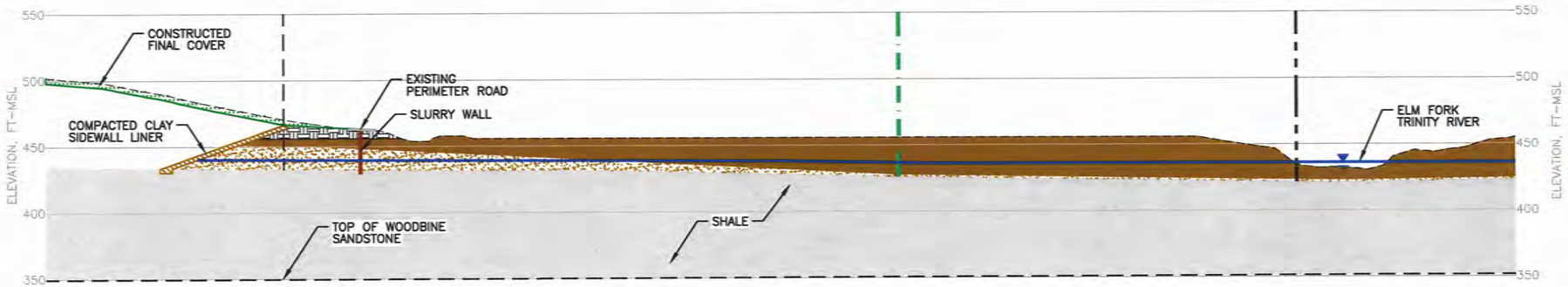
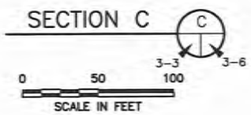
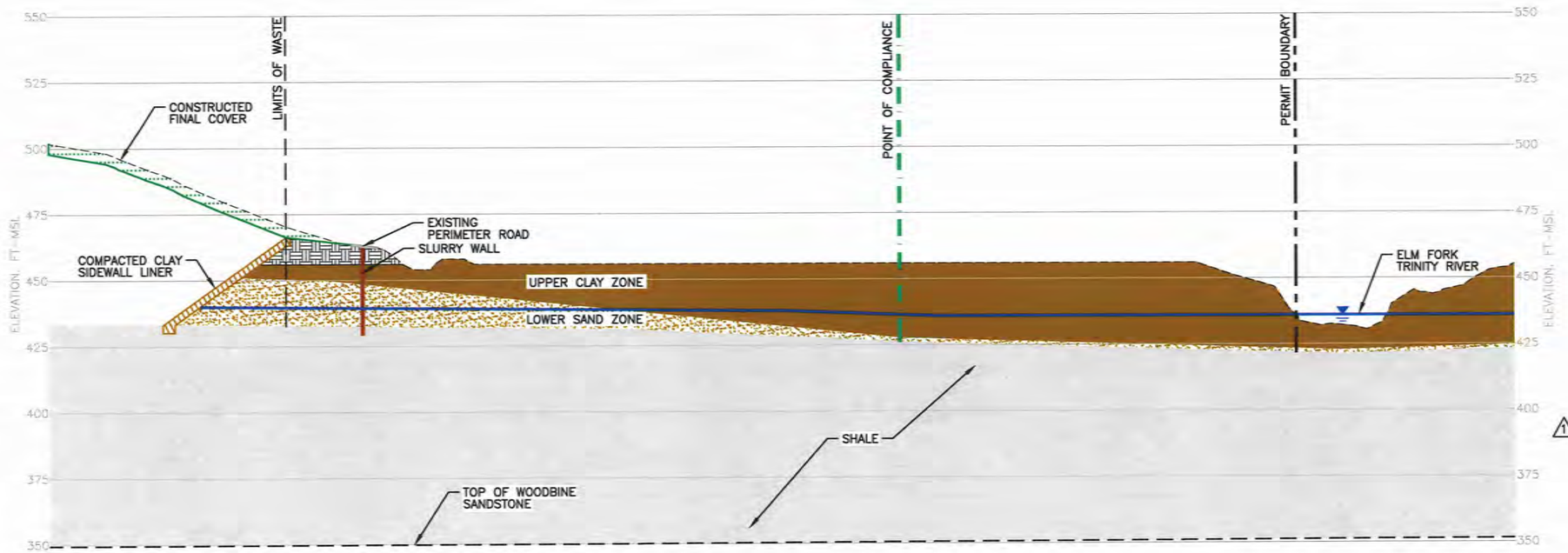


SECTION C





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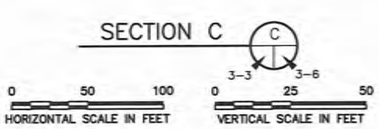

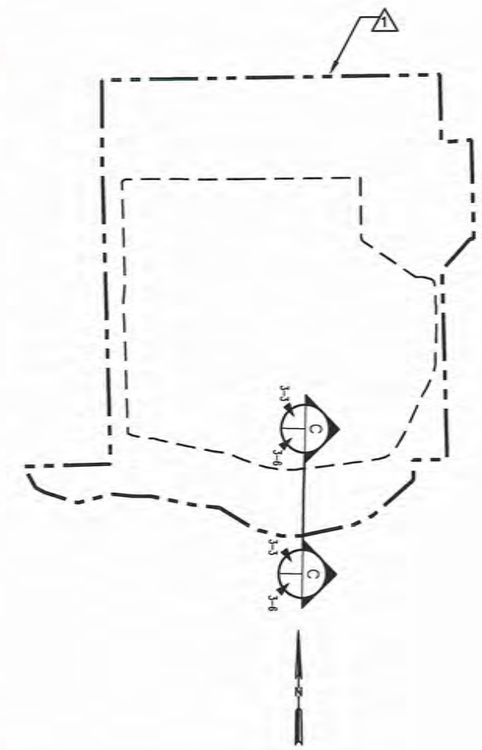

SECTION LOCATION MAP
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LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

LEGEND

- PERMIT BOUNDARY
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DESIGN BY: RJS
REVIEWED BY: RSF

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SOUTH AREA CROSS SECTION C

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 3-6

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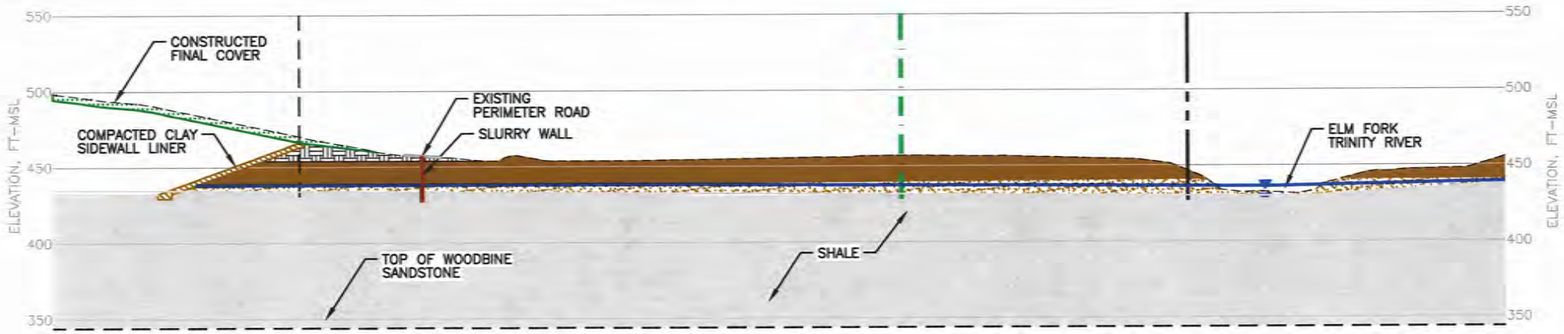

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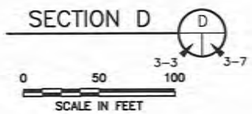

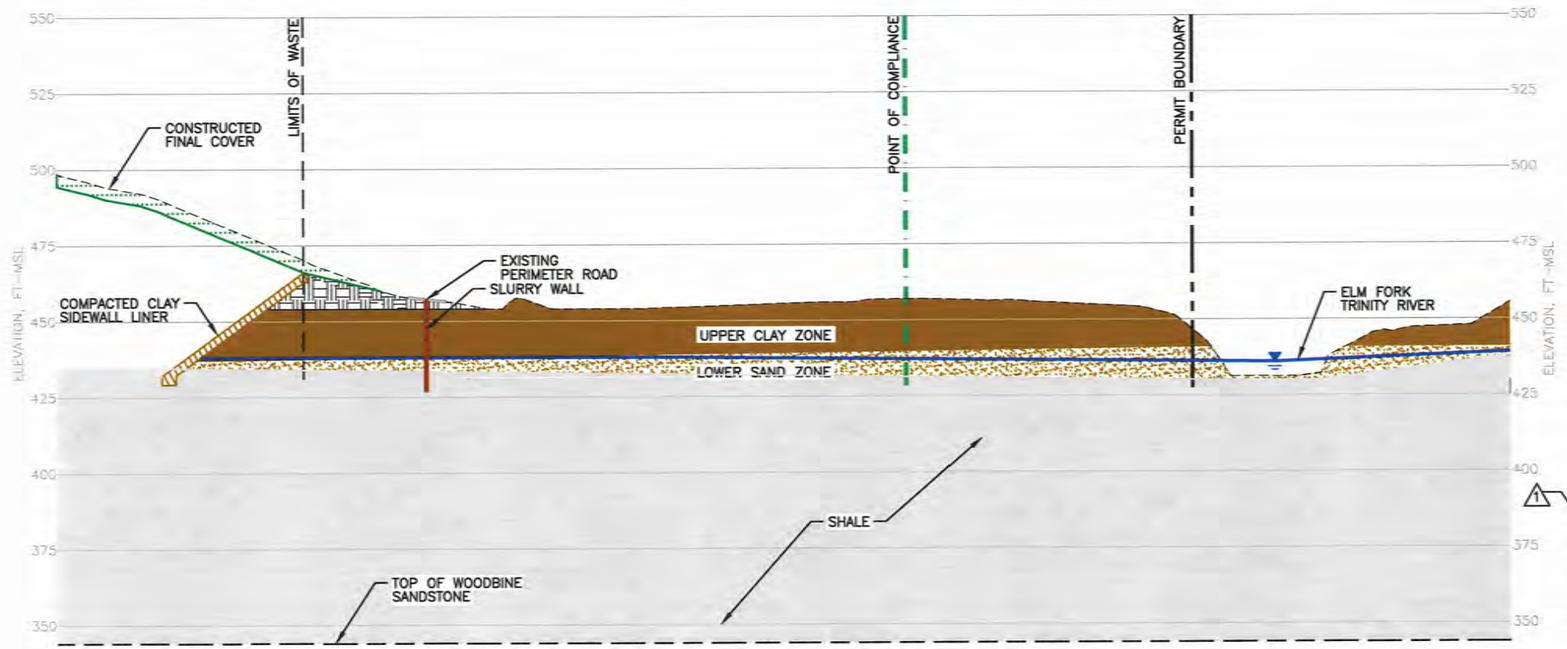

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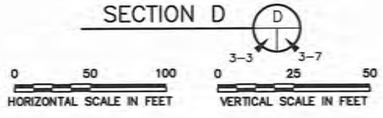

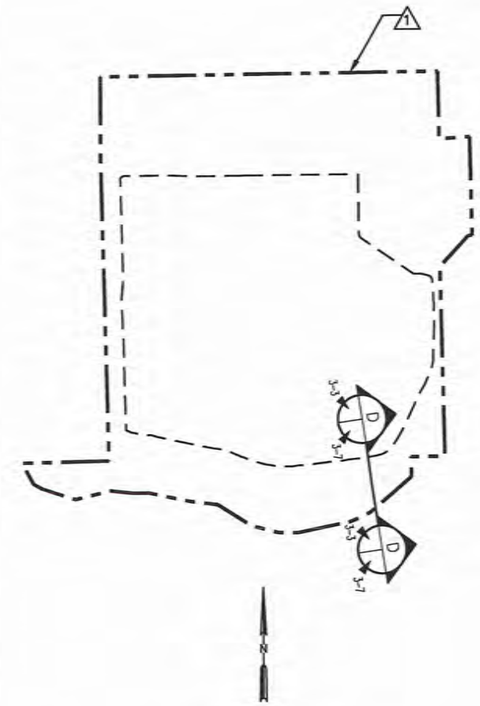

SECTION LOCATION MAP
(NTS)

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LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- POTENTIOMETRIC SURFACE (SEE NOTE 3)
- EXISTING GRADE (SEE NOTE 1)
- POINT OF COMPLIANCE
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- SHALE
  - (HORIZ. $K_{AVG}=1.6 \times 10^{-8}$ cm/s)
  - (VERT. $K_{AVG}=2.5 \times 10^{-8}$ cm/s)

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DESIGN BY: RJS
REVIEWED BY: RSF

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SOUTH AREA CROSS SECTION D

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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NAPERVILLE, IL
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DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE 3-7

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\3-4 THRU 3-7 - SECTIONS.dwg, sford, 1:2

APPENDIX IIIG-A

REGIONAL GEOLOGIC DATA

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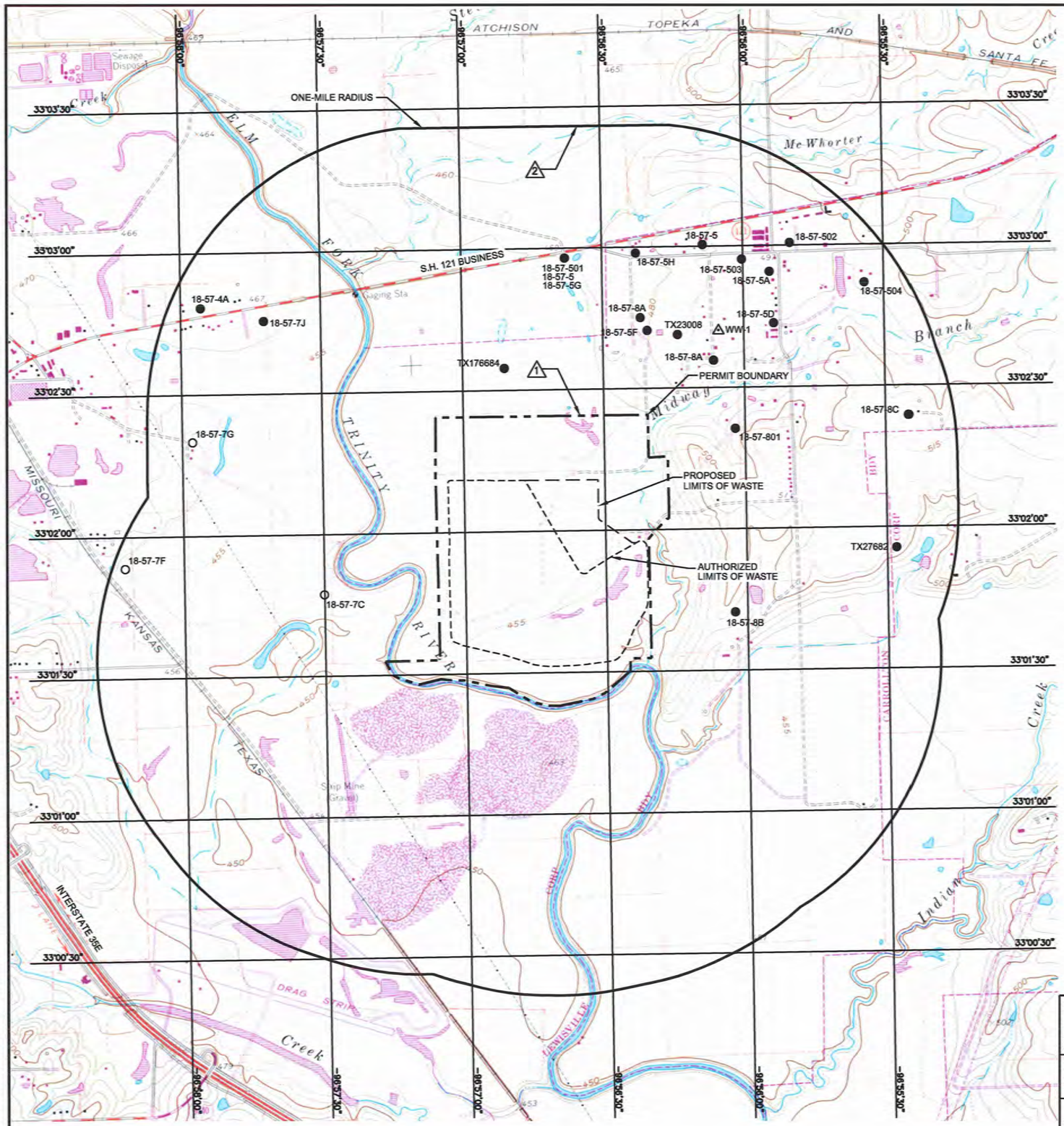

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N

0 1000 2000
SCALE IN FEET

LEGEND

— — — —	PERMIT BOUNDARY
- - - - - - - -	AUTHORIZED LIMITS OF WASTE
— — — — — —	PROPOSED LIMITS OF WASTE
33°02'00"	GEODETIC COORDINATE SYSTEM
● 18-57-5D	REGISTERED WATER WELL WITH GRID NUMBER OR WELL ID NUMBER ANNOTATED
△ WW-1	POTENTIAL WATER WELL LOCATION IDENTIFIED BY WBC IN MARCH 2011 FROM ADJACENT ROADWAY
○ 18-57-5D	FORMER WATER WELL LOCATION DESCRIBED IN PERMIT NO. 1312A
△ 1	INDICATES REVISION (SEE LIST OF REVISIONS)

TEXAS

LEWISVILLE EAST, TEX.
N3300–W9652.5/7.5
1960
PHOTOREVISED 1981
DMA 6658 II SW–SERIES V882

CARROLLTON, TEX.
NW/4 CARROLLTON 15 QUADRANGLE
N3252.5–W9652.5/7.5
1959
DMA 6640 IV NW–SERIES V882

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1957. Field checked 1960

Polyconic projection. 10,000-foot grid ticks based on Texas coordinate system, north central zone. 1000-meter Universal Transverse Mercator grid ticks, zone 14, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 10 meters south and 27 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Red tint indicates areas in which only landmark buildings are shown

Areas covered by dashed light-blue pattern are subject to controlled inundation to 532 feet

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.
2. UPDATED ONE–MILE RADIUS.

DRAFT

NOTES:

1. SITE LOCATION BASE MAP ADAPTED FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAPS ABOVE.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. WATER WELL LOCATIONS ARE APPROXIMATE AND BASED ON WELL DRILLER SUPPLIED INFORMATION AND TWDB GRID MAP ON PAGE IIIG–A–60 IN APPENDIX IIIG–A.
4. FORMER WATER WELL LOCATIONS OBTAINED FROM PERMIT NO. MSW–1312A APPLICATION.

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☐ ISSUED FOR CONSTRUCTION
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DATE: 02/2012
FILE: 1339–351–11
CAD: IIIG–A–6 WATER WELL.DWG

DRAWN BY: VRS
DESIGN BY: RSF
REVIEWED BY: RSF

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT WATER WELL LOCATION MAP

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DENTON COUNTY, TEXAS

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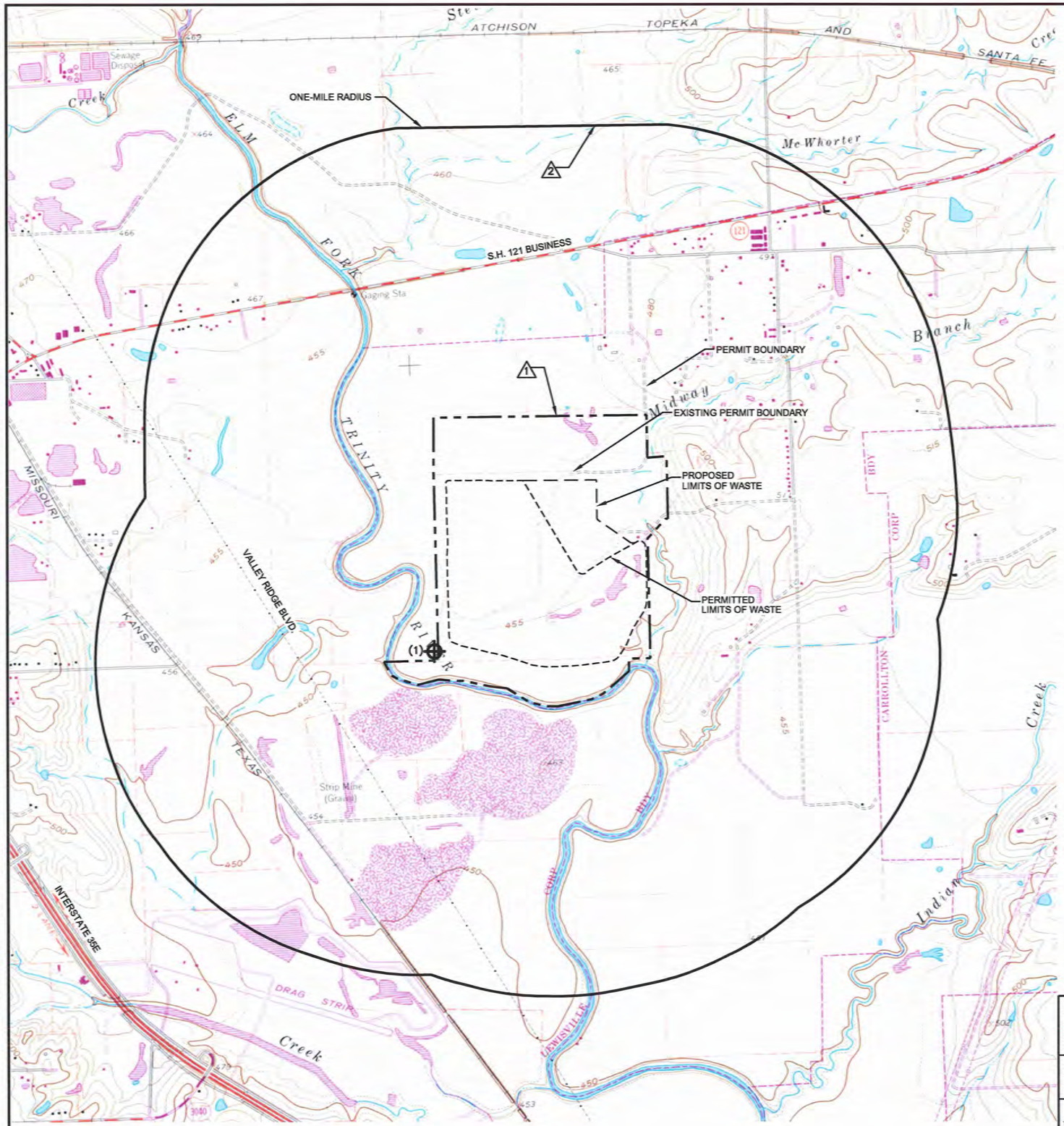
COLUMBUS, OH
DENVER, CO
FORT WORTH, TX (817) 735–9770
GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE IIIG–A–6

O:\1339\351\EXPANSION 2009\PART III–SDP\IIIG\IIIG–A–6 WATER WELL LOC.dwg, sford, 1:2



N

0 1000 2000
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- (1) GAS WELL LOCATION WITH NUMBER OF SURFACE PENETRATIONS (WELLS) AT LOCATION ANNOTATED

TEXAS

LEWISVILLE EAST, TEX.
N3300—W9652.5/7.5
1960
PHOTOREVISED 1981
DMA H532 III SW—SERIES V882

CARROLLTON, TEX.
NW/4 CARROLLTON 15 QUADRANGLE
N3252.5—W9652.5/7.5
1959
DMA 6646 IV NW—SERIES V882

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1957. Field checked 1960

Polyconic projection. 10,000-foot grid ticks based on Texas coordinate system, north central zone. 1000-meter Universal Transverse Mercator grid ticks, zone 14, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 10 meters south and 27 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

*Red tint indicates areas in which only landmark buildings are shown

Areas covered by dashed light-blue pattern are subject to controlled inundation to 532 feet

△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.
2. UPDATED ONE-MILE RADIUS.

NOTES:

1. GAS WELL LOCATION DATA OBTAINED FROM WBC FIELD OBSERVATIONS AND TEXAS RAILROAD COMMISSION RECORDS ON-LINE GIS AT http://gis2.rrc.state.tx.us/public/ IN FEBRUARY 2012.
2. NO RECORDS OF ACTIVE OIL WELLS WITHIN THE ONE MILE SEARCH RADIUS WERE FOUND IN THE RAILROAD COMMISSION DATABASE.
3. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

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- [x] FOR PERMITTING PURPOSES ONLY
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DATE: 02/2012
FILE: 1339-351-11
CAD: IIIG-A-7 GAS WELL LOCS.DWG

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MAJOR PERMIT AMENDMENT GAS WELL LOCATION MAP

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GRIFFITH, IN
SOUTH BEND, IN
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FIGURE IIIG-A-7

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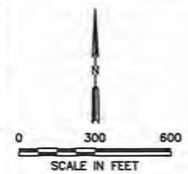
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\IIIG-A-7 OIL AND GAS WELL LOC.dwg, afor4, 1:2

APPENDIX IIIG-B

SITE EXPLORATION DATA



LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- PERMITTED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- EXISTING ROAD
- EXISTING TOPOGRAPHIC CONTOUR
- PROPOSED EXCAVATION
- PROPOSED LEACHATE COLLECTION PIPE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED DEEPER EXCAVATION AREA
- PROPOSED WASTE FOOTPRINT LATERAL EXPANSION AREA
- MW-3R (456.9) — EXISTING MONITORING WELL WITH SURFACE ELEVATION POSTED IN FT-MSL
- MW-10 (464.3) — OBSERVATION/MONITORING WELL WITH SURFACE ELEVATION POSTED IN FT-MSL
- FORMER MW-7 — FORMER MONITORING WELL LOCATION WITH SURFACE ELEVATION POSTED IN FT-MSL
- B-22 (454.0) — RONE 1980 BORING LOCATION WITH SURFACE ELEVATION POSTED IN FT-MSL
- TC-1 (460.0) — REED ENGINEERING 1994 BORING LOCATION WITH SURFACE ELEVATION POSTED IN FT-MSL.
- WB-5 (454) — WBC BORING AT LEAST 5 FEET BELOW EDE WITH SURFACE ELEVATION POSTED IN FT-MSL
- WB-2 (460) — WBC BORING AT LEAST 30 FEET BELOW EDE WITH SURFACE ELEVATION POSTED IN FT-MSL
- WB-1 (464) — WBC BORING AT LEAST 5 FEET BELOW EDE WITH PIEZOMETER INSTALLED AND SURFACE ELEVATION POSTED IN FT-MSL
- WB-15 (460) — WBC GEOTECHNICAL BORING FOR STRENGTH TESTING WITH SURFACE ELEVATION POSTED IN FT-MSL
- TGP-1 — CAREL CORPORATION TEMPRORAY GAS PROBE WITH SURFACE ELEVATION POSTED IN FT-MSL
- PZ-30 (434.4) — CAREL CORPORATION PIEZOMETER PROBE WITH SURFACE ELEVATION POSTED IN FT-MSL
- APPROXIMATE LOCATION OF SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. NO BORING LOG FOR MONITOR WELL MW-13R HAS BEEN LOCATED. THE LOCATION OF THIS MONITOR WELL HAS BEEN INCLUDED FOR INFORMATION PURPOSES.
4. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 2.1 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH THE REQUIRMENTS OF APPENDIX IIIH.
5. THE SLURRY WALL WILL BE CONSTRUCTED FOLLOWING THE SCHEDULE INCLUDED IN A PERMIT MODIFICATION TITLE "PERMIT MODIFICATION AND CORRECTION PLAN REVISION SLURRY WALL INSTALLATION" AND SUBMITTED TO TCEQ IN DECEMBER 2012 UNDER TCEQ PERMIT NO. MSW-1312A. IF TCEQ PERMIT NO. MSW-1312B IS ISSUED PRIOR TO THE CONSTRUCTION OF THE SLURRY WALL, THEN THE SLURRY WALL WILL BE CONSTRUCTED UNDER TCEQ PERMIT NO. MSW-1312B.

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☐ CLIENT APPROVAL BY: _____

DATE: 02/2012
FILE: 1339-351-11
CAD: IIIG-B-1 BORING LOCS.DWG
DRAWN BY: SRF
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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st. TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SOIL BORING LOCATION MAP

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DENTON COUNTY, TEXAS

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FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG-B-2

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\IIIG-B-2 SOIL BORING LOC MAP.dwg, sford, 1:2

APPENDIX IIIG-C

SITE GEOLOGIC DATA

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- EXISTING ROAD
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 394 — PROPOSED EXCAVATION
- PROPOSED LEACHATE COLLECTION PIPE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED DEEPER EXCAVATION AREA WITHIN AUTHORIZED DISPOSAL AREA
- PROPOSED WASTE FOOTPRINT LATERAL EXPANSION AREA
- A — A' GEOLOGIC CROSS SECTION LOCATION
- MW-3R (456.9) — EXISTING MONITORING WELL WITH SURFACE ELEVATION POSTED IN FT-MSL
- MW-10 (464.3) — OBSERVATION WELL WITH SURFACE ELEVATION POSTED IN FT-MSL
- FORMER MW-7 — FORMER MONITORING WELL LOCATION WITH SURFACE ELEVATION POSTED IN FT-MSL
- B-22 (454.0) — RONE 1980 BORING LOCATION WITH SURFACE ELEVATION POSTED IN FT-MSL
- TC-1 (460.0) — REED ENGINEERING 1994 BORING LOCATION WITH SURFACE ELEVATION POSTED IN FT-MSL.
- WB-5 (454) — WBC BORING AT LEAST 5 FEET BELOW EDE WITH SURFACE ELEVATION POSTED IN FT-MSL
- WB-2 (460) — WBC BORING AT LEAST 30 FEET BELOW EDE WITH SURFACE ELEVATION POSTED IN FT-MSL
- WB-1 (464) — WBC BORING AT LEAST 5 FEET BELOW EDE WITH PIEZOMETER INSTALLED AND SURFACE ELEVATION POSTED IN FT-MSL
- WB-15 (460) — WBC GEOTECHNICAL BORING FOR STRENGTH TESTING WITH SURFACE ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

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DATE: 02/2012
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CAD: IIIG-C-1 SECTION LOCS.DWG

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REVISIONS

NO.	DATE	DESCRIPTION
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MAJOR PERMIT AMENDMENT GEOLOGIC CROSS SECTION LOCATION MAP

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FIGURE IIIG-C-1

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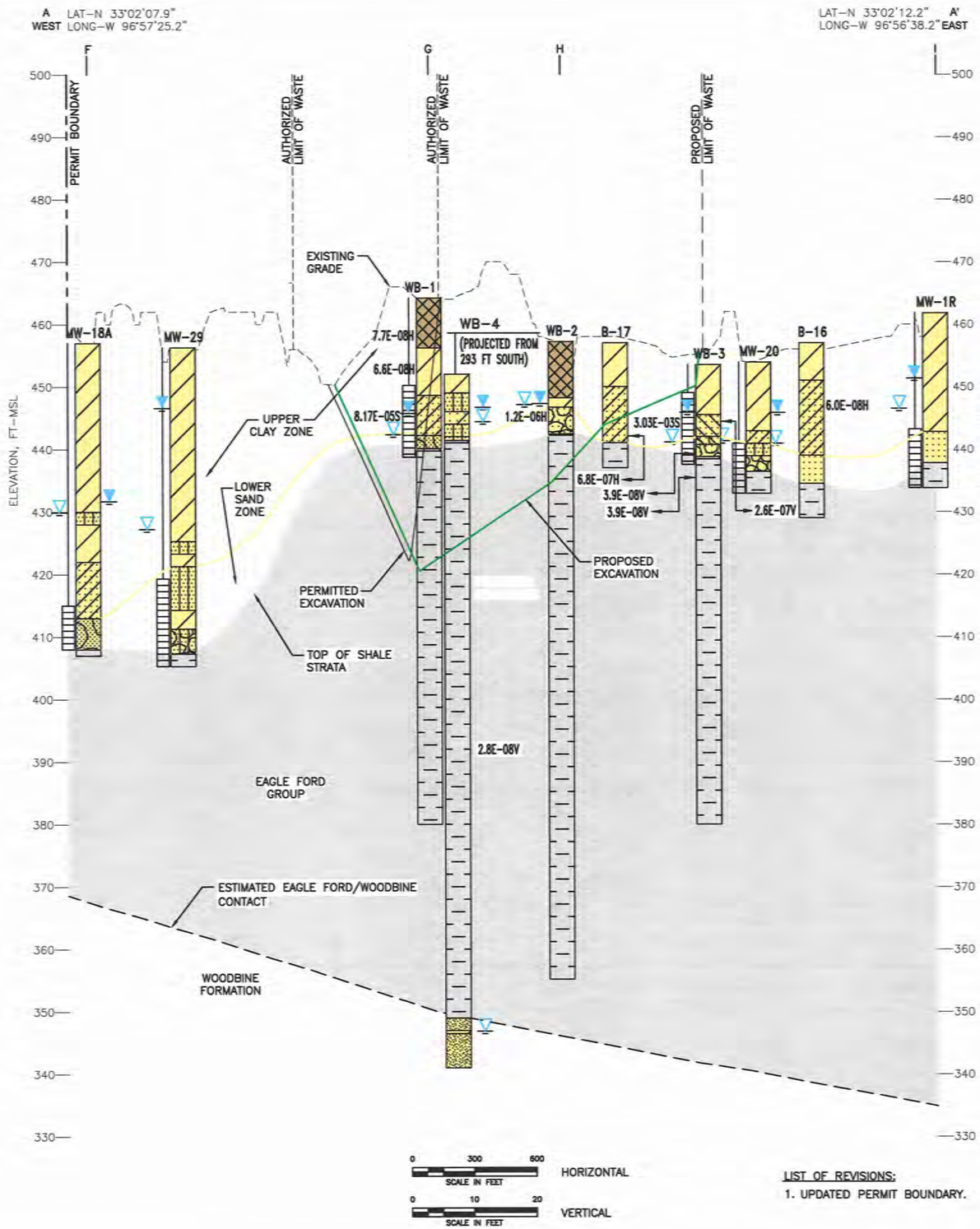
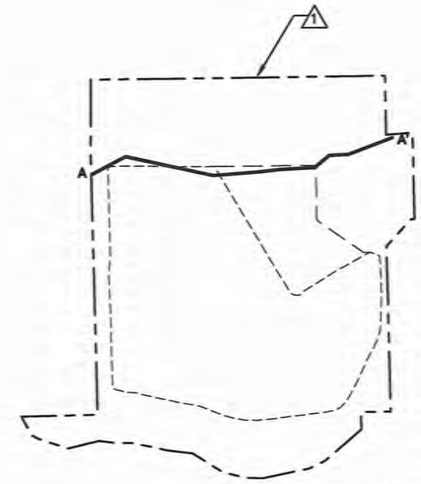
G:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\IIIG-C-1 CROSS SEC LOC.dwg, sford, 12





SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

BORING LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - GRAVELLY SAND
    - GRAVEL
- ALLUVIAL STRATA
  - LOWER SAND ZONE
    - SANDY GRAVEL
    - SILTY SANDY GRAVEL
    - CLAYEY SANDY GRAVEL
    - CLAYEY GRAVEL
- EARTHEN FILL
- SHALE STRATA
  - WEATHERED SHALE
  - UNWEATHERED SHALE
- WOODBINE STRATA
  - WEATHERED SHALE
  - SANDSTONE

MONITOR WELL OR PIEZOMETER WITH RISER (TOP) AND SCREEN (BOTTOM)

STATIC GROUNDWATER ELEVATION (FT–MSL) FROM GROUNDWATER MONITORING GAUGING DATA

GROUNDWATER ELEVATION AT TIME OF DRILLING (FT–MSL)

DRAFT

NOTES:

1. GROUNDWATER ELEVATIONS AT TIME OF DRILLING AND STATIC GROUNDWATER ELEVATIONS FROM PREVIOUS SUBSURFACE INVESTIGATION BORING LOGS AND GROUNDWATER MONITORING RECORDS. IN BOREHOLES WHERE NO GROUNDWATER HAS BEEN REPORTED, NO STATIC OR AT TIME OF DRILLING GROUNDWATER SYMBOL IS SHOWN. STATIC GROUNDWATER ELEVATIONS IN EXISTING MONITORING WELLS AND EXPANSION AREA BOREHOLES MEASURED ON DECEMBER 5, 2010.
2. CROSS SECTION LOCATION INDICATED ON SECTION LOCATION MAP INSET AND FIGURE IIIG–C–1.
3. STRATIGRAPHIC ZONES INTERPOLATED BETWEEN BOREHOLE LOCATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE ILLUSTRATED.
4. HYDRAULIC CONDUCTIVITY (K) MEASUREMENTS POSTED IN CM/SEC IN SCIENTIFIC NOTATION ADJACENT TO MEASUREMENT LOCATION/DEPTH. AN 'H' AT THE END OF THE K VALUE (i.e. 1.1E–04H) INDICATES MEASUREMENT IS GEOTECHNICAL LABORATORY HORIZONTAL K MEASUREMENT. A 'V' AT THE END OF THE K VALUE (i.e. 2.2E–04V) INDICATES MEASUREMENT IS GEOTECHNICAL LABORATORY VERTICAL K MEASUREMENT. AN 'S' AT THE END OF THE K VALUE (i.e. 3.3E–04S) INDICATES K IS DERIVED FROM INSITU RISING HEAD SLUG TEST DATA WHICH REPRESENTS THE HYDRAULIC CONDUCTIVITY OF A WELL SCREEN INTERVAL

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

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DATE: 02/2012
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REVISIONS

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MAJOR PERMIT AMENDMENT
GEOLOGIC CROSS–SECTION A–A'

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GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE IIIG–C–2

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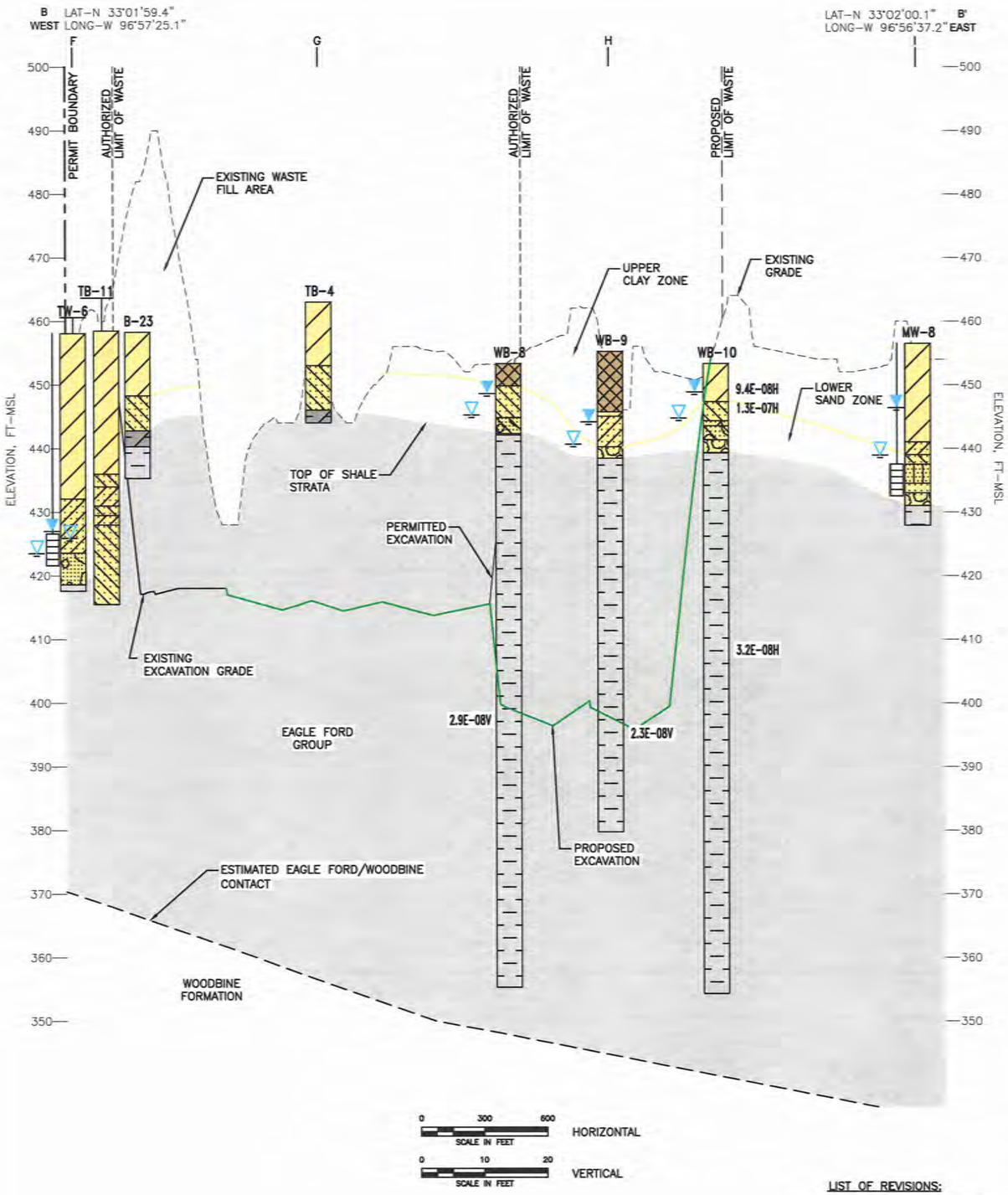
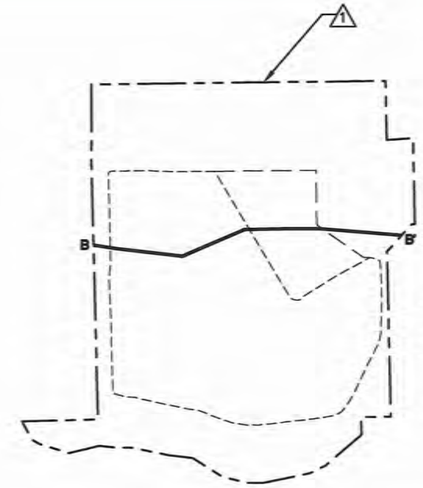
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\IIIG-C-2_C-10 CROSS SECTIONS.dwg, aford, 1:2





SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

BORING LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SANDY GRAVEL
- ALLUVIAL STRATA
  - LOWER SAND ZONE
    - GRAVELLY SANDY CLAY
    - GRAVELLY SAND
- EARTHEN FILL
- SHALE STRATA
  - WEATHERED SHALE
  - UNWEATHERED SHALE

MONITOR WELL OR PIEZOMETER WITH RISER (TOP) AND SCREEN (BOTTOM)

STATIC GROUNDWATER ELEVATION (FT–MSL) FROM GROUNDWATER MONITORING GAUGING DATA

GROUNDWATER ELEVATION AT TIME OF DRILLING (FT–MSL)

DRAFT

NOTES:

1. GROUNDWATER ELEVATIONS AT TIME OF DRILLING AND STATIC GROUNDWATER ELEVATIONS FROM PREVIOUS SUBSURFACE INVESTIGATION BORING LOGS AND GROUNDWATER MONITORING RECORDS. IN BOREHOLES WHERE NO GROUNDWATER HAS BEEN REPORTED, NO STATIC OR AT TIME OF DRILLING GROUNDWATER SYMBOL IS SHOWN. STATIC GROUNDWATER ELEVATIONS IN EXISTING MONITORING WELLS AND EXPANSION AREA BOREHOLES MEASURED ON DECEMBER 5, 2010.
2. CROSS SECTION LOCATION INDICATED ON SECTION LOCATION MAP INSET AND FIGURE IIIG–C–1.
3. STRATIGRAPHIC ZONES INTERPOLATED BETWEEN BOREHOLE LOCATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE ILLUSTRATED.
4. HYDRAULIC CONDUCTIVITY (K) MEASUREMENTS POSTED IN CM/SEC IN SCIENTIFIC NOTATION ADJACENT TO MEASUREMENT LOCATION/DEPTH. AN 'H' AT THE END OF THE K VALUE (i.e. 1.1E–04H) INDICATES MEASUREMENT IS GEOTECHNICAL LABORATORY HORIZONTAL K MEASUREMENT. A 'V' AT THE END OF THE K VALUE (i.e. 2.2E–04V) INDICATES MEASUREMENT IS GEOTECHNICAL LABORATORY VERTICAL K MEASUREMENT. AN 'S' AT THE END OF THE K VALUE (i.e. 3.3E–04S) INDICATES K IS DERIVED FROM INSITU RISING HEAD SLUG TEST DATA WHICH REPRESENTS THE HYDRAULIC CONDUCTIVITY OF A WELL SCREEN INTERVAL

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

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DATE: 02/2012
FILE: 1339–351–11
CAD: IIIG–C–3 SECTION B–B'.DWG

DRAWN BY: VRS
DESIGN BY: RSF
REVIEWED BY: JPY

PREPARED FOR
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REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GEOLOGIC CROSS–SECTION B–B'

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG–C–3

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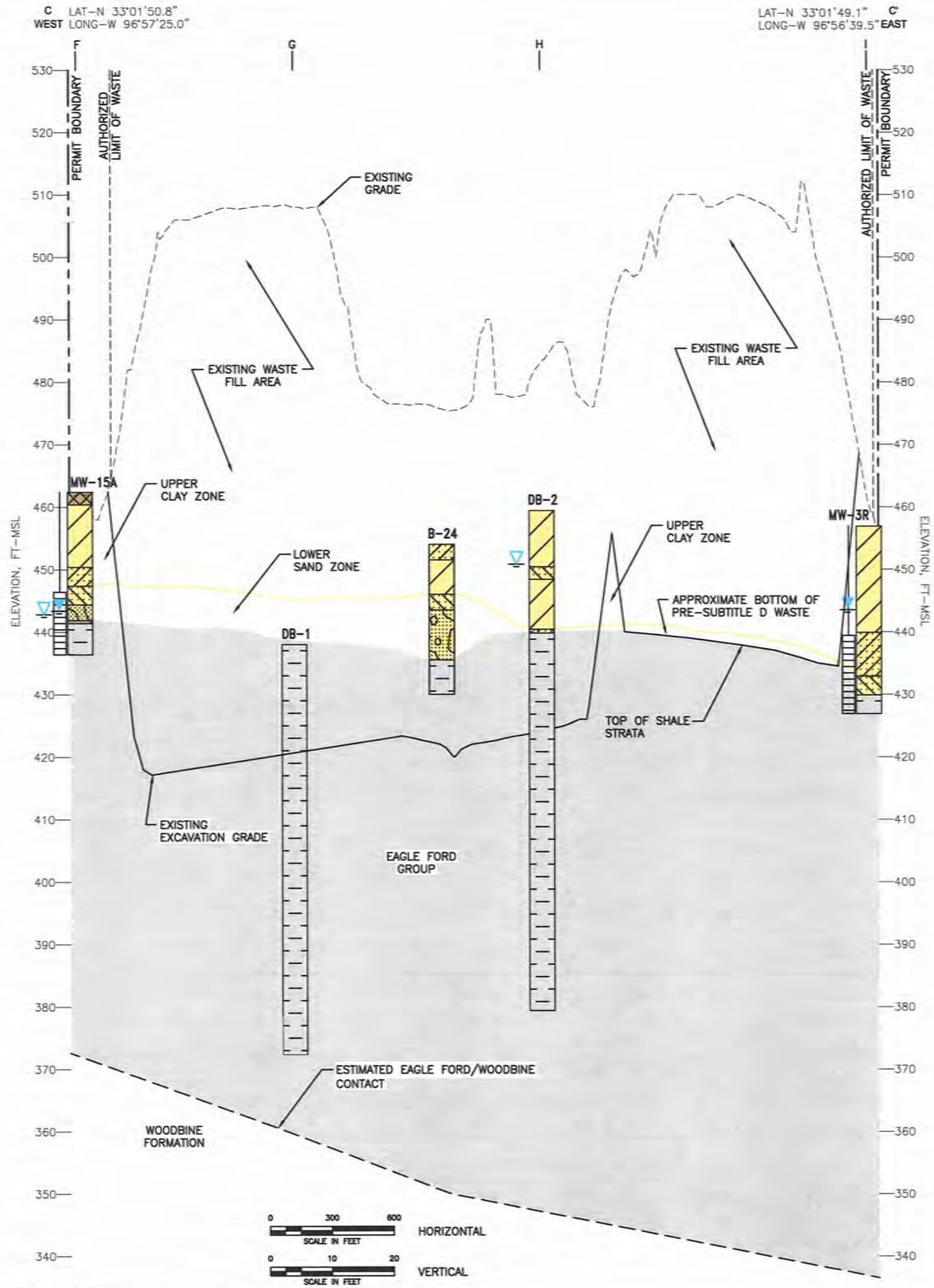

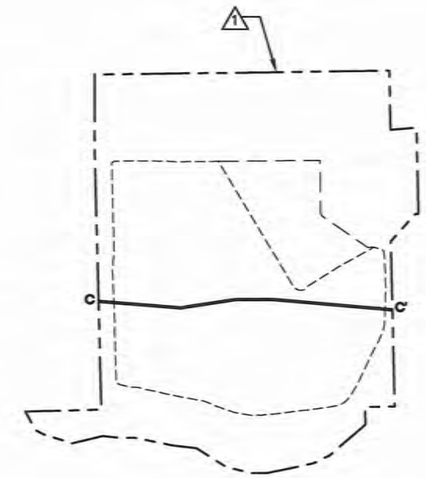

SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

BORING LEGEND

ALLUVIAL STRATA
- UPPER CLAY ZONE
  - CLAY AND SILTY CLAY
  - SANDY CLAY
- LOWER SAND ZONE
  - CLAYEY SAND
  - GRAVELLY SAND
  - SANDY GRAVEL

EARTHEN FILL

SHALE STRATA
- WEATHERED SHALE
- UNWEATHERED SHALE

MONITOR WELL OR PIEZOMETER WITH RISER (TOP) AND SCREEN (BOTTOM)

STATIC GROUNDWATER ELEVATION (FT–MSL) FROM GROUNDWATER MONITORING GAUGING DATA

GROUNDWATER ELEVATION AT TIME OF DRILLING (FT–MSL)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

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1. GROUNDWATER ELEVATIONS AT TIME OF DRILLING AND STATIC GROUNDWATER ELEVATIONS FROM PREVIOUS SUBSURFACE INVESTIGATION BORING LOGS AND GROUNDWATER MONITORING RECORDS. IN BOREHOLES WHERE NO GROUNDWATER HAS BEEN REPORTED, NO STATIC OR AT TIME OF DRILLING GROUNDWATER SYMBOL IS SHOWN. STATIC GROUNDWATER ELEVATIONS IN EXISTING MONITORING WELLS AND EXPANSION AREA BOREHOLES MEASURED ON DECEMBER 5, 2010.
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3. STRATIGRAPHIC ZONES INTERPOLATED BETWEEN BOREHOLE LOCATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE ILLUSTRATED.

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CAD: IIIG–C–4 SECTION C–C'.DWG

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DESIGN BY: RSF
REVIEWED BY: JPY

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10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GEOLOGIC CROSS–SECTION C–C'

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG–C–4

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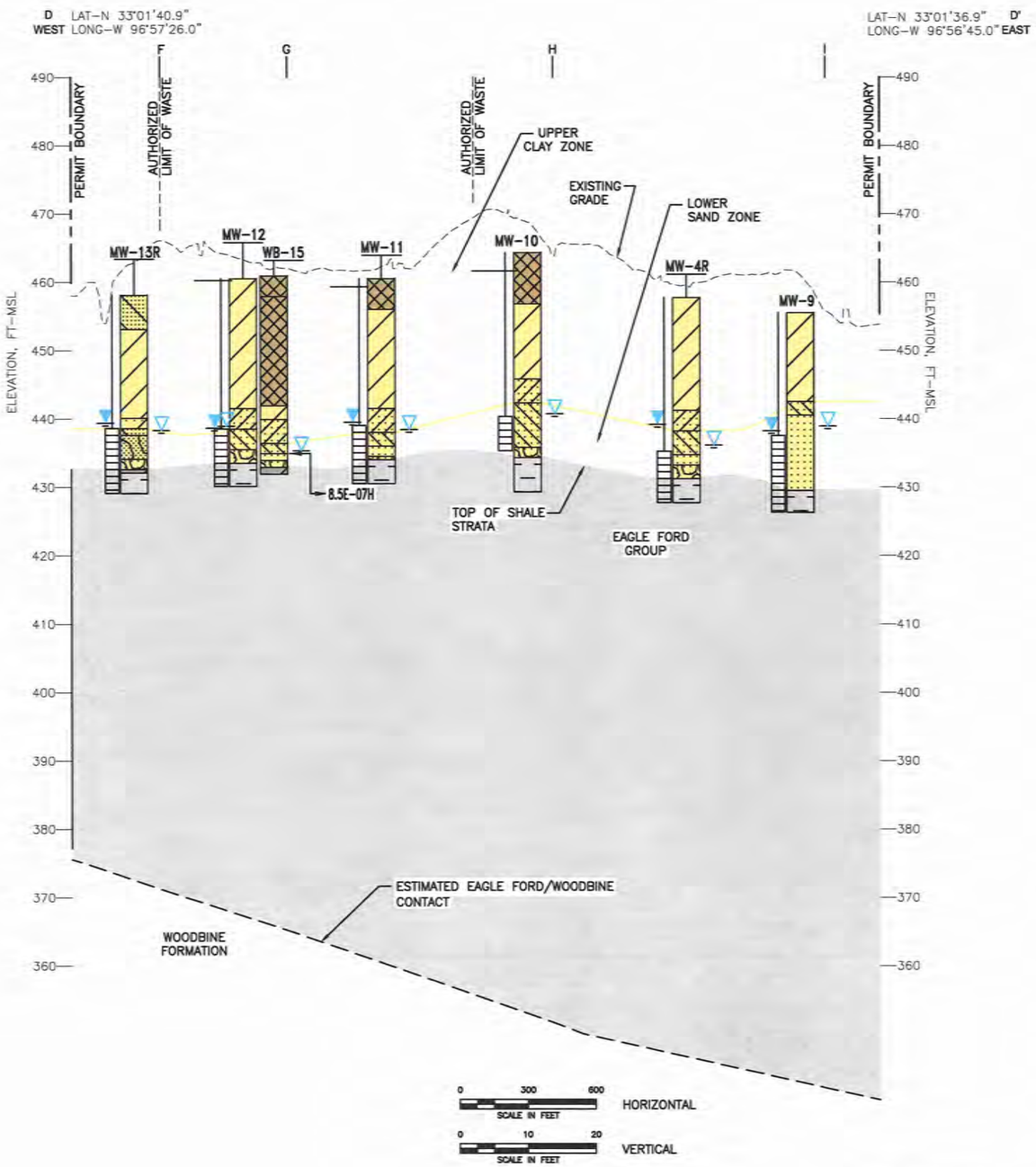

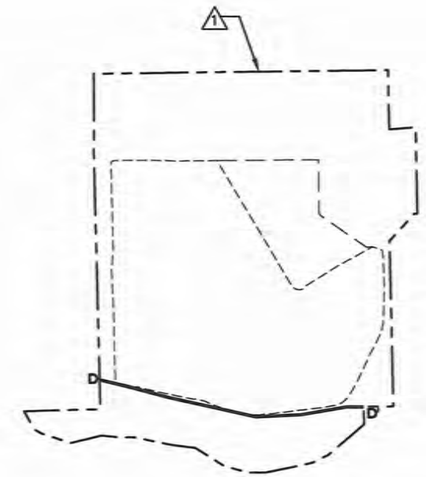

SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
INDICATES REVISION
(SEE LIST OF REVISIONS BELOW)

BORING LEGEND

ALLUVIAL STRATA
- UPPER CLAY ZONE
  - CLAY AND SILTY CLAY
  - SANDY CLAY
- LOWER SAND ZONE
  - SAND
  - CLAYEY SAND
  - GRAVELLY SAND
  - SANDY GRAVEL

EARTHEN FILL

SHALE STRATA
- WEATHERED SHALE
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GROUNDWATER ELEVATION AT TIME OF DRILLING (FT–MSL)

DRAFT

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LIST OF REVISIONS:

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GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
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FIGURE IIIG–C–5

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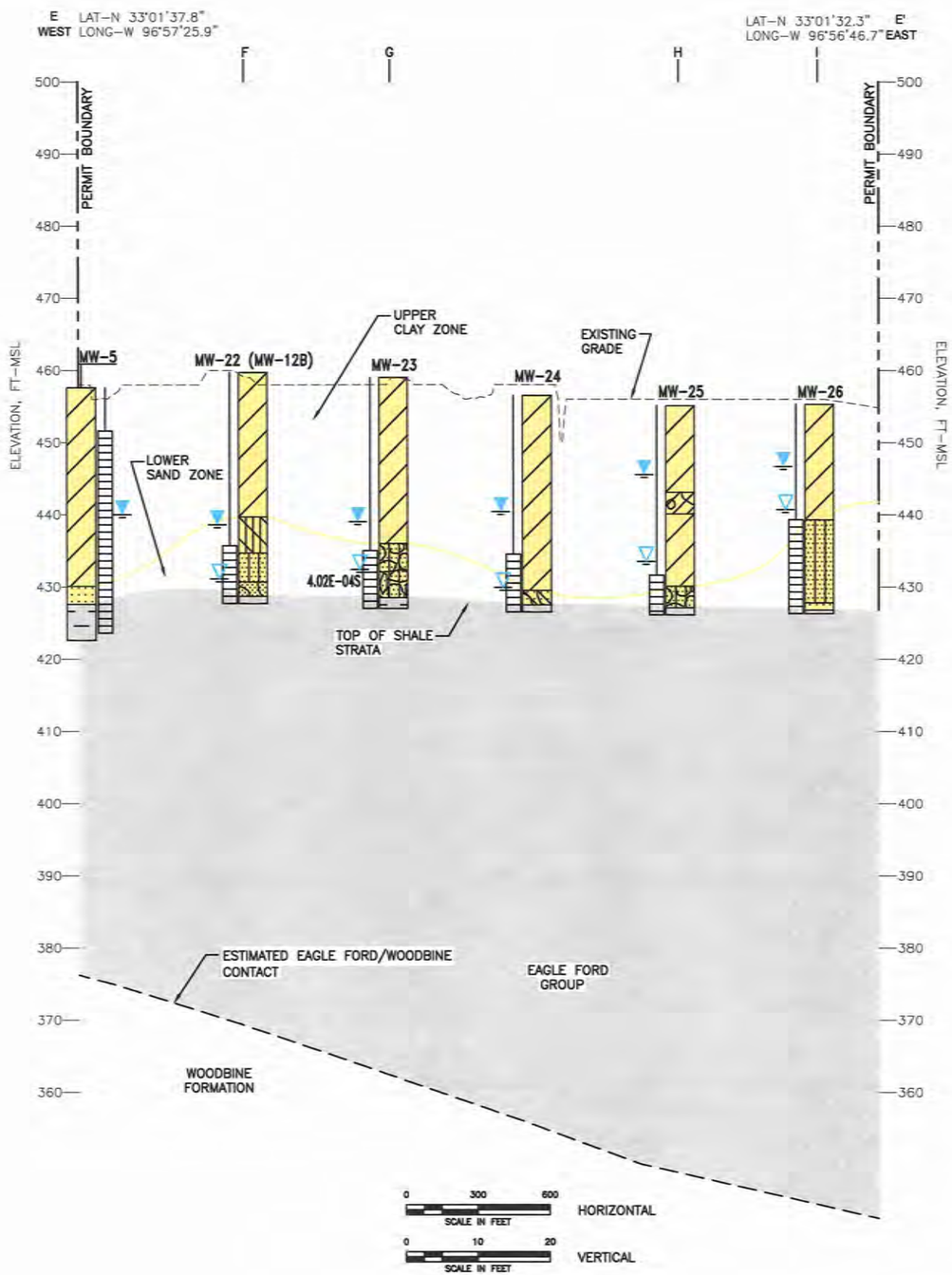

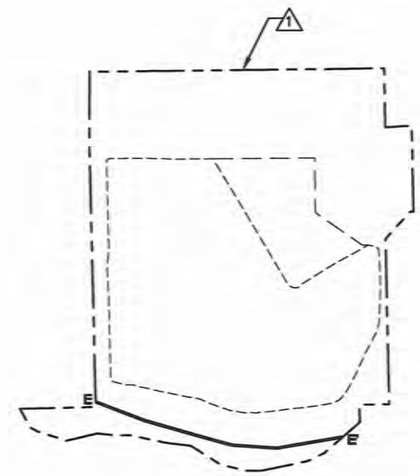

SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

BORING LEGEND

ALLUVIAL STRATA
- UPPER CLAY ZONE
  - CLAY AND SILTY CLAY
  - GRAVELLY CLAY
- LOWER SAND ZONE
  - SAND
  - SILTY SAND
  - CLAYEY SILT

ALLUVIAL STRATA
- LOWER SAND ZONE
  - CLAYEY SANDY GRAVEL
  - GRAVELLY SAND
  - SILTY SANDY GRAVEL

SHALE STRATA
- UNWEATHERED SHALE

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STATIC GROUNDWATER ELEVATION (FT–MSL) FROM GROUNDWATER MONITORING GAUGING DATA

GROUNDWATER ELEVATION AT TIME OF DRILLING (FT–MSL)

DRAFT

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FIGURE IIIG–C–6

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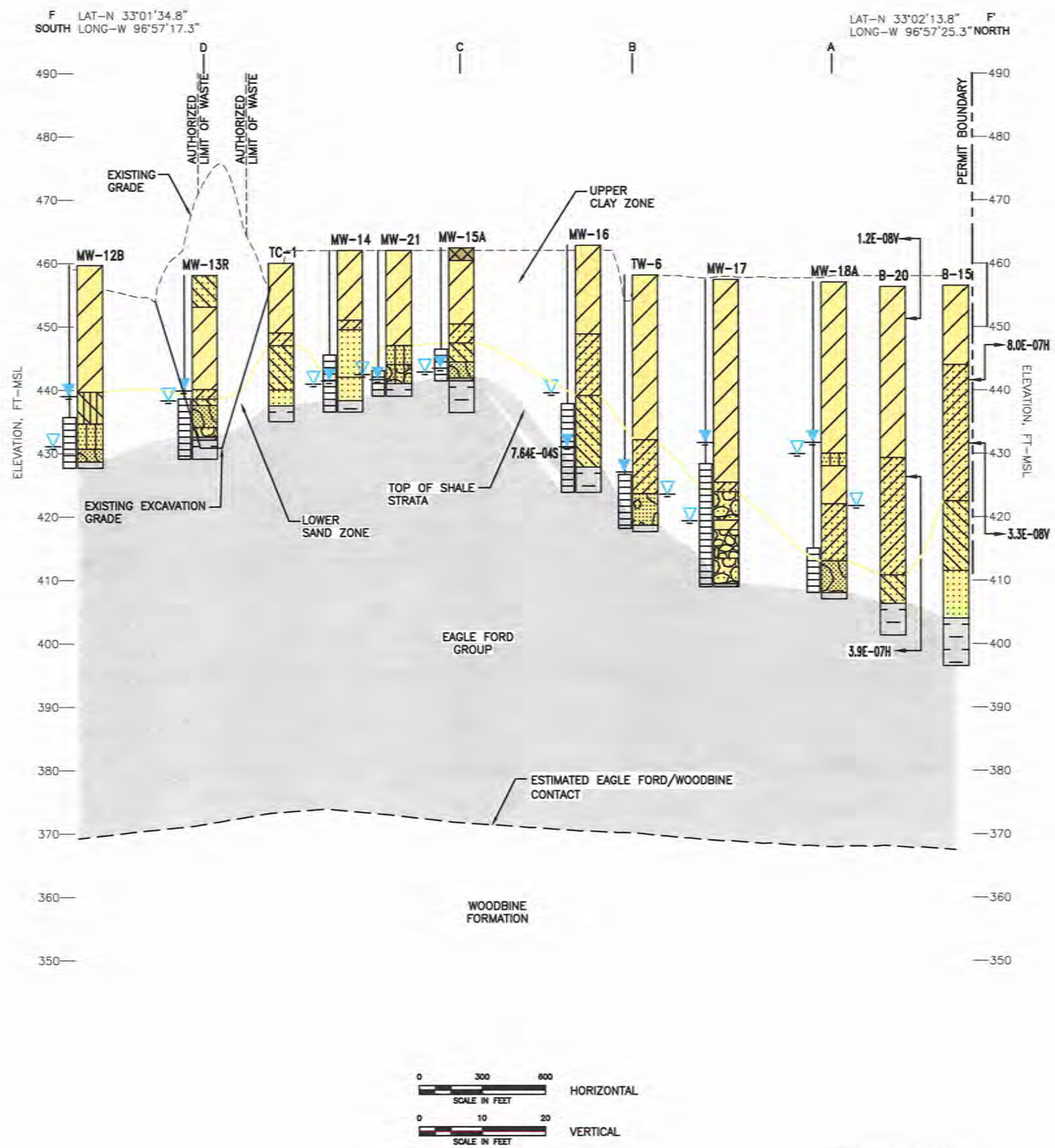

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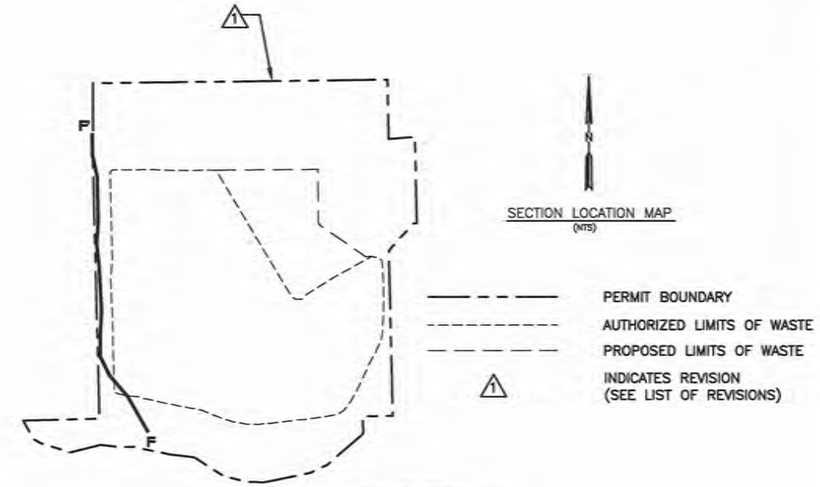

BORING LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - GRAVELLY SAND
    - GRAVEL
- ALLUVIAL STRATA
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    - SILTY SANDY GRAVEL
    - SANDY GRAVEL
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GROUNDWATER ELEVATION AT TIME OF DRILLING (FT-MSL)

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FIGURE IIIG-C-7

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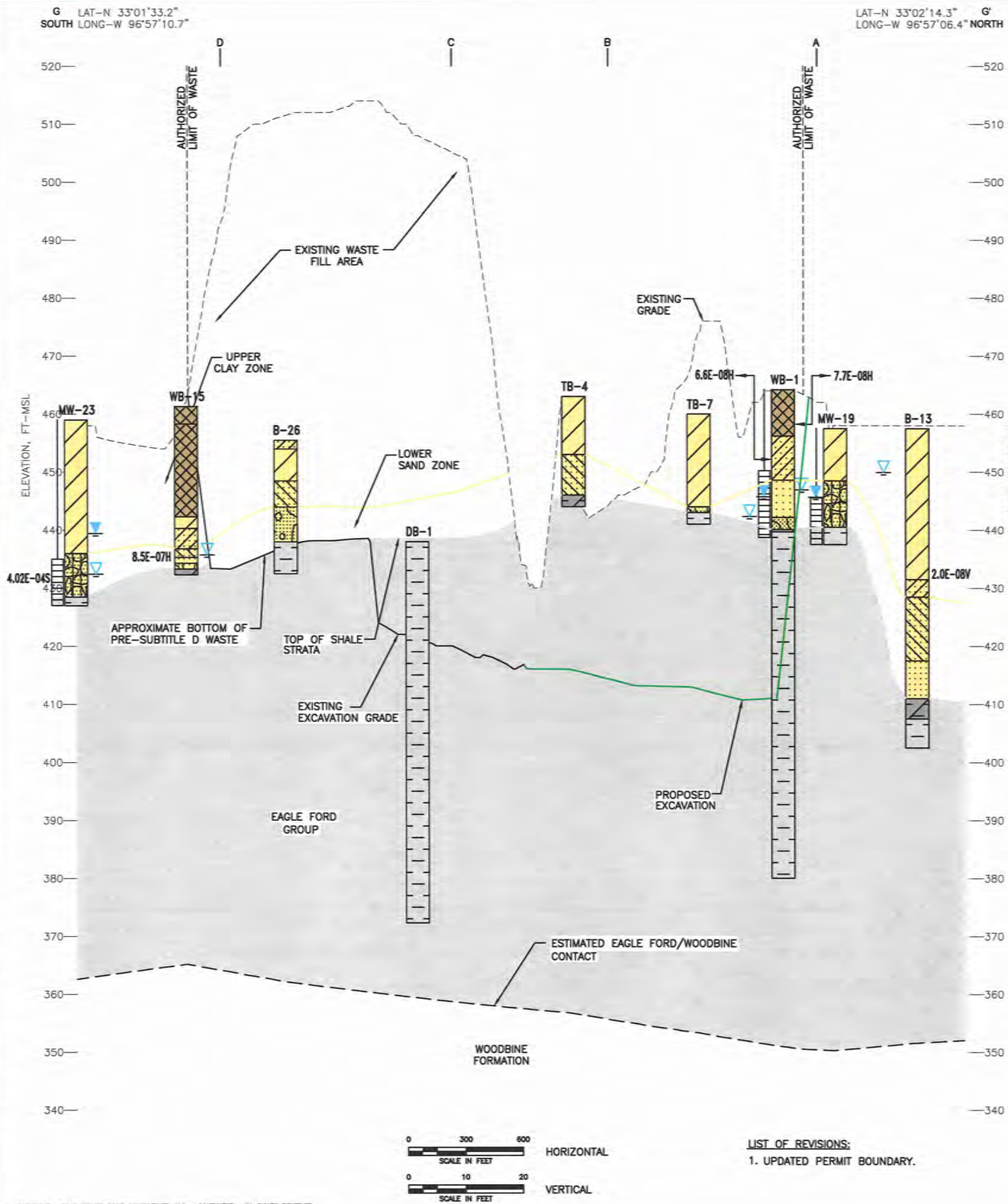

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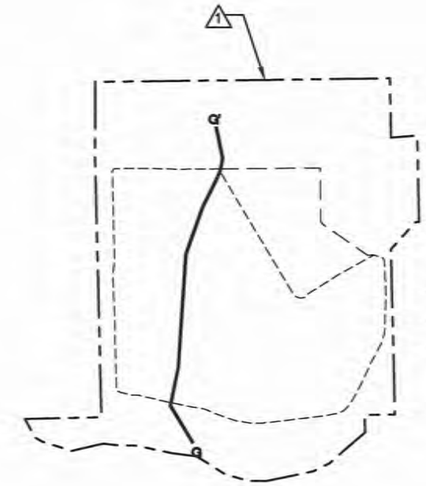

SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
INDICATES REVISION (SEE LIST OF REVISIONS)

BORING LEGEND

ALLUVIAL STRATA
- UPPER CLAY ZONE
  - CLAY AND SILTY CLAY
  - SANDY CLAY
- LOWER SAND ZONE
  - SAND
  - CLAYEY SAND
  - SILTY SANDY GRAVEL

ALLUVIAL STRATA
- LOWER SAND ZONE
  - GRAVELLY SAND
  - SANDY GRAVEL

EARTHEN FILL

SHALE STRATA
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MONITOR WELL OR PIEZOMETER WITH RISER (TOP) AND SCREEN (BOTTOM)

STATIC GROUNDWATER ELEVATION (FT–MSL) FROM GROUNDWATER MONITORING GAUGING DATA

GROUNDWATER ELEVATION AT TIME OF DRILLING (FT–MSL)

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DATE: 02/2012
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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG–C–8

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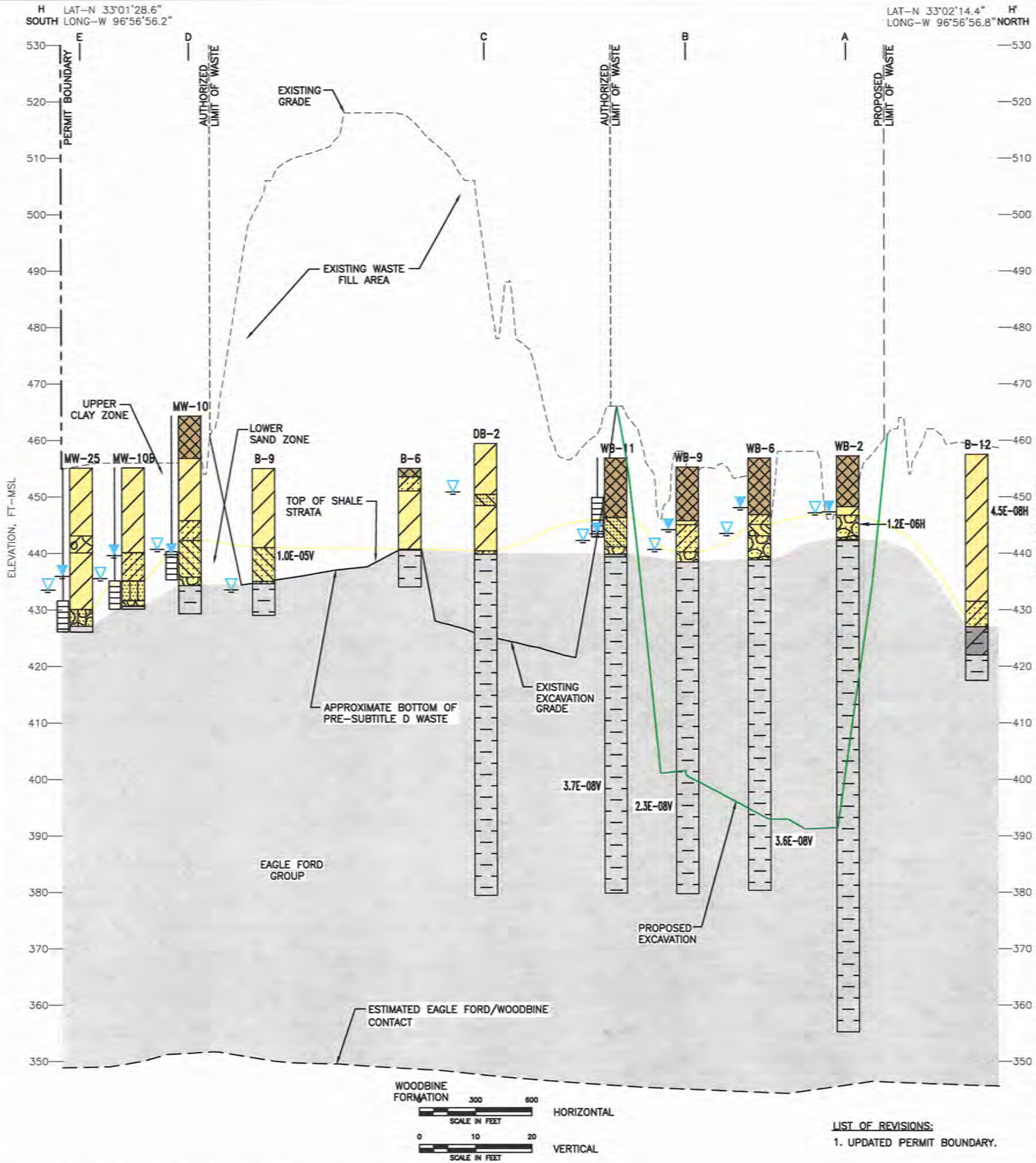

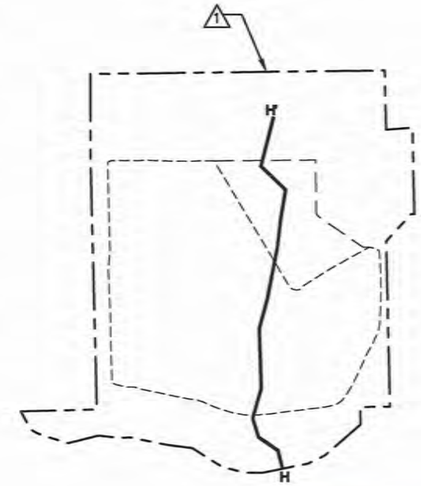

SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
INDICATES REVISION (SEE LIST OF REVISIONS)

BORING LEGEND

- ALLUVIAL STRATA
  - UPPER CLAY ZONE
    - CLAY AND SILTY CLAY
    - SANDY CLAY
  - LOWER SAND ZONE
    - SAND
    - CLAYEY SAND
    - SILTY SAND
    - SILTY SANDY GRAVEL
    - GRAVEL
  - LOWER SAND ZONE
    - SANDY GRAVEL
    - CLAYEY GRAVEL
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GRIFFITH, IN
SOUTH BEND, IN
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FIGURE IIIG–C–9

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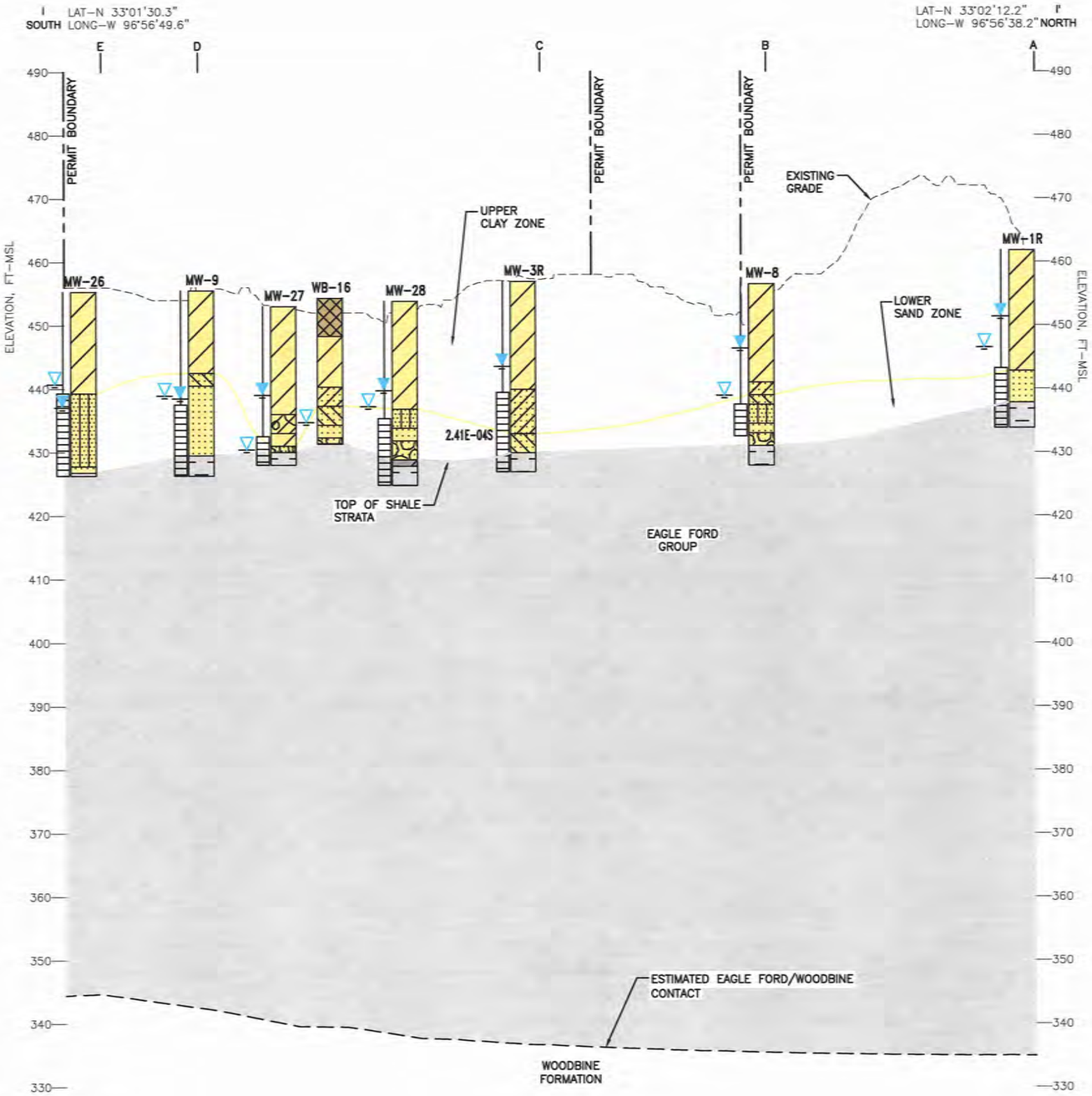
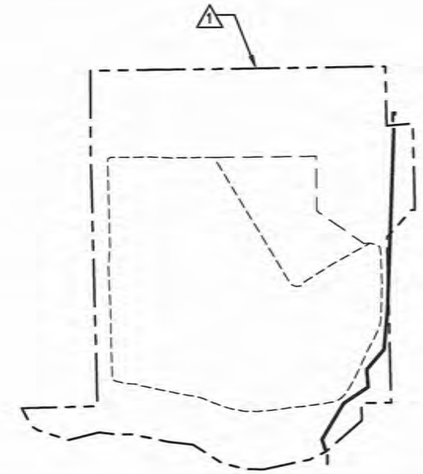
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIG\IIIG-C-2_C-10 CROSS SECTIONS.dwg, sfor4, 1:2





SECTION LOCATION MAP
(NTS)

PERMIT BOUNDARY
AUTHORIZED LIMITS OF WASTE
PROPOSED LIMITS OF WASTE
INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

BORING LEGEND

ALLUVIAL STRATA
- UPPER CLAY ZONE
  - CLAY AND SILTY CLAY
  - SANDY CLAY
- LOWER SAND ZONE
  - SAND
  - CLAYEY SAND
  - SILTY SAND
  - SANDY GRAVEL

ALLUVIAL STRATA
- LOWER SAND ZONE
  - SILTY SANDY GRAVEL
  - GRAVELLY CLAY
  - CLAYEY GRAVEL

EARTHEN FILL

SHALE STRATA
- WEATHERED SHALE
- UNWEATHERED SHALE

MONITOR WELL OR PIEZOMETER WITH RISER (TOP) AND SCREEN (BOTTOM)

STATIC GROUNDWATER ELEVATION (FT–MSL) FROM GROUNDWATER MONITORING GAUGING DATA

GROUNDWATER ELEVATION AT TIME OF DRILLING (FT–MSL)

NOTES:

1. GROUNDWATER ELEVATIONS AT TIME OF DRILLING AND STATIC GROUNDWATER ELEVATIONS FROM PREVIOUS SUBSURFACE INVESTIGATION BORING LOGS AND GROUNDWATER MONITORING RECORDS. IN BOREHOLES WHERE NO GROUNDWATER HAS BEEN REPORTED, NO STATIC OR AT TIME OF DRILLING GROUNDWATER SYMBOL IS SHOWN. STATIC GROUNDWATER ELEVATIONS IN EXISTING MONITORING WELLS AND EXPANSION AREA BOREHOLES MEASURED ON DECEMBER 5, 2010.
2. CROSS SECTION LOCATION INDICATED ON SECTION LOCATION MAP INSET AND FIGURE IIIG–C–1.
3. STRATIGRAPHIC ZONES INTERPOLATED BETWEEN BOREHOLE LOCATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE ILLUSTRATED.

DRAFT

0 300 600 SCALE IN FEET HORIZONTAL

0 10 20 SCALE IN FEET VERTICAL

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GEOLOGIC CROSS–SECTION I–I'

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE IIIG–C–10

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G:\1339\351\EXPANSION 2009\PART III–SDP\IIIG\IIIG–C–2_C–10 CROSS SECTIONS.dwg, sford, 1:2

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 440 — TOP OF SHALE ELEVATION CONTOUR IN FT-MSL
- EXISTING ROAD
- MW-3R (456.9) — EXISTING MONITORING WELL WITH TOP OF SHALE ELEVATION POSTED IN FT-MSL
- MW-10A (461.1) — TEMPORARY CAREL CORPORATION MONITORING WELL WITH TOP OF SHALE ELEVATION POSTED IN FT-MSL
- FORMER MW-7 — FORMER MONITORING WELL LOCATION WITH TOP OF SHALE ELEVATION POSTED IN FT-MSL
- B-22 (454.0) — RONE 1980 BORING LOCATION WITH TOP OF SHALE ELEVATION POSTED IN FT-MSL
- TC-1 (460.0) — REED ENGINEERING 1994 BORING LOCATION WITH TOP OF SHALE ELEVATION POSTED IN FT-MSL.
- (NC) — NOT CONTOURED, SHALE NOT ENCOUNTERED
- WB-2 (442.4) — WBC 2010 BORING LOCATION WITH TOP OF SHALE ELEVATION POSTED IN FT-MSL
- PWB-1 (440.1) — WBC 2010 PIEZOMETER LOCATION WITH TOP OF SHALE ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

DRAFT

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION DATA FROM DOCUMENTS COMPILED BY RONE, REED, AND CAREL AND WBC BOREHOLE LOGS.
3. NA; BOREHOLE ADVANCED FROM BOTTOM OF BOREHOLE EXCAVATION. TRUE TOP OF SHALE UNKNOWN.

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MAJOR PERMIT AMENDMENT TOP OF SHALE STRATA ELEVATION CONTOUR MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-C-11

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APPENDIX IIIG-D

SITE HYDROGEOLOGIC DATA

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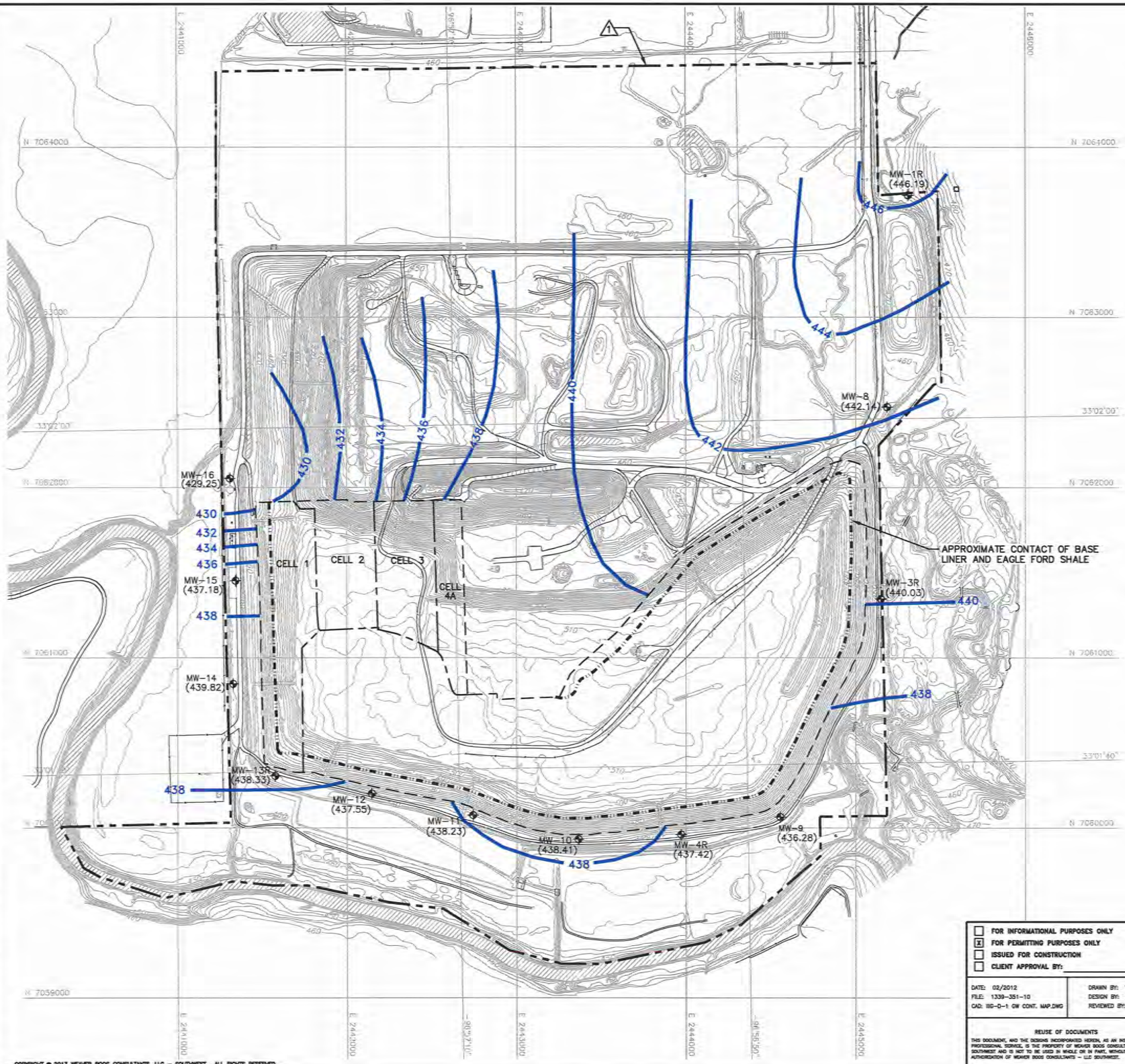

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- 510 EXISTING CONTOUR
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 33°02'06" GEODETIC COORDINATE SYSTEM
- CELL BOUNDARY
- MW-8 (442.14) GROUNDWATER MONITORING WELL WITH WATER LEVELS POSTED IN FT-MSL
- 430 GROUNDWATER CONTOUR (SEE NOTE 3)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC CONTOURS AND WATER LEVEL MEASUREMENTS REPRODUCED FROM GROUNDWATER CONTOUR MAP – DECEMBER 1999 PREPARED BY THE CAREL CORPORATION. WATER LEVELS MEASURED DECEMBER 17, 1999. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.

LIST OF REVISIONS:

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MAJOR PERMIT AMENDMENT
POTENTIOMETRIC SURFACE MAP
DECEMBER 1999

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DENTON COUNTY, TEXAS

Weaver Boos Consultants

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FIGURE IIIG-D-1

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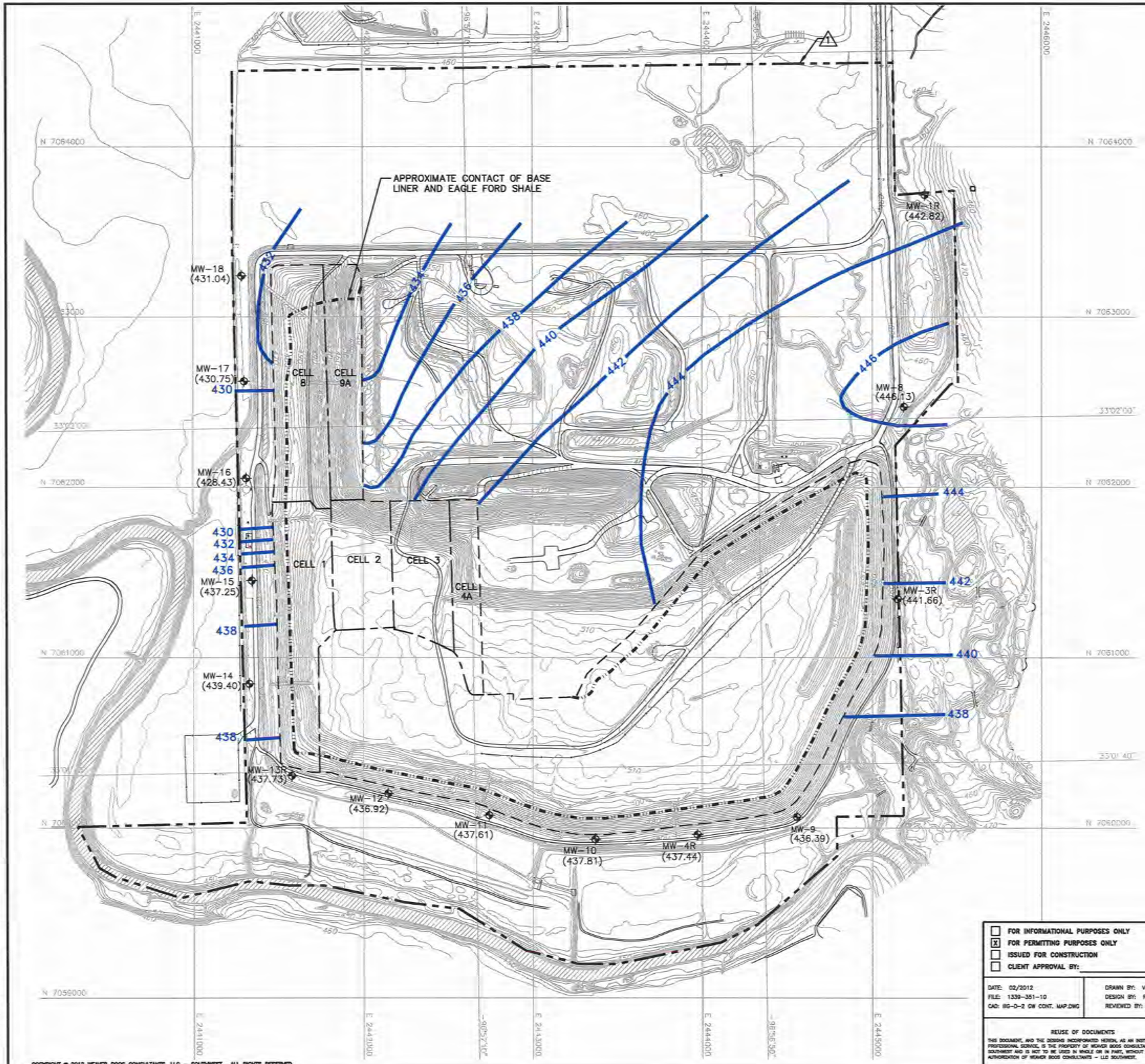

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- 510 EXISTING CONTOUR
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 33°02'06" GEODETIC COORDINATE SYSTEM
- CELL BOUNDARY
- MW-8 (446.13) GROUNDWATER MONITORING WELL WITH WATER LEVELS POSTED IN FT-MSL
- 430 GROUNDWATER CONTOUR (SEE NOTE 3)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC CONTOURS AND WATER LEVEL MEASUREMENTS REPRODUCED FROM GROUNDWATER CONTOUR MAP – DECEMBER 2000 PREPARED BY THE CAREL CORPORATION. WATER LEVELS MEASURED DECEMBER 22, 2000. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

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MAJOR PERMIT AMENDMENT
POTENTIOMETRIC SURFACE MAP
DECEMBER 2000
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-D-2

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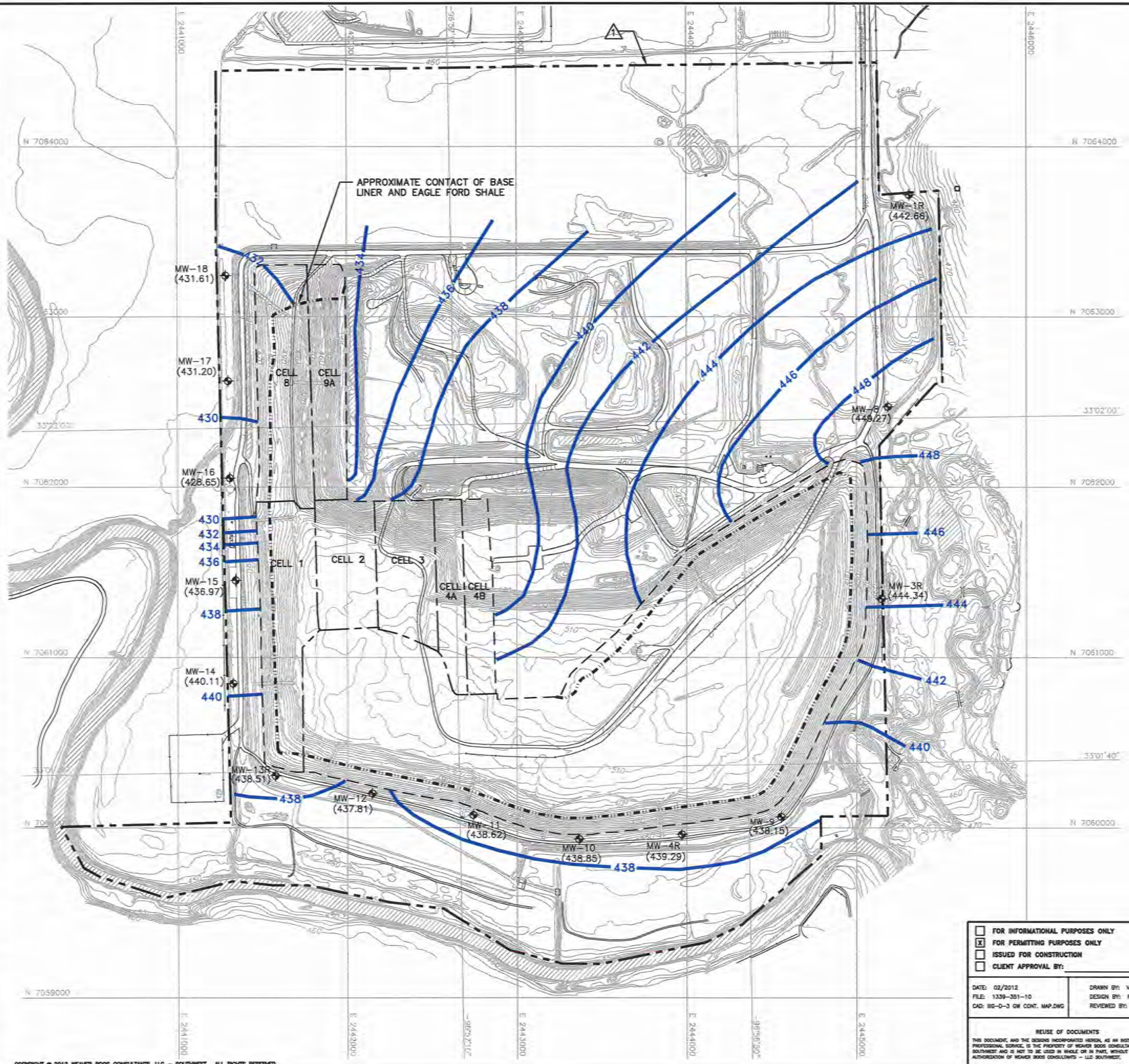

N

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- 510 EXISTING CONTOUR
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 33°02'00" GEODETIC COORDINATE SYSTEM
- CELL BOUNDARY
- MW-8 (449.27) GROUNDWATER MONITORING WELL WITH WATER LEVELS POSTED IN FT-MSL
- 430 GROUNDWATER CONTOUR (SEE NOTE 3)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC CONTOURS AND WATER LEVEL MEASUREMENTS REPRODUCED FROM GROUNDWATER CONTOUR MAP – DECEMBER 2002 PREPARED BY THE CAREL CORPORATION. WATER LEVELS MEASURED DECEMBER 16-17, 2002. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.

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MAJOR PERMIT AMENDMENT
POTENTIOMETRIC SURFACE MAP
DECEMBER 2002

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-D-3

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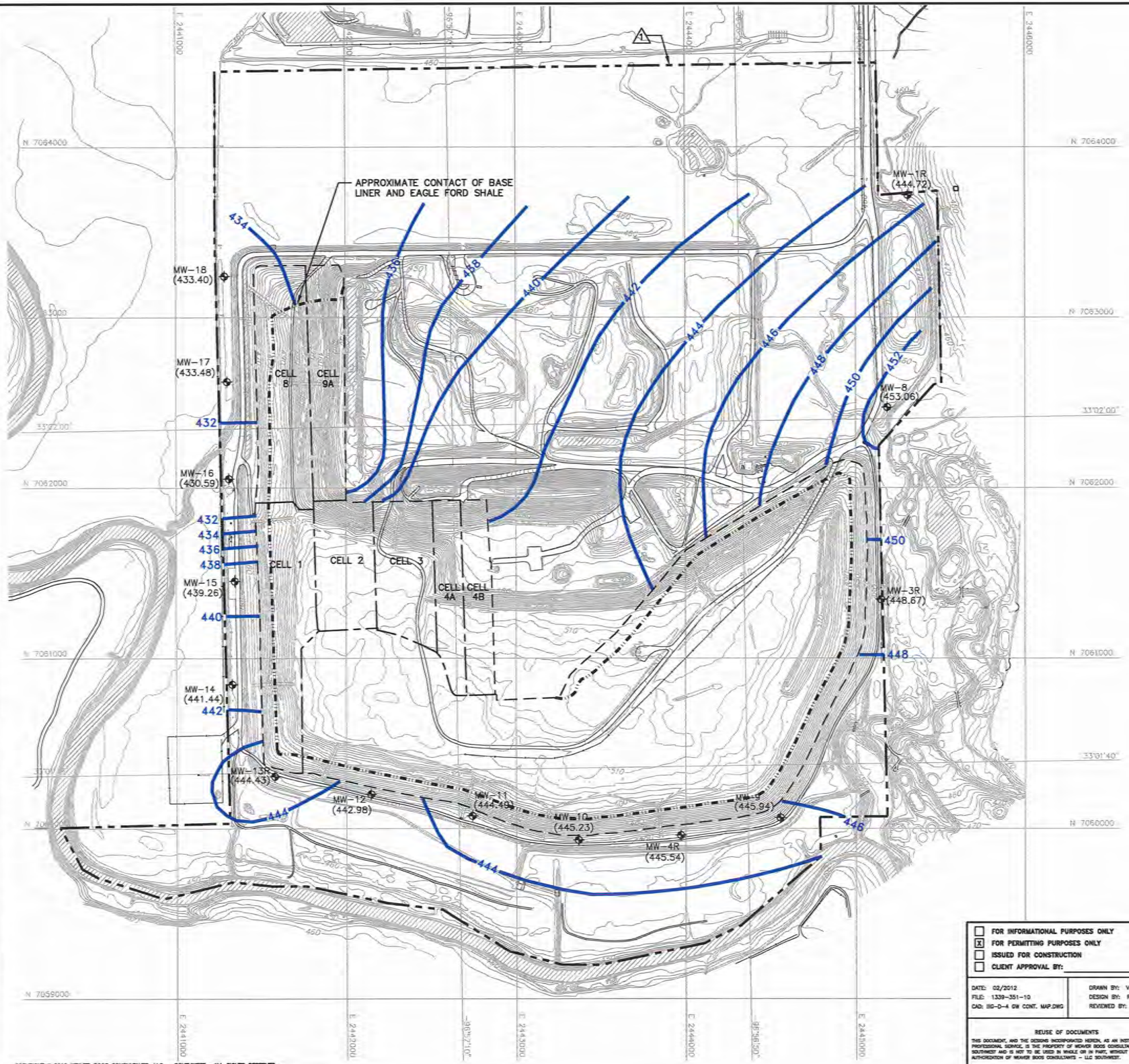

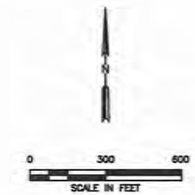

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- 510 EXISTING CONTOUR
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 33°02'00" GEODETIC COORDINATE SYSTEM
- CELL BOUNDARY
- MW-8 (453.06) GROUNDWATER MONITORING WELL WITH WATER LEVELS POSTED IN FT-MSL
- 430 GROUNDWATER CONTOUR (SEE NOTE 3)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- 1 INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC CONTOURS AND WATER LEVEL MEASUREMENTS REPRODUCED FROM GROUNDWATER CONTOUR MAP – DECEMBER 2004 PREPARED BY THE CAREL CORPORATION. WATER LEVELS MEASURED DECEMBER 20-21, 2004. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

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MAJOR PERMIT AMENDMENT
POTENTIOMETRIC SURFACE MAP
DECEMBER 2004

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-D-4

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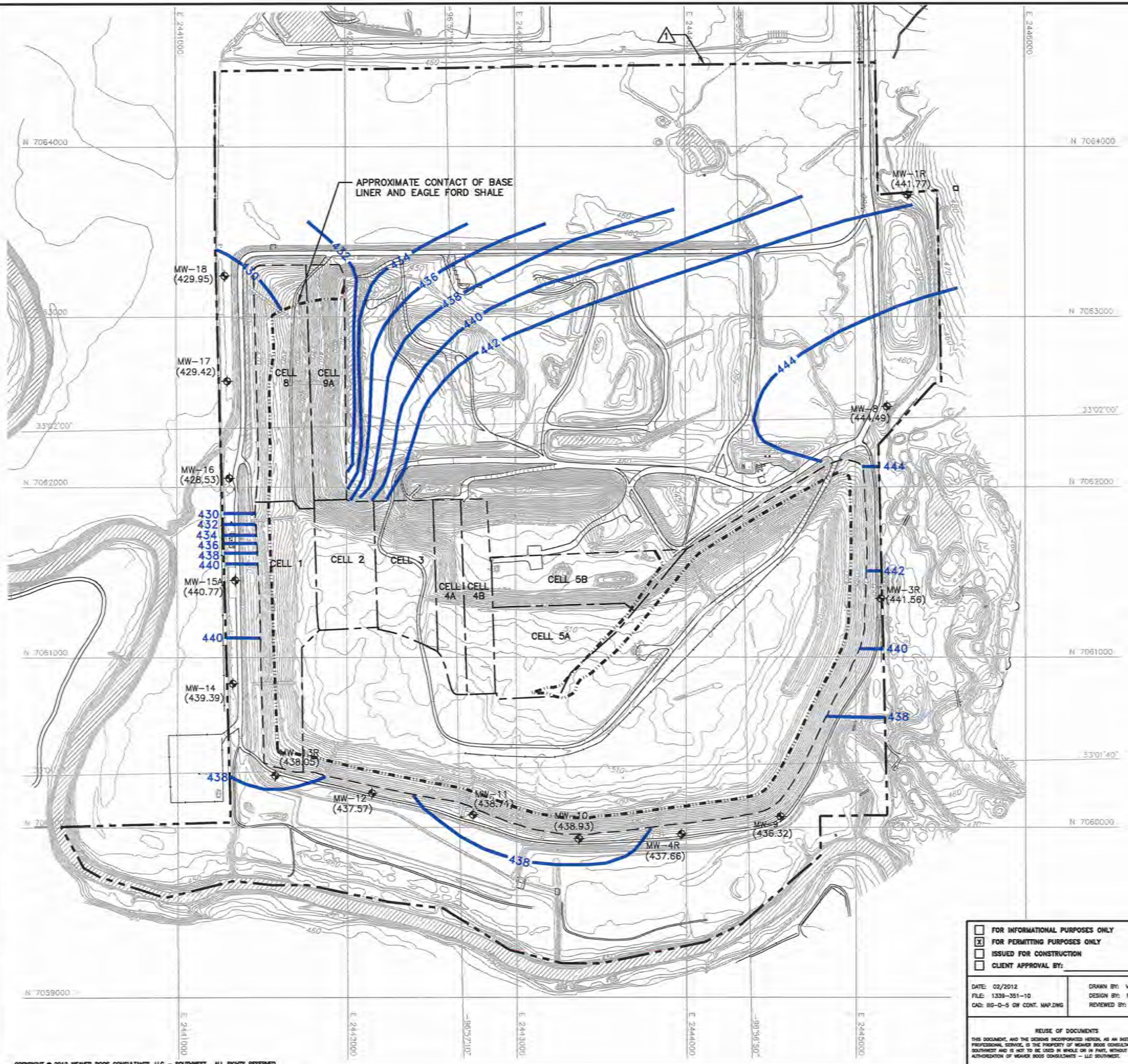

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- 510 — EXISTING CONTOUR
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- CELL BOUNDARY
- MW-8 (444.49) — GROUNDWATER MONITORING WELL WITH WATER LEVELS POSTED IN FT-MSL
- 430 — GROUNDWATER CONTOUR (SEE NOTE 3)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC CONTOURS AND WATER LEVEL MEASUREMENTS REPRODUCED FROM GROUNDWATER CONTOUR MAP – DECEMBER 2006 PREPARED BY THE CAREL CORPORATION. WATER LEVELS MEASURED DECEMBER 13-14, 2006. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

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MAJOR PERMIT AMENDMENT
POTENTIOMETRIC SURFACE MAP
DECEMBER 2006

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DENTON COUNTY, TEXAS

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FIGURE IIIG-D-5

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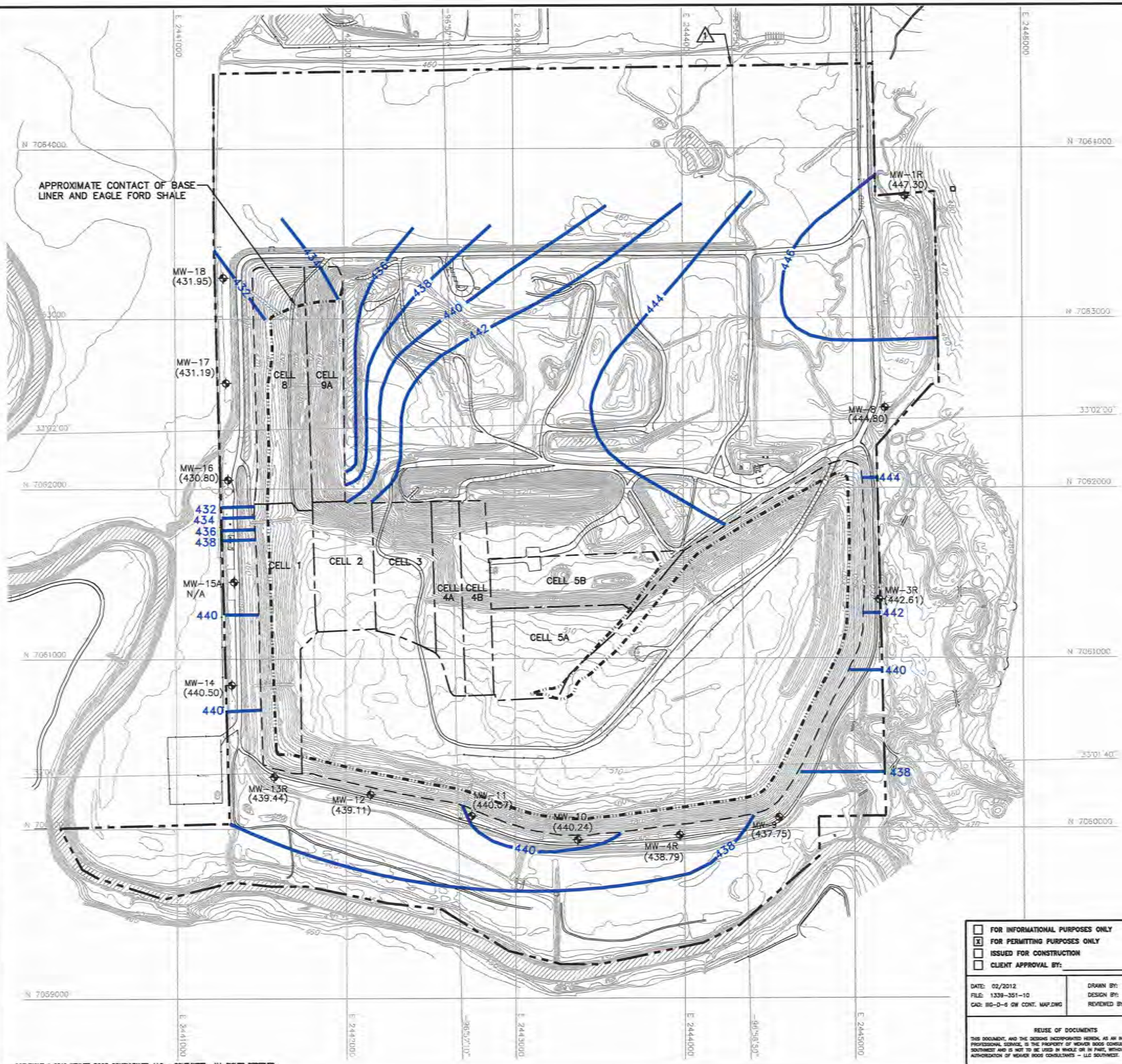

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- 510 — EXISTING CONTOUR
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- CELL BOUNDARY
- MW-8 (444.80) — GROUNDWATER MONITORING WELL WITH WATER LEVELS POSTED IN FT-MSL
- 430 — GROUNDWATER CONTOUR (SEE NOTE 3)
- N/A — WATER LEVEL BELOW TOP OF PUMP
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- △1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. POTENTIOMETRIC CONTOURS AND WATER LEVEL MEASUREMENTS REPRODUCED FROM GROUNDWATER CONTOUR MAP – DECEMBER 2008 PREPARED BY THE CAREL CORPORATION. WATER LEVELS MEASURED DECEMBER 1-3, 2008. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

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FILE: 1339-351-10
CAD: BG-D-6 GW CONT. MAP.DWG

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DESIGN BY: RSF
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
POTENTIOMETRIC SURFACE MAP
DECEMBER 2008

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727
CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG-D-6

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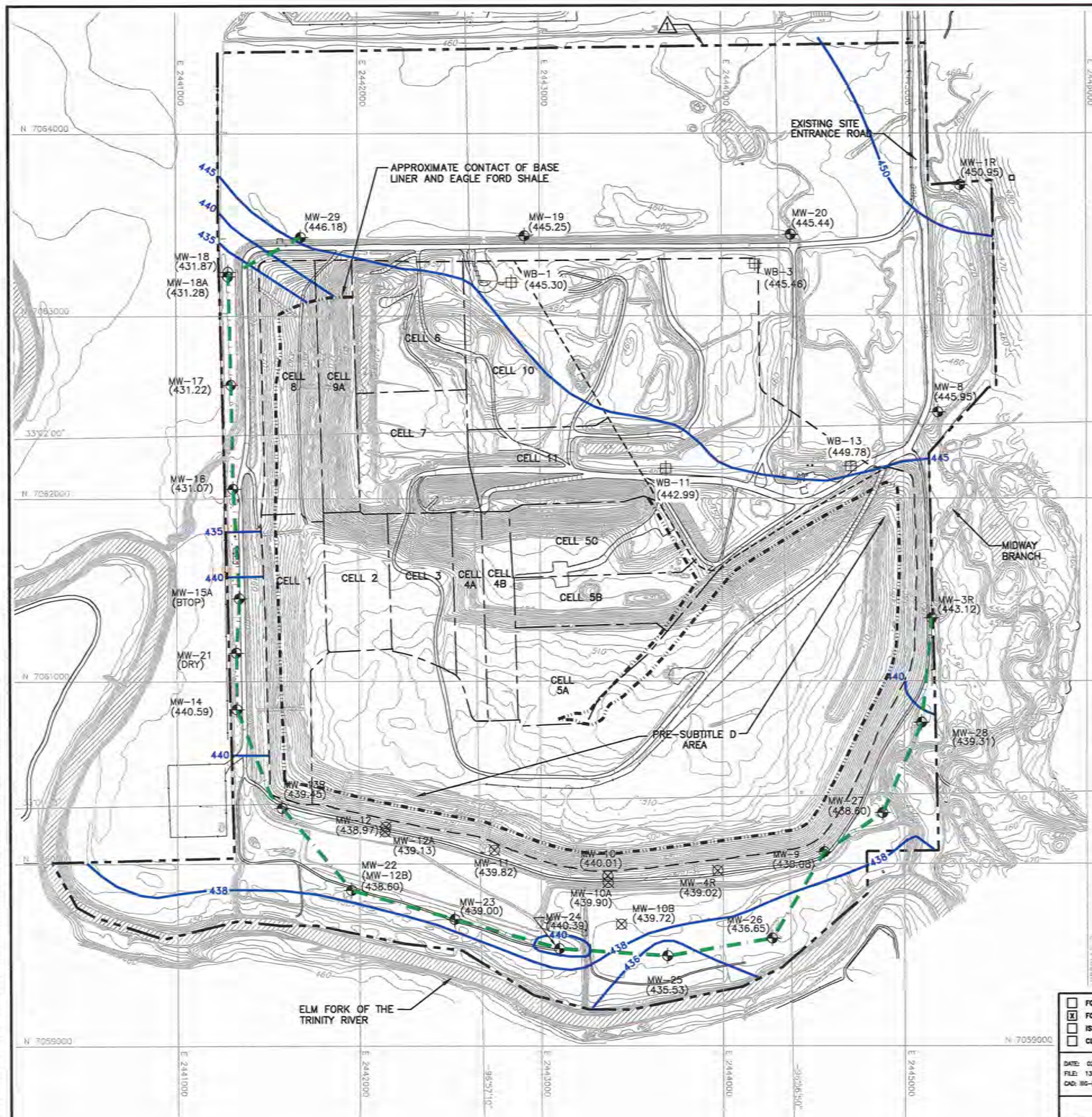

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- EXISTING ROAD
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER ELEVATION CONTOUR (FT-MSL)
- EXISTING PERMITTED POINT OF COMPLIANCE (TCEQ PERMIT NO. MSW-1312A)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- MW-3R (443.12) — EXISTING MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10 (440.01) — OBSERVATION WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-18 (431.87) — EXISTING MONITORING WELL TO BE REMOVED FOLLOWING BACKGROUND DATA EVALUATION REPORT SUBMITTAL FOR MONITORING WELL MW-18A.
- PWB-1 (445.30) — EXISTING EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON DECEMBER 5, 2010. POTENTIOMETRIC CONTOURS INTERPRETED BY WBC. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.
4. BTOP-WATER LEVEL BELOW TOP OF PUMP.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

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DATE: 02/2012
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CAD: IIG-D-7 GW CONT. MAP.DWG

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2018	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
POTENTIOMETRIC SURFACE MAP
DECEMBER 2010

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO
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GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE IIIG-D-7

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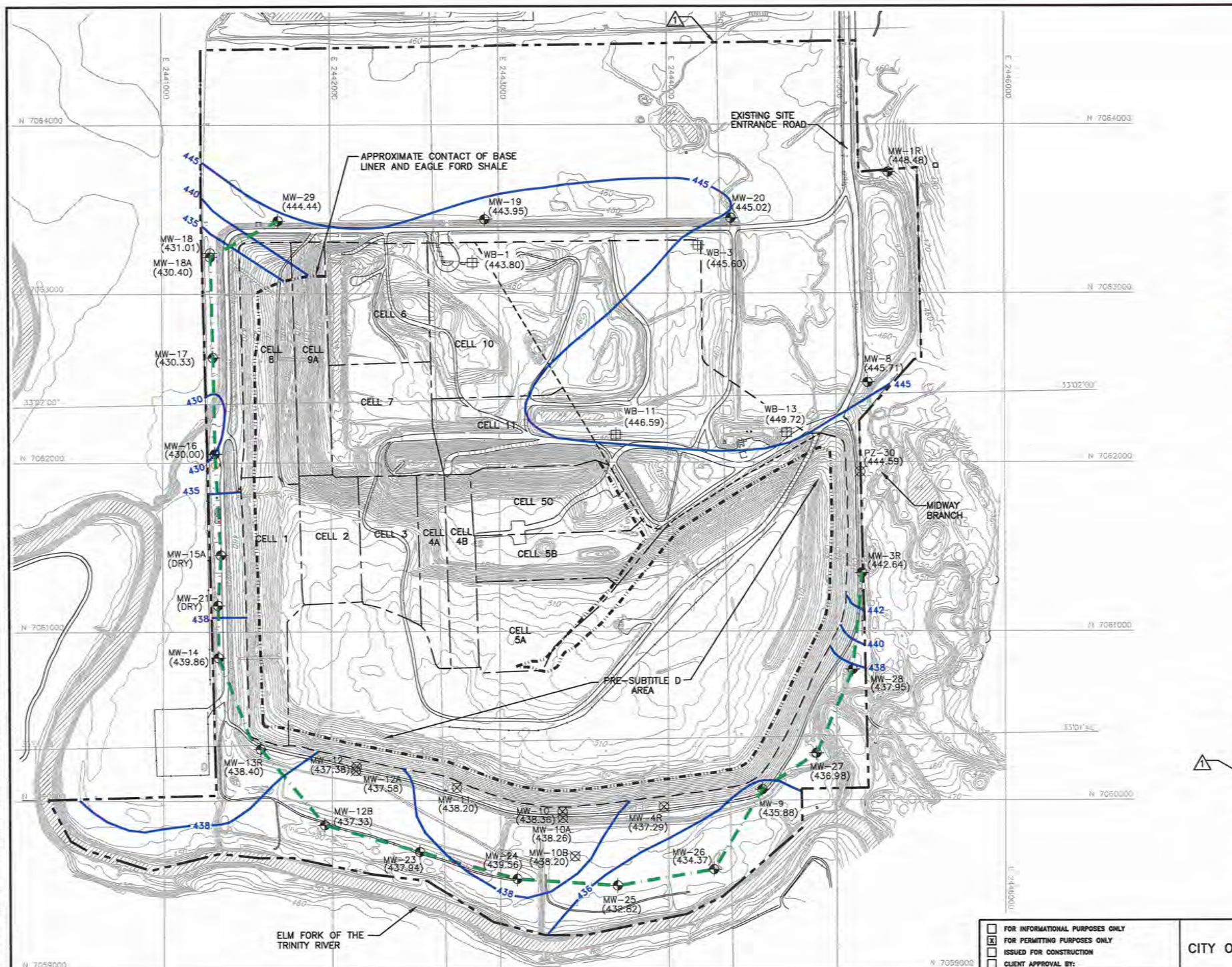

N

0 300 600

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 STATE PLANE COORDINATE SYSTEM
- EXISTING ROAD
- 500 EXISTING TOPOGRAPHIC CONTOUR
- 430 GROUNDWATER ELEVATION CONTOUR (FT-MSL)
- EXISTING PERMITTED POINT OF COMPLIANCE (TCEQ PERMIT NO. MSW-1312A)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- MW-3R (442.64) EXISTING MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10 (438.36) OBSERVATION WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-18 (431.01) EXISTING MONITORING WELL TO BE REMOVED FOLLOWING BACKGROUND DATA EVALUATION REPORT SUBMITTAL FOR MONITORING WELL MW-18A.
- WB-1 (443.80) EXISTING EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. WATER LEVEL MEASUREMENTS COLLECTED BY CAREL CORPORATION ON DECEMBER 21, 2011. WATER LEVEL FROM PZ-30 COLLECTED BY CAREL CORPORATION ON DECEMBER 2, 2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC. IN AUGUST 2013, WBC UPDATED POTENTIOMETRIC CONTOURS NEAR MONITOR WELL MW-16 DUE TO NEW DATUM ELEVATION SURVEY.
4. DRY-INSUFFICIENT GROUNDWATER FOR SAMPLING GAUGING.

1

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT POTENTIOMETRIC SURFACE MAP DECEMBER 2011

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DENTON COUNTY, TEXAS

Weaver Boos Consultants
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FORT WORTH, TX (817) 735-9770
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FIGURE IIIG-D-7A

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APPENDIX IIIG-F

DECEMBER 2010 THROUGH DECEMBER 2011 GROUNDWATER CONTOUR MAPS

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BIDDING, OR PERMIT PURPOSES.

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 12/1/2010. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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CAD: IIF-F-1-GROUNDWATER.DWG

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REVISIONS

NO.	DATE	DESCRIPTION
1	11/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT GROUNDWATER CONTOUR MAP 12/1/2010

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG-F-1

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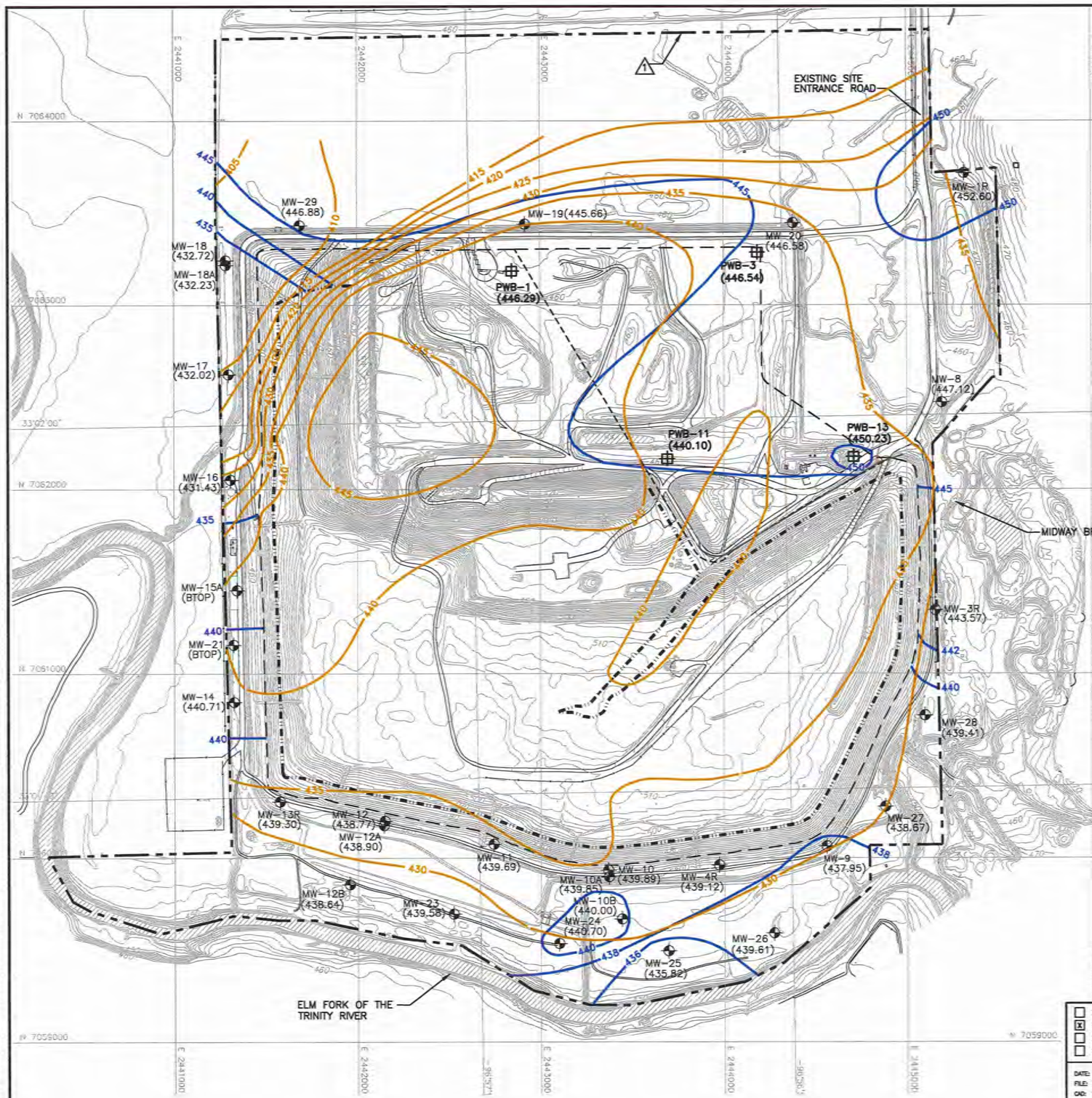

N

0 300 600

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 1/17/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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REVISIONS

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1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
1/17/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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FIGURE IIIG-F-2

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0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 2/23/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
2/23/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG-F-3

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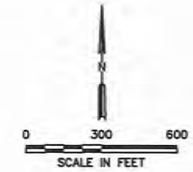

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 3/31/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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☐ CLIENT APPROVAL BY: _____

DATE: 12/2012
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CAD: IIF-F-4-GROUNDWATER.DWG

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DESIGN BY: RSF
REVIEWED BY: RSF

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
3/31/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG-F-4

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0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 500 EXISTING TOPOGRAPHIC CONTOUR
- 430 GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 4/29/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.
5. DAMAGED PUMP STUCK IN CASING ABOVE WATER TABLE, WATER LEVEL NOT MEASURED.

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1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
4/29/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-F-5

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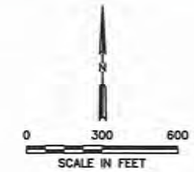

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 5/13/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.
5. NM-NOT MEASURED.

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10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT GROUNDWATER CONTOUR MAP 5/13/2011

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DENTON COUNTY, TEXAS

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FIGURE IIIG-F-6

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LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 6/6/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	FIRST COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
6/6/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-F-7

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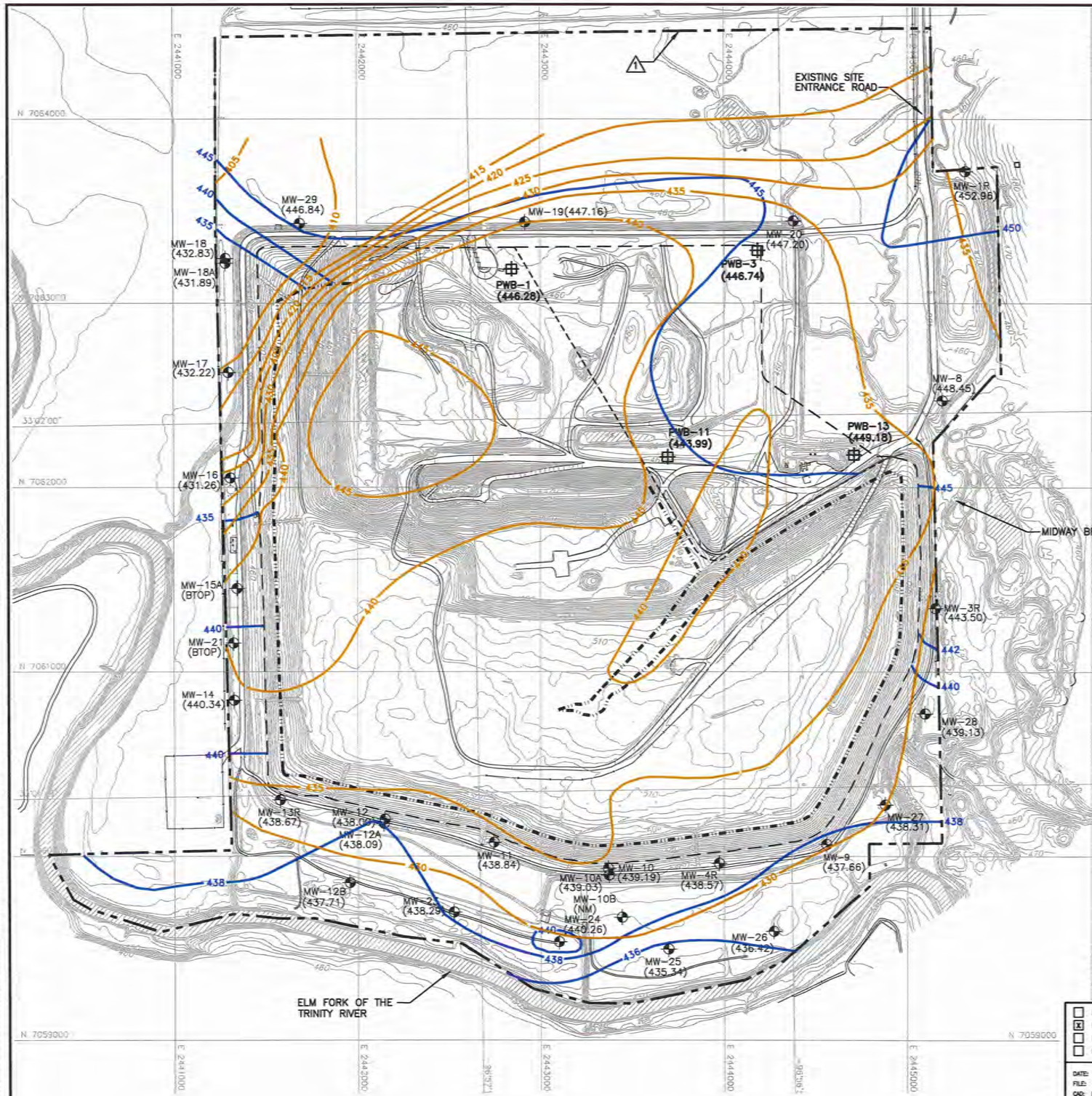

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 STATE PLANE COORDINATE SYSTEM
- 500 EXISTING TOPOGRAPHIC CONTOUR
- 430 GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 7/11/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.
5. NM-NOT MEASURED.

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
7/11/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-F-8

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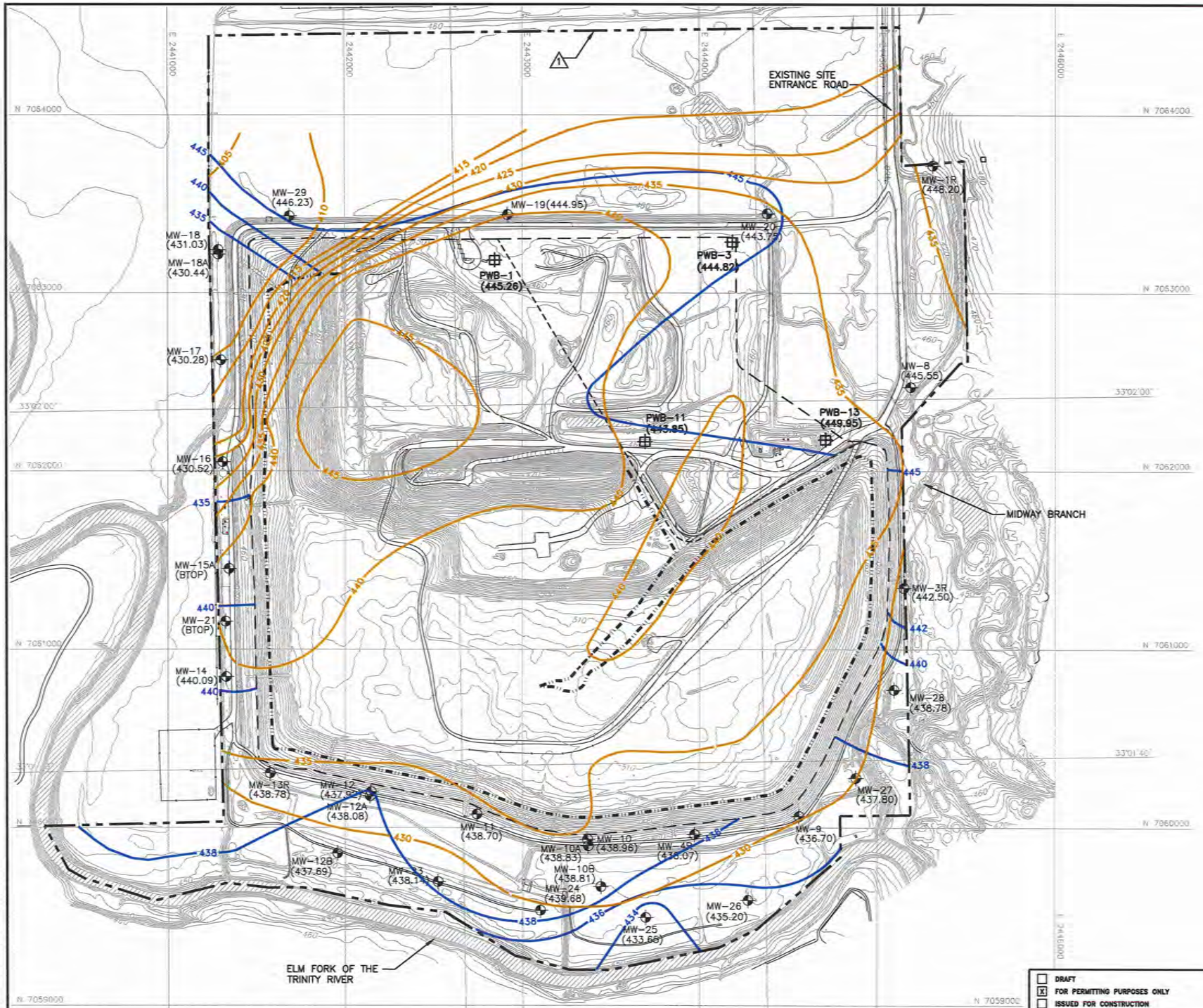

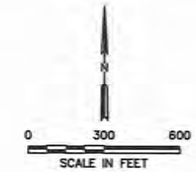

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 8/8/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
8/8/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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FIGURE IIIG-F-9

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LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

DRAFT

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY CAREL CORPORATION ON 9/26/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. DRY-CAREL CORPORATION REPORTS WELL HAD INSUFFICIENT GROUNDWATER FOR SAMPLING OR GAUGING IN SEPTEMBER 2011 MONITORING EVENT. WBC SEPTEMBER 2011 GAUGING INDICATES NO GROUNDWATER ABOVE TOP OF PUMP.
5. NM-NOT MEASURED

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	FIRST COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT GROUNDWATER CONTOUR MAP 9/26/2011

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FIGURE IIIG-F-10

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N

0 300 600

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

DRAFT

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 10/26/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC. PZ-30 WATER LEVEL MEASURED BY CAREL CORPORATION ON 10/6/2011.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
10/26/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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FIGURE IIIG-F-11

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0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY WBC ON 11/23/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. BTOP-WATER LEVEL BELOW TOP OF DEDICATED PUMP, WATER LEVEL NOT MEASURED.

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT GROUNDWATER CONTOUR MAP 11/23/2011

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIG-F-12

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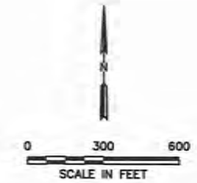

LEGEND

- PERMIT BOUNDARY
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL)
- 435 — TOP OF SHALE ELEVATION CONTOUR (FT-MSL)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- EXISTING ROAD
- MW-3R (443.12) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- MW-10A (439.90) — OBSERVATION/MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- PWB-1 (445.30) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT-MSL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.

NOTES:

1. EXISTING TOPOGRAPHIC CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 08-28-10.
2. TOP OF SHALE STRATA ELEVATION REPRODUCED FROM FIGURE IIIG-C-11.
3. WATER LEVEL MEASUREMENTS COLLECTED BY CAREL CORPORATION ON 12/20-21/2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. DRY-INSUFFICIENT GROUNDWATER FOR SAMPLING OR GAUGING.

DRAFT

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 12/2012
FILE: 1339-351-11
CAD: IIF-F-13-GROUNDWATER.DWG

DRAWN BY: VRS
DESIGN BY: RSF
REVIEWED BY: RSF

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
GROUNDWATER CONTOUR MAP
12/21/2011
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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FIGURE IIIG-F-13

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O:\1339\351\EXPANSION 2008\PART III-SDP\IIIG\IIIG-F\IIIG-F-13-GROUNDWATER MAP.dwg, sford, 1:2

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIH
GROUNDWATER MONITORING, SAMPLING AND ANALYSIS PLAN

Prepared for

City of Farmers Branch

February 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014

Revised August 2016

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Prepared by

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WBC Project No. 1339-351-11-02-6B.8

This document is intended for permitting purposes only.

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2 GROUNDWATER MONITORING SYSTEM

2.1 Groundwater Monitoring Systems

2.1.1 Existing Groundwater Monitoring System

The currently approved groundwater detection monitoring system design for the Camelot Landfill was completed by The Carel Corporation in 2010 to comply with Title 30 TAC §330.403(a)(2). The groundwater monitoring system is currently (as of December 2012) comprised of 21 detection monitoring wells. The monitoring system's current point of compliance detection monitoring wells include MW-3R, MW-8, MW-9, MW-12B, MW-13R, MW-14, MW-15A, MW-16, MW-17, MW-18A, MW-21, MW-23, MW-24, MW-25, MW-26, MW-27, MW-28, and MW-29. The background monitoring wells include MW-1R, MW-19, and MW-20. The Background Data Evaluation Report (BDER) for detection monitoring wells MW-1R, MW-3R, MW-8, MW-9, MR-13R, MW-14, MW-16, and MW-17 was approved by the TCEQ on April 12, 2012. The BDER for the newer detection monitoring wells MW-12B, MW-18A, MW-19, MW-20, MW-23, MW-24, MW-25, MW-26, MW-27, MW-28, and MW-29 was approved by the TCEQ on November 15, 2012.

The TCEQ approved the removal of former detection monitoring well MW-18 in a letter dated August 1, 2012. Monitoring well MW-18 was removed in December 2012.

In addition to the above, in December 2012 a revision to the Corrective Action Plan was submitted to TCEQ to install a slurry wall around the southern and eastern portions of the site (refer to Appendix IIIH-H). The revision to the Corrective Action Plan ~~will~~ modif~~y~~ied the existing monitoring system as noted below.

- Installation of MW-9A. The installation of the slurry wall ~~will~~ isolated MW-9, as it ~~will be~~ is located between the slurry wall and the limits of waste ~~after the slurry wall is installed~~. Therefore, monitor well MW-9A ~~will be~~ was installed on the south side of the slurry wall, as a replacement detection monitor well. Eight consecutive quarters of background data collection will begin within 90 days of monitor well MW-9A installation in accordance with Section 5.3 and 30 TAC §330.407(a)(1). Following background data collection, the facility will submit a background data evaluation report to the TCEQ prior to the next scheduled detection monitoring event. Monitor well MW-9A will become part of the detection monitoring system after TCEQ acceptance of the background data evaluation report. Existing monitor well MW-9 will be retained as an observation monitor well (refer to Section 2.1.4).
- Installation of MW-4A. The installation of the slurry wall ~~will~~ also isolated MW-4R, which was previously a point of compliance detection monitor well that is currently monitored as part of the corrective action program. Monitor well MW-4A ~~will be~~ was installed on the south side of the slurry

wall, as an additional observation well. Existing observation monitor well MW-4R ~~will be~~ was retained (refer to Section 2.1.4). The observation well pair MW-4R/MW-4A ~~will~~ monitors groundwater on both sides of the slurry wall.

- Installation of MW-13R2. Monitor well MW-13R2 ~~will be~~ was installed at the western termination of the slurry wall after the slurry wall ~~is~~ was installed. MW-13R2 ~~will be~~ is situated between the slurry wall and the limits of waste to monitor groundwater quality in this area.

2.1.2 Proposed Detection Monitoring System

As part of this permit amendment application, the facility proposes to install three additional point of compliance (POC) detection monitor wells (MW-30, MW-31 and MW-32). MW-30 and MW-31 will replace MW-13R. MW-32 will be installed about 125 feet south of MW-9A.

Each of these new well locations are shown on Figure IIIH-A-1 in Appendix IIIH-A. As shown on Figure IIIH-A-1, the installation of MW-30, MW-31, and MW-32 will create a uniform POC on the southern portion of the site. The spacing between the slurry wall and the POC varies between about 128 feet and 400 feet.

As discussed in Section 2.1.4, an observation monitor well system ~~will be~~ is located between the limits of waste and the POC on the southern portion of the site. This additional observation well system ~~will~~ monitors groundwater quality on both sides of the slurry wall to verify the effectiveness of the slurry wall (which creates an additional hydraulic barrier between the limits of waste and the POC). The observation well system also provides an additional monitoring system between the slurry wall and the POC to monitor groundwater quality in this area. As discussed in Section 2.1.4, this additional monitoring system is subject to the same sampling and reporting requirements as the detection monitor wells. The observation monitor wells will be statistically evaluated after each monitoring event in accordance with Section 6. The statistical results will be reported to TCEQ in the annual groundwater monitoring report. In the event that assessment monitoring is required for the observation monitor wells, the facility will comply with the TCEQ assessment monitoring requirements listed in Title 30 TAC §330.409. In the event that an assessment of corrective measures is necessary, the assessment will include an analysis of the effectiveness of the slurry wall, LFG control system, and any other potential corrective measures in meeting the requirements and objectives of the remedy as described under Title 30 TAC §330.413 (refer to Section 2.1.4 for additional information).

The existing and proposed detection monitoring well layouts are shown on Figure IIIH-A-1. Monitor well MW-9A will remain a point of compliance well until its replacement (MW-32) has an approved background evaluation. Monitor well MW-13R will be replaced by monitor wells MW-30 and MW-31, as

shown on Figure IIIH-A-1. Monitor well MW-13R will continue to be monitored for VOCs and total metals as part of the detection monitoring system until its removal is authorized by TCEQ in writing. Monitor well MW-31 will be added between monitoring wells MW-30 and MW-12B to maintain the 600-foot well spacing requirement. Following the removal of monitor well MW-13R and the transition of MW-9A to an observation well, there will be 22 detection monitoring wells. Monitoring wells MW-30, MW-31, and MW-32 are designed to monitor the uppermost aquifer at the base of the Alluvial Strata and will be constructed within 90 days of the approval of TCEQ Permit No. 1312B, in accordance with the requirements of Title 30 TAC §330.421. A certification of the proposed groundwater monitoring system is provided on page IIIH-A-4 of Appendix IIIH-A.

The following chronologically summarizes the proposed detection monitoring system changes:

- Install replacement detection monitor wells MW-30, MW-31, and MW-32 within 90 days of approval of TCEQ Permit No. 1312B. Begin total metals and VOC background data collection for monitor wells MW-30, MW-31, and MW-32 within 90 days of well installation.
- Continue to monitor wells MW-9A and MW-13R for total metals and VOCs during detection monitoring events until the background data report for replacement detection monitor wells MW-30, MW-31, and MW-32 is approved by the TCEQ and written TCEQ authorization to plug redundant monitor well MW-13R is received.
- Plug redundant monitor well MW-13R within 90 days of receiving TCEQ written plugging authorization.

The existing and proposed detection monitoring well layouts are shown on Figure IIIH-A-1 - Groundwater Monitoring System. Figure IIIH-A-7 presents the existing monitor wells, observation wells, and landfill gas probes as of August 2013 in the southern portion of the site. Each new monitoring well will be constructed in accordance with the requirements of Title 30 TAC §330.421. Construction details regarding the existing and proposed monitor wells are shown on Figures IIIH-A-2 and IIIH-A-3. All wells authorized by the TCEQ for removal will be plugged and abandoned by a Texas-licensed monitor well driller. The detection monitoring system is designed to monitor the uppermost aquifer at the base of the Alluvial Strata.

2.1.3 Existing Corrective Action Monitoring System

In July 2003, the facility implemented a corrective action monitoring program as part of a VOC nature and extent assessment in response to the presence of volatile organic compounds in groundwater that exceeded the applicable groundwater protection standard concentrations due to landfill gas migration. The TCEQ-approved corrective action remedy includes landfill gas extraction within the waste footprint and monitored natural attenuation in the area near the affected observation monitor wells, which includes MW-4R, MW-4A, MW-10, MW-10A, MW-10B, MW-11, B-2, B-3, MW-12, ~~and~~ MW-12A and MW-13R2. The locations of

these observation monitor wells are shown on Figure IIIH-A-1. The observation well system is monitored annually in accordance with the corrective action plan and is designed to monitor the uppermost aquifer at the base of the Alluvial Strata. The facility will continue to monitor these wells as part of the corrective action program until the TCEQ approves the completion of remedy. At that time, the wells will transition to observation monitor well, as discussed in Section 2.1.4.

2.1.4 Proposed Observation Wells

2.1.4.1 Purpose

In addition to the detection monitoring system discussed in Section 2.1.2, an additional observation monitor well system is proposed to monitor groundwater quality between the limits of waste and the POC on the southern portion of the site. This additional observation well system will monitor groundwater quality on both sides of the slurry wall to verify the effectiveness of the slurry wall (which creates an additional hydraulic barrier between the limits of waste and the POC) and to provide an additional monitoring system that is designed to detect constituents of concern before they would reach the point of compliance. This early detection system, which is generally located 120 feet to 400 feet upgradient of the point of compliance, will allow for the implementation of corrective action measures before an impact is detected at the point of compliance.

The observation well monitoring system is shown on Figure IIIH-A-1 and listed in Table 2-1.

2.1.4.2 Current Status and Transition of Existing Wells to Observation Monitor Wells

As discussed in Section 2.1.3, observation monitor wells MW-4R, MW-4A, MW-10, MW-10A, MW-10B, MW-11, B-2, B-3, MW-12, ~~and~~ MW-12A, and MW-13R2, are currently part of the Corrective Action Program and will continue to be monitored consistent with the requirements of the Corrective Action Plan (refer to Appendix IIIH-H) until the facility is released from corrective action monitoring requirements. The current status of each well and how the well will be utilized within the observation well monitoring system is provided in Table 2-1. As noted in Table 2-1, each of the existing observation wells will continue to be monitored as observation monitor wells after the well is released from the Corrective Action Program requirements (this includes MW-4A, MW-9A, and MW-13R2 which ~~will be~~ were installed after the slurry wall ~~is~~ was constructed).

2.1.4.3 Observation Monitor Well Monitoring Plan

After the observation wells listed in Table 2-1 are released from the Corrective Action Program, they will be monitored annually and sampled for the same GWSAP-required constituents as the detection monitor wells (refer to Table 5-1 in Section 5.1). The observation monitor wells will be statistically evaluated after each monitoring event in accordance with Section 6. The statistical results will be reported to TCEQ in the annual groundwater monitoring report.

In the event that assessment monitoring is required for the observation monitor wells, the facility will comply with the TCEQ assessment monitoring requirements listed in Title 30 TAC §330.409. In accordance with Title 30 TAC §330.409, the landfill will sample and analyze the groundwater monitoring system for the full set of constituents listed in Appendix II to 40 Code of Federal Regulations (CFR) Part 258. The assessment monitoring requirements include sampling and analyses for 40 CFR 258 Appendix II constituents at the SSI well(s) and at the wells on each side of the well(s) exhibiting the SSI(s), unless an alternative subset of wells for sampling and analyses is designated by the TCEQ. Appendix II constituents shall be sampled annually following the initial Appendix II assessment monitoring sampling event unless an alternate sampling frequency is approved by the TCEQ. For any new constituent(s) detected in the observation monitor wells as a result of the complete Appendix II analysis, a minimum of four statistically independent samples from each background well shall be collected and analyzed to establish background levels for the additional constituent(s), unless an alternative subset of Appendix II background constituent analyses is designated by the TCEQ. In addition, a groundwater protection standard for each 40 CFR Part 258 Appendix II constituent detected will be established as required by 30 TAC §330.409(h) or (i). In the event assessment monitoring is initiated, assessment monitoring will continue until the assessment constituents are statistically below the constituent's background concentration for two consecutive events using TCEQ-approved statistical procedures.

The facility will initiate an assessment of corrective measures within 90 days of finding that any of the assessment constituents have been detected at a statistically significant level exceeding the constituent's groundwater protection standard. In the event that an assessment of corrective measures is necessary, the assessment will include an analysis of the effectiveness of the slurry wall, LFG control system, and any other potential corrective measures in meeting the requirements and objectives of the remedy as described under Title 30 TAC §330.413. In the event that an assessment of corrective measures is necessary, all interested and affected parties will be notified in accordance with the provisions of Title 30 TAC §305.107(c) and the facility will select a remedy and submit a report describing the remedy and how it will meet the required standards.

Table 2-1 Observation Wells

Observation Well	Location		Current Status	Observation Well System
	North of Slurry Wall	South of Slurry Wall		
MW-4R	✓		Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the limits of waste and the slurry wall.
MW-4A		✓	Corrective Action Observation Monitor Well	This well ~~will be~~ was installed as a corrective action observation monitor well after slurry wall construction. Once this well is released from the Corrective Action Program, it will transition to an observation well that will be monitored annually. This well will monitor groundwater quality between the slurry wall and the POC.
MW-9	✓		Point of Compliance Detection Monitoring (will transition to observation well after slurry wall construction)	After the slurry wall ~~is~~ was installed, this detection monitoring well ~~will~~ transitioned to an observation monitor well that will be monitored annually because it will no longer meet the TCEQ requirements for a point of compliance detection monitoring well. This well ~~will~~ monitors groundwater quality between the limits of waste and the slurry wall.
MW-9A		✓	Future Point of Compliance Detection Monitoring (Replacement for MW-9)	Monitor well MW-9A will replace detection monitor well MW-9 after the slurry wall ~~is~~ was constructed. Following slurry wall construction, replacement point of compliance detection monitor well MW-9A ~~will be~~ was installed as close as practical to MW-9 and south of (outside) the slurry wall. Monitor well MW-9 will remain as part of the Corrective Action Program as an observation well. After the issuance of TCEQ Permit No. 1312B, monitor well MW-32 will be installed as a future replacement point of compliance detection monitor well for monitor well MW-9A. Monitor well MW-9A will continue to serve as a detection monitor well until replacement monitor well MW-32 completes its background data collection and its background data evaluation report is approved by the TCEQ. At that time, monitor well MW-9A will transition to an observation well.
MW-10	✓		Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the limits of waste and the slurry wall.
MW-10A		✓	Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the slurry wall and the POC.
MW-10B		✓	Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the slurry wall and the POC.
MW-11	✓		Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the limits of waste and the slurry wall.
B-2		✓	Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the slurry wall and the POC.
B-3		✓	Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the slurry wall and the POC.
MW-12	✓		Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the limits of waste and the slurry wall.
MW-12A		✓	Corrective Action Observation Monitor Well	Once this well is released from the Corrective Action Program, it will transition to an observation monitor well that will be monitored annually. This well will monitor groundwater quality between the slurry wall and the POC.
MW-13R2	✓		This well ~~will be~~ was installed as part of the revision to the Corrective Action Plan (refer to Appendix IIIH-H).	MW-13R2 ~~will be~~ is located at the western termination of the slurry wall. MW-13R2 ~~will be~~ is situated between the slurry wall and the limits of waste to monitor groundwater quality at this location. This well ~~will be~~ was installed as a corrective action observation monitor well after ~~permit issuance and~~ slurry wall construction.

Table 2-2
Groundwater Monitoring Wells

Well Number	Designation	Status
MW-1R	Background	Installed pre-2010, retained in system.
MW-3R	Point of Compliance	Installed pre-2010, retained in system.
MW-4R	Observation	Installed pre-2010, observation/monitor well.
MW-4A	Observation	~~To be i~~Installed in 2013, observation/monitor well.
MW-8	Point of Compliance	Installed pre-2010, retained in system.
MW-9	Observation	Installed pre-2010, observation/monitor well.
MW-9A	Point of Compliance/ Observation	Interim detection monitor well, ~~to be~~ installed in 2013~~5~~, to be replaced by MW-32, then become an observation/monitor well.
MW-10	Observation	Installed pre-2010, observation/monitor well.
MW-10A	Observation	Installed pre-2010, observation/monitor well.
MW-10B	Observation	Installed pre-2010, observation/monitor well.
MW-11	Observation	Installed pre-2010, observation/monitor well.
MW-12	Observation	Installed pre-2010, observation/monitor well.
MW-12A	Observation	Installed pre-2010, observation/monitor well.
MW-12B (former MW-22)	Point of Compliance	Installed pre-2010, retained in system.
MW-13R	Point of Compliance	Installed pre-2010, to be removed and replaced by MW-30 and MW-31.
MW-13R2	Observation	~~To be i~~Installed in 2013~~5~~, observation/monitor well.
MW-14	Point of Compliance	Installed pre-2010, retained in system.
MW-15A	Point of Compliance	Installed pre-2010, retained in system.
MW-16	Point of Compliance	Installed pre-2010, retained in system.
MW-17	Point of Compliance	Installed pre-2010, retained in system.
MW-18	Former Point of Compliance	Removed December 2012 consistent with the approved Groundwater Monitoring System Revision Permit Modification which was completed to meet the requirements of §330.403(a)(2).
MW-18A	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-19	Background	Installed in 2010 for §330.403(a)(2) compliance.
MW-20	Background	Installed in 2010 for §330.403(a)(2) compliance.
MW-21	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-23	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-24	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-25	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-26	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-27	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-28	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-29	Point of Compliance	Installed in 2010 for §330.403(a)(2) compliance.
MW-30	Point of Compliance	Proposed new monitoring well, to replace MW-13R.
MW-31	Point of Compliance	Proposed new monitoring well, to replace MW-13R.
MW-32	Point of Compliance	Proposed new monitoring well, to replace MW-9A.
B-2	Observation	Installed pre-2010, observation/monitor well.
B-3	Observation	Installed pre-2010, observation/monitor well.

2.1.5 Woodbine Monitor Wells

Ten new monitor wells will be installed into the Woodbine Formation aquifer. The location of the Woodbine Formation is shown on Figures IIIG-C-2 through IIIG-C-10 in Appendix IIG. The locations of the 10 Woodbine monitor wells are shown on Figure IIIH-A-1 and are listed in Table 2-3. As shown on Figure IIIG-A-4, the Woodbine groundwater potentiometric surface generally dips from west to east beneath the site. The proposed Woodbine monitor wells OW-1 through OW-8 are down groundwater gradient wells and Woodbine monitor wells OW-9 and OW-10 are up gradient wells.

The Woodbine monitor wells will be installed within 12 months after the latter to occur of (1) TCEQ issuance of a final amended permit, or (2) the final resolution of any judicial appeal of the issuance of the amended permit. Within 60 days of Woodbine monitor well completions a well installation report will be submitted to the TCEQ. The report will include lithologic logs, a site map drawn to scale locating the wells, and the relevant construction details regarding the wells. The wells will be constructed of 2-inch inside diameter PVC well casings and screens consistent with Figure IIIH-A-3. Each well will be screened in a saturated interval of the Woodbine Formation and will be equipped with a dedicated pneumatic groundwater sampling pump to facilitate representative sample collection.

Woodbine monitor wells OW-1 through OW-10 are not part of the Corrective Action well system nor are they part of the detection monitoring well network. The Woodbine monitor wells will be sampled annually in conjunction with facility corrective action observation well monitoring events. The Woodbine monitor wells will be sampled, analyzed, and statistically evaluated in accordance with Appendix IIIH.

Consistent with Appendix IIIH requirements, eight consecutive quarters of total metals concentration data will be collected to establish background concentrations. Following background data collection, the facility will submit a background data evaluation report to the TCEQ within three months after the eighth total metals background data collection event. Following the report's submittal, the total metals results from each annual monitoring event will be statistically evaluated using the TCEQ-approved background data pools. The facility will begin annual monitoring for volatile organic compounds at the time of the first background data collection event. In accordance with Appendix IIIH, any VOC detection or total metals statistical exceedance will result in the completion of alternative source demonstration, assessment monitoring or corrective action tasks as required by Appendix IIIH.

Table 2-3
Woodbine Monitor Wells

Well Number	Designation	Status
OW-1	Monitoring Well, Down Gradient	Proposed new monitor wells will be installed.
OW-2	Monitoring Well, Down Gradient	
OW-3	Monitoring Well, Down Gradient	
OW-4	Monitoring Well, Down Gradient	
OW-5	Monitoring Well, Down Gradient	
OW-6	Monitoring Well, Down Gradient	
OW-7	Monitoring Well, Down Gradient	
OW-8	Monitoring Well, Down Gradient	
OW-9	Monitoring Well, Up Gradient	
OW-10	Monitoring Well, Up Gradient	

2.2 Monitoring Well Design and Maintenance

The groundwater monitoring well details are shown in Figures IIIH-A.2 and IIIH-A.3 of Appendix IIIH-A. Consistent with Title 30 TAC §330.421, all facility monitoring wells and observation monitor wells were drilled and installed by a qualified driller (Texas licensed water well, monitor well, or master driller). The 2010-installed monitoring wells are constructed of 2-inch diameter Schedule 40 PVC with 2.0 to 10 feet of continuous, factory-slotted PVC screens having 0.010-inch slots. The filter pack consists of 20-40 mesh silica sand placed to approximately 2 feet above the top of the screen. A bentonite seal consisting of approximately 2 feet of hydrated bentonite pellets has been placed on top of the filter sand. The remainder of the borehole is grouted to within approximately 2 feet of ground surface with bentonite grout. Surface completions are 4-foot by 4-foot by 6-inch concrete pads with protective steel bollards as needed. Figure IIIH-A-2 lists the monitoring well details and Figure IIIH-A-3 shows the typical monitoring well construction configuration.

All parts of the groundwater monitoring system will be operated and maintained so that they perform at least to design specifications throughout the life of the monitoring program. Any monitoring well that is damaged to the extent that it is no longer suitable for sampling will be reported to the TCEQ who may make a determination about whether to repair or replace the well. Any monitoring well that is no longer used will be plugged and abandoned by a Texas-licensed monitoring well driller in accordance with TCEQ and other agency requirements. No monitoring or observation well will be plugged and abandoned (removed) without prior TCEQ written authorization. Any replacement monitoring well will be installed in accordance with Title 30 TAC §330.421 by a Texas-licensed monitoring well driller.

After a replacement monitoring well is installed, the well will be developed to remove drilling artifacts. Development will continue until all of the water used or affected during drilling activities has been removed and field measurement of pH, specific conductance (or conductivity), turbidity and temperature have stabilized in accordance with the parameter stabilization criteria listed in Section 3.4.5. In addition, the replacement monitoring well location and all appropriate elevations associated with the top-of-well equipment will be surveyed by a Texas-registered professional surveyor or engineer. The elevations will be surveyed to the nearest 0.01 foot and referenced to mean seal level. The point on the well casing where the top of casing elevation was determined will be permanently marked on the casing. The well location will be given in terms of latitude and longitude (to the nearest 0.1 seconds) or accurately referenced to the landfill's grid system.

Within 60 days of replacement well completion, a monitoring well installation report will be submitted to the TCEQ. The report will include a lithologic log, a site map drawn to scale locating the well, and the relevant point of compliance details regarding the well. For new monitoring well installations, any forms required by any applicable agency will be submitted to that agency and form copies will be provided to the TCEQ as part of the monitoring well installation report.

2.3 Groundwater Monitoring Program

All facility detection monitoring wells are sampled semi-annually for the detection monitoring parameters listed in Table 5-1 of Section 5.1. The corrective action observation wells will be sampled annually as discussed in Section 2.1.4. The Woodbine monitor wells will be sampled annually as discussed in Section 2.15 and Table 2-3. The new monitoring wells will begin detection monitoring within six months of background data evaluation by the TCEQ in accordance with Appendix IIIH, Sections 5.3 through 5.5. Details regarding the proposed sampling, analyses, and statistical comparison procedures to be utilized in groundwater monitoring are detailed in the following sections of Appendix IIIH.

Table 8-2
Corrective Action Timeline

Date	Action	Report	Status	Result
2004	Phase 1 Nature and Extent Investigation	Investigation of the Nature and Extent of VOC Detections in Monitor Well MW-10 (CC, 2004)[1]	Complete	No VOCs detected down gradient of MW-10 in MW-10B.
2005	Installation of Landfill Gas Collection and Control System	Permit Modification (WBC, 2004)[1]	Installed 2005	VOC concentrations generally stabilize or decline.
2008	Enhancement of Landfill Gas Collection and Control System	Permit Modification (WBC, 2007)[1]	Installed 2008	VOC concentrations generally stabilize or decline.
2008	Phase 2 Nature and Extent Investigation	Investigation of the Nature and Extent of VOC Detections in Monitor Wells MW-10 and MW-12 and Arsenic in MW-10 (CC, 2008)[1]	Complete	No VOC or arsenic detected down gradient of MW-10 in MW-10B or in observation well MW-12B down gradient of MW-12.
2009	Assessment of Corrective Measures	Assessment of Corrective Measures (CC, 2009)[1]	GCCS enhancement and monitored natural attenuation selected as remedy.	VOC concentrations generally stable or declining.
2010	Enhancement of Landfill Gas Collection and Control System	Permit Modification (WBC, 2009)[1]	Installed 2010	VOC concentrations generally stable or declining.
2010	Public Meeting	NA	Complete	Meeting to discuss selected remedy.
2011	Selection of Remedy	Selection of Remedy letter (CC, 2010)[1]	Complete	VOC concentrations generally stable or declining.
2011	Metal Reducing Compound (MRC) Pilot Study	Pilot Study Report (CC, 2011)[1]	Complete	MRC is not a viable remedial option.

[1] Reference citation provided in Section 10 of Appendix IIIH.

8.4 Implementation of Corrective Action and Monitoring Status

The Corrective Action Plan has been fully implemented. In response to the VOCs detections, the facility installed an active gas collection and control system (GCCS) in several phases between 2005 and 2010. Optimization of the gas extraction system is performed on a frequent basis. The effectiveness of the source targeted system is monitored in the approved-corrective action monitoring system shown on Figure IIIH-A-1 and the designated monitored natural attenuation (MNA) observation/monitor wells including MW-4A, MW-4R, MW-9, MW-10, MW-10A, MW-10B, MW-11, B-2, B-3, MW-12, ~~and~~ MW-12A, and MW-13R2. Monitor wells MW-4A, MW-9A, and MW-13R2 ~~will be~~ were installed ~~as part of~~ after the slurry wall installation, ~~which is schedule to occur~~ in October 2013~~5~~. Monitor well MW-9A will initially serve as both a detection and observation well until the background data set for replacement detection well MW-32 is approved. After the MW-32 approval, MW-9A will become an observation well used for corrective action monitoring. The MNA

observation/monitor wells are monitored on an annual basis as required by the corrective action plan.

In addition to the selected remedy requirements, the facility completed a pilot study to evaluate the potential to reduce VOC and arsenic concentrations at the observation well MW-10 location in September 2010. The goal of the pilot study was to determine the effectiveness of enhanced bioremediation to reduce the constituents of concern using an injected Metals Reducing Compound (MRC), which is also known to be effective at remediating VOCs. In the November 2011 Pilot Study Report, the Carel Corporation concluded that MRC injection was not a viable localized or full scale remediation method at the Camelot Landfill.

Figures IIIH-B-70 and IIIH-B-71 in Appendix IIIH-B delineate groundwater contamination plumes in accordance with the requirements of Title 30 TAC §330.63(f)(2).

8.5 Slurry Wall Construction

The facility has ~~proposed to~~ installed a slurry wall around the perimeter of the pre-Subtitle D area, as discussed in Appendix IIIA and Appendix IIIH-H.

APPENDIX IIIH-A

GROUNDWATER MONITORING SYSTEM

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
UNDER THE AUTHORITY OF
JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION,
BIDDING, OR PERMIT PURPOSES.

GROUNDWATER MONITORING SYSTEM CERTIFICATION

General Site Information

Site: Camelot Landfill

Site Location: Denton County

MSW Permit No.: 1312B

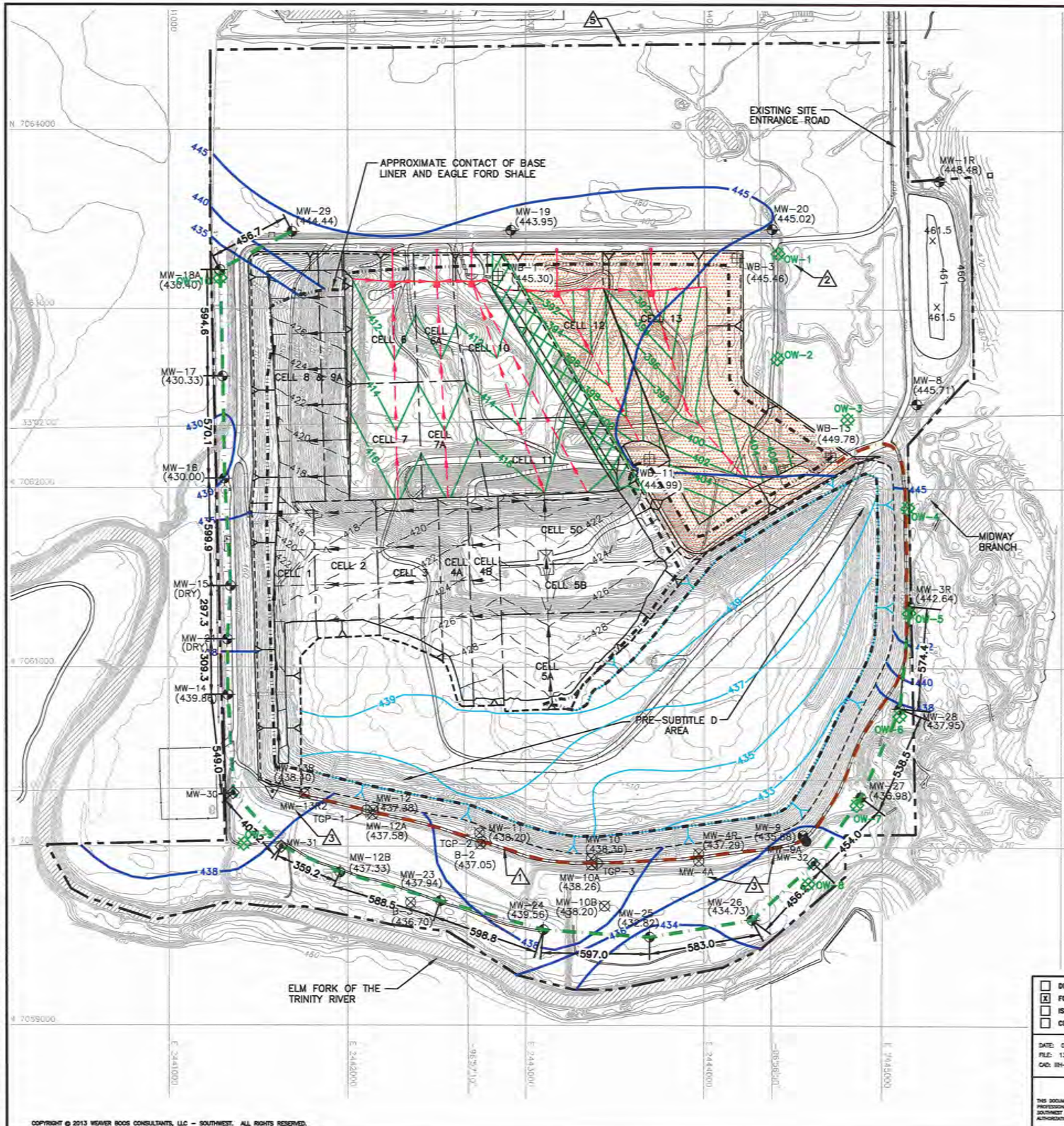
Qualified Groundwater Scientist Statement

I, Robert S. Ferbend, am a registered professional geoscientist in the State of Texas and a qualified groundwater scientist as defined in Title 30 TAC §330.3(120). I have reviewed the groundwater monitoring system and supporting details contained herein. In my professional opinion, the groundwater monitoring system design and construction details are in compliance with the groundwater monitoring requirements specified in Title 30 TAC §§330.401, 330.403, 330.405, 330.407, 330.409, 330.419, and 330.421. This system has been designed for the Camelot Landfill. The only warranty made by me in connection with this document is that I have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of my profession, practicing in the same or similar locality. No other warranty, expressed or implied, is intended.

Firm/Address: Weaver Boos Consultants, LLC–Southwest
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76019

Signature: _____
Robert S. Ferbend, P.G., Texas License No. 713

Date: _____



LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- EXISTING ROAD
- 500 — EXISTING TOPOGRAPHIC CONTOUR
- 430 — GROUNDWATER ELEVATION CONTOUR (FT–MSL)
- 394 — PROPOSED EXCAVATION
- 600 — REGRADED BUFFER ZONE AREA
- PROPOSED LEACHATE COLLECTION PIPE
- PROPOSED LEACHATE COLLECTION SUMP
- 422 — AS–BUILT TOP OF SUBTITLE D GEOMEMBRANE LINER (SEE NOTE 4)
- 433 — APPROXIMATE BOTTOM OF WASTE CONTOUR IN PRE–SUBTITLE D AREA (SEE NOTE 5)
- EXISTING LEACHATE LINE
- (1) EXISTING SLURRY WALL
- PROPOSED DEEPER EXCAVATION AREA
- PROPOSED WASTE FOOTPRINT LATERAL EXPANSION AREA
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- PROPOSED POINT OF COMPLIANCE
- MW–3R (442.64) — EXISTING DETECTION MONITORING WELL WITH GROUNDWATER ELEVATION POSTED IN FT–MSL
- MW–10 (438.36) — OBSERVATION/MONITOR WELL WITH GROUNDWATER ELEVATION POSTED IN FT–MSL
- WB–1 (443.80) — FORMER EXPANSION AREA PIEZOMETER WITH GROUNDWATER ELEVATION POSTED IN FT–MSL
- MW–30 — PROPOSED DETECTION MONITORING WELL
- MW–9 (435.88) — EXISTING DETECTION MONITORING WELL CONVERTED TO OBSERVATION WELL AFTER SLURRY WALL INSTALLATION (WITH GROUNDWATER ELEVATION POSTED IN FT–MSL)
- MW–13R (439.45) — EXISTING MONITORING WELL PROPOSED TO BE REMOVED AFTER REPLACEMENT WELL BACKGROUND DATA CONCENTRATIONS APPROVED FOR MONITOR WELLS MW–30 AND MW–31 (WITH GROUNDWATER ELEVATION POSTED IN FT–MSL)
- MW–9A — MW–9 DETECTION WELL REPLACEMENT TO BE CONVERTED TO OBSERVATION WELL AFTER PROPOSED MW–32 REPLACEMENT DETECTION WELL HAS A TCEQ APPROVED BACKGROUND DATA EVALUATION
- (2) OW–1 — PROPOSED WOODBINE MONITOR WELL
- (1) — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW–1 THROUGH OW–10.
3. REVISED NOTE 7.
4. UPDATED GROUNDWATER MONITORING WELLS MW–4A, MW–9A, AND MW–13R2 WITH AS–BUILT LOCATIONS.
5. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83.
2. (5) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016.
3. WATER LEVEL MEASUREMENTS COLLECTED BY CAREL CORPORATION ON DECEMBER 21, 2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. AS–BUILT TOP OF GEOMEMBRANE LINER CONTOURS WERE DEVELOPED FROM HISTORICAL SLERS MAINTAINED IN THE SITE OPERATING RECORD.
5. APPROXIMATE BOTTOM OF WASTE CONTOURS IN THE PRE–SUBTITLE D AREA WERE DEVELOPED FROM HISTORICAL SLER INFORMATION.
6. OBSERVATION/MONITORING WELLS ARE DISCUSSED IN SECTION 8.4 OF APPENDIX IIIH. THESE WELLS ARE NOT PART OF THE DETECTION MONITORING SYSTEM, BUT WILL BE MONITORED CONSISTENT WITH TCEQ REQUIRMENTS.
7. (3) THE SLURRY WALL WAS COMPLETED IN OCTOBER 2015.

☐ DRAFT
☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 05/2013
FILE: 1339–351–11
CAD: IIIH–A–1 GW MONITORING.DWG

DRAWN BY: VRS
DESIGN BY: RSF
REVIEWED BY: RSF

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
3	08/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT GROUNDWATER MONITORING SYSTEM

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F–3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO
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GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE IIIH–A–1

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIH\IIIH-A-1 GROUNDWATER MONITORING.dwg, afor4, 1:2

WELL NUMBER	NORTHING	EASTING	INSTALL DATE	CASING INSIDE DIAMETER[4]	GROUND ELEVATION	TOP OF CASING ELEVATION	TOTAL BOREHOLE DEPTH	FILTER PACK ELEVATION		WELL SCREEN ELEVATION		FILTER PACK DEPTH		WELL SCREEN DEPTH		GROUNDWATER ELEVATION[3]	DEPTH TO GROUNDWATER[3]
								TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM		
EXISTING GROUNDWATER MONITORING WELLS[1]																	
MW-1R[B]	7063716	2445309	09/19/95	4.0	461.8	464.74	28.0	443.2	433.8	441.6	437.0	18.6	28.0	20.2	24.8	453.81	8.0
MW-3R[P]	7061345	2445148	08/30/93	4.0	456.9	459.92	30.0	439.4	426.9	436.9	426.9	17.5	30.0	20.0	30.0	443.43	13.5
MW-4R[O]	7059961	2443971	11/28/95	4.0	457.7	461.21	30.0	435.2	427.7	434.5	429.9	22.5	30.0	23.2	27.8	438.74	19.0
1 MW-4A[O]	7059927	2443966	11/20/2015	2.0	457.8	460.62	30.0	435.8	427.8	433.8	428.8	22.0	30.0	24.0	29.0	440.08	17.7
MW-8[B]	7062472	2445185	09/20/95	4.0	456.5	459.95	28.6	437.5	427.9	435.8	431.2	19.0	28.6	20.7	25.3	447.52	9.0
MW-9[P]	7060064	2444557	11/27/95	4.0	455.5	458.98	29.2	437.5	426.3	436.7	429.5	18.0	29.2	18.8	26.0	437.80	17.7
1 MW-9A[P,O]	7060034	2444567	11/20/2015	2.0	455.3	458.47	29.0	434.3	426.3	432.3	427.3	21.0	29.0	23.0	28.0	441.84	13.5
MW-10[O]	7059934	2443367	12/01/95	4.0	464.3	467.79	35.0	440.3	429.3	439.1	434.5	24.0	35.0	25.2	29.8	439.37	24.9
MW-10A[O]	7059897	2443371	08/23/07	2.0	461.1	464.42	30.0	435.1	431.1	434.2	431.2	26.0	30.0	26.8	29.8	439.26	21.8
MW-10B[O]	7059668	2443442	08/26/08	2.0	455.2	458.65	25.0	437.2	430.2	435.2	430.2	18.0	25.0	20.0	25.0	439.20	16.0
MW-11[O]	7060075	2442742	12/05/95	4.0	460.5	463.95	30.0	439.3	430.5	438.1	433.7	21.2	30.0	22.4	26.8	439.08	21.4
MW-12[O]	7060202	2442146	12/06/95	4.0	460.5	463.96	30.4	438.5	430.1	437.9	433.3	22.0	30.4	22.6	27.2	438.24	22.3
MW-12A[O]	7060177	2442141	08/23/07	2.0	460.2	463.85	29.0	435.2	431.2	434.4	431.4	25.0	29.0	25.8	28.8	438.39	21.8
1 MW-13R[P,8]	7060305	2441577	01/17/96	4.0	458.9	462.60	30.0	437.9	428.9	436.8	431.8	21.0	30.0	22.1	27.1	438.98	19.9
MW-13R2[O]	7060294	2441760	11/19/2015	2.0	463.3	466.05	35.0	437.3	428.3	434.3	429.3	26.0	35.0	29.0	34.0	439.66	23.6
MW-14[P]	7060846	2441328	01/25/96	4.0	462.0	465.50	25.5	445.5	436.5	444.2	439.5	16.5	25.5	17.8	22.5	440.48	21.5
MW-15A[P]	7061454	2441344	06/06/06	2.0	462.4	466.77	26.0	446.4	436.4	444.4	439.4	16.0	26.0	18.0	23.0	BTOP[7]	BTOP[7]
MW-16[P]	7062052	2441310	01/22/96	4.0	462.8	465.65	39.0	437.8	423.8	435.0	427.8	25.0	39.0	27.8	35.0	431.55	26.5
MW-17[P]	7062623	2441300	05/02/00	2.0	457.4	459.90	48.5	428.3	408.9	425.3	410.3	29.1	48.5	32.1	47.1	432.40	25.0
MW-18A[P]	7063217	2441286	08/24/10	2.0	457.0	459.93	50.0	421.0	407.0	419.0	409.0	36.0	50.0	38.0	48.0	432.47	24.5
MW-19[B]	7063439	2442917	08/23/10	2.0	457.5	460.63	20.0	445.5	437.5	443.5	438.5	12.0	20.0	14.0	19.0	446.29	11.2
MW-20[B]	7063446	2444379	08/23/10	2.0	453.9	456.99	21.0	440.9	432.9	438.9	433.9	13.0	21.0	15.0	20.0	447.16	6.7
MW-21[P]	7061156	2441326	08/25/10	2.0	462.0	464.89	23.0	443.0	439.0	442.0	439.5	19.0	23.0	20.0	22.5	BTOP[7]	BTOP[7]
MW-12B[P] (SEE NOTE 14)	7059856	2441957	08/26/08	2.0	459.7	463.22	32.0	435.7	427.7	432.7	427.7	24.0	32.0	27.0	32.0	437.99	21.7
MW-23[P]	7059696	2442524	08/25/10	2.0	458.9	462.05	32.0	434.9	426.9	432.9	427.9	24.0	32.0	26.0	31.0	438.73	20.2
MW-24[P]	7059534	2443100	08/25/10	2.0	456.5	459.56	30.0	434.5	426.5	432.5	427.5	22.0	30.0	24.0	29.0	440.01	16.5
MW-25[P]	7059495	2443696	08/30/10	2.0	455.1	457.56	29.0	431.6	426.1	429.6	427.1	23.5	29.0	25.5	28.0	435.75	19.4
MW-26[P]	7059591	2444271	08/31/10	2.0	455.3	457.94	29.0	439.3	426.3	437.3	427.3	16.0	29.0	18.0	28.0	436.71	18.6
MW-27[P]	7060278	2444880	08/30/10	2.0	453.0	456.10	25.0	432.5	428.0	431.5	429.0	20.5	25.0	21.5	24.0	438.38	14.6
MW-28[P]	7060773	2445092	08/30/10	2.0	453.8	456.71	29.0	435.3	424.8	433.3	425.8	18.5	29.0	20.5	28.0	439.17	14.6
MW-29[P]	7063432	2441689	08/23/10	2.0	456.3	459.58	51.0	419.3	405.3	416.3	406.3	37.0	51.0	40.0	50.0	447.10	9.2
PROPOSED GROUNDWATER MONITORING WELLS[2,10]																	
MW-30[9]	7060252	2441389	NEW	2.0	456	NEW	24.0	440.0	432.0	438.0	433.0	16.0	24.0	18.0	23.0	TBD[11]	TBD[11]
MW-31[9]	7059998	2441627	NEW	2.0	458	NEW	27.0	439.0	431.0	437.0	432.0	19.0	27.0	21.0	26.0	TBD[11]	TBD[11]
MW-32[9]	7059908	2444616	NEW	2.0	458	NEW	31.0	435.0	427.0	433.0	428.0	23.0	31.0	25.0	30.0	TBD[11]	TBD[11]

NOTES:

1. ELEVATIONS LISTED ABOVE IN FEET ABOVE MEAN SEA LEVEL, ALL DEPTHS LISTED IN FEET BELOW GROUND SURFACE.
2. PROPOSED MONITORING WELL GROUND ELEVATIONS ESTIMATED FROM SITE TOPOGRAPHIC MAP.
3. GROUNDWATER MEASUREMENTS TAKEN BY WBC ON APRIL 1, 2011.
4. MONITORING WELL CASING INSIDE DIAMETERS LISTED ABOVE IN INCHES.
5. POINT OF COMPLIANCE (P) OR BACKGROUND (B) OR OBSERVATION/MONITOR (O) WELL.
6. MONITORING WELL MW-18 TO BE REMOVED FOLLOWING BACKGROUND DATA EVALUATION REPORT SUBMITTAL FOR REPLACEMENT WELL MW-18A.
7. BTOP – WATER LEVEL BELOW TOP OF DEDICATED PUMP; WATER LEVEL NOT MEASURED.
8. EXISTING GROUNDWATER MONITORING WELL TO BE REMOVED FOLLOWING BACKGROUND DATA EVALUATION REPORT APPROVAL FOR REPLACEMENT MONITORING WELLS.
9. PROPOSED POINT OF COMPLIANCE GROUNDWATER MONITORING WELL.
10. PROPOSED GROUNDWATER MONITORING WELL DETAILS ARE ESTIMATED FROM EXISTING BORING LOGS. ACTUAL DEPTHS AND ELEVATIONS OF DETAILS TO BE DETERMINED IN FIELD.
11. TO BE DETERMINED (TBD) DURING THE INSTALLATION OF THE MONITORING WELL.
12. MW-16 SURVEY DATA WAS UPDATED IN MARCH 2013 (REFER TO APPENDIX G, SHEET IIIG-B-91A AND NOTES ON PAGES IIIG-25 AND IIIG-33 OF APPENDIX IIIG).
13. MONITOR WELL MW-25 TOP OF CASING ELEVATION REVISED PER CAREL CORPORATION MONITOR WELL REPAIR REPORT DATED OCTOBER 16, 2013.
14. MONITOR WELL MW-12B HAS PREVIOUSLY BEEN REFERRED TO AS MW-22 IN SOME SUBMITTALS HOWEVER, THE OFFICIAL DESCRIPTION FOR THIS WELL HAS ALWAYS BEEN MW-12B.

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1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. TABLE UPDATED TO REFLECT AS-BUILT INFORMATION FOR MW-4A, MW-9A, AND MW-13R2.

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DATE: 08/2013
FILE: 1339-351-11
CAD: IIH-A-2 MW DETAIL.DWG

DRAWN BY: VRS
DESIGN BY: RSF
REVIEWED BY: JPY

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2013	2nd TCEQ COMMENT RESPONSE
3	12/2013	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
MONITORING WELL DETAILS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIH-A-2

O:\1339\351\EXPANSION 2009\PART III-SDP\IIIH\IIIH-A-2 MW DETAILS.dwg, afor4, 1:1

APPENDIX IIIH-B
GROUNDWATER MONITORING DATA

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0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- EXISTING ROAD
- EXISTING TOPOGRAPHIC CONTOUR
- GROUNDWATER ELEVATION CONTOUR (FT-MSL)
- EXISTING PERMITTED POINT OF COMPLIANCE (TCEQ PERMIT NO. MSW-1312A)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- MW-3R (<1) EXISTING MONITORING WELL WITH GROUNDWATER cis-1,2-DCE CONCENTRATION POSTED IN ug/L
- MW-10 (34) EXISTING OBSERVATION WELL WITH GROUNDWATER cis-1,2-DCE CONCENTRATION POSTED IN ug/L.
- WB-1 FORMER EXPANSION AREA PIEZOMETER
- APPROXIMATE AREA THAT CIS-1,2-DICHLOROETHYLENE PLUME CONCENTRATION EXCEEDS 70ug/L GROUNDWATER PROTECTION STANDARD
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. WATER LEVEL MEASUREMENTS COLLECTED BY CAREL CORPORATION ON DECEMBER 21, 2011. WATER LEVEL FROM PZ-30 COLLECTED BY CAREL CORPORATION ON DECEMBER 2, 2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. GROUNDWATER CONCENTRATION FOR CIS-1,2-DICHLOROETHYLENE IN DECEMBER 2011 POSTED AT WELL LOCATION IN ug/L WHICH IS EQUIVALENT TO PARTS PER BILLION.

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DATE: 12/2012
FILE: 1339-351-10
CAD: IIIH-B-70 PLUME MAP.DWG

DRAWN BY: SRF
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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	09/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
DICHLOROETHYLENE GROUNDWATER PROTECTION STANDARD PLUME MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO FORT WORTH, TX EVANSVILLE, IN RIVERSIDE, MO GRAND RAPIDS, MI SOUTH BEND, IN SPRINGFIELD, IL CLAREMONT, FL

FIGURE IIIH-B-70

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0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- AUTHORIZED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 STATE PLANE COORDINATE SYSTEM
- EXISTING ROAD
- 500 EXISTING TOPOGRAPHIC CONTOUR
- 430 GROUNDWATER ELEVATION CONTOUR (FT-MSL)
- EXISTING PERMITTED POINT OF COMPLIANCE (TCEQ PERMIT NO. MSW-1312A)
- APPROXIMATE CONTACT WITH EAGLE FORD SHALE
- MW-3R (<5) EXISTING MONITORING WELL WITH GROUNDWATER TRICHLOROETHYLENE CONCENTRATION POSTED IN ug/L.
- MW-10 (<5) EXISTING OBSERVATION WELL WITH GROUNDWATER TRICHLOROETHYLENE CONCENTRATION POSTED IN ug/L.
- WB-1 FORMER EXPANSION AREA PIEZOMETER
- APPROXIMATE AREA THAT GROUNDWATER TRICHLOROETHYLENE PLUME CONCENTRATION IN DECEMBER 2011 EXCEEDS 5ug/L GROUNDWATER PROTECTION STANDARD
- 1 INDICATES REVISION (SEE LIST OF REVISIONS BELOW)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016. (1)
3. WATER LEVEL MEASUREMENTS COLLECTED BY CAREL CORPORATION ON DECEMBER 21, 2011. WATER LEVEL FROM PZ-30 COLLECTED BY CAREL CORPORATION ON DECEMBER 2, 2011. POTENTIOMETRIC CONTOURS PREPARED BY WBC.
4. GROUNDWATER CONCENTRATION FOR TRICHLOROETHYLENE IN DECEMBER 2011 POSTED AT WELL LOCATION IN ug/L WHICH IS EQUIVALENT TO PARTS PER BILLION.

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- [ ] CLIENT APPROVAL BY:

DATE: 12/2012
FILE: 1339-351-10
CAD: IIIH-B-71 PLUME MAP.DWG

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REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
10	08/2018	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT TRICHLOROETHYLENE GROUNDWATER PROTECTION STANDARD PLUME MAP

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DENTON COUNTY, TEXAS

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FIGURE IIIH-B-71

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIH\IIIH-B-71-TRICHLOROETHYLENE PLUME MAP.dwg, aford, 1:2

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX III I
LANDFILL GAS MANAGEMENT PLAN

Prepared for

City of Farmers Branch

February 2012
Revised December 2012
Revised August 2013
Revised June 2014

Revised August 2016

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Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-5F

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2.4 Hydraulic Conditions

The site is located approximately 2 miles south of Lake Lewisville within the watershed of the Elm Fork of the Trinity River. The Elm Fork of the Trinity River forms the southern boundary of the site. Midway Branch, a tributary of the Elm Fork, flows along the east side of the permit boundary.

2.5 Facility Structures Within the Permit Boundary

All on-site structures, including but not limited to, buildings, subsurface vaults, utilities, or any other areas where potential gas buildup would be of concern as well as any future on-site structures, buildings, subsurface vaults, utilities, or any other areas where potential gas buildup would be of concern, installed within the permit boundary (per any future permit amendments or modifications) will be monitored as described in Section 3.2.

2.6 Underground Utilities

Currently the underground sanitary sewer line has ~~test~~ trench vents. In addition, passive vent pipes will be installed into or directly adjacent to the pipe bedding of underground utilities to monitor for LFG migration and vent potential methane accumulations. The passive vent pipes will be installed near the underground utility where it crosses the permit boundary. Currently, there are two existing underground utilities at the site. The first is a sanitary sewer line easement that crosses the southwest and northwest corners of the existing permit boundary. Trench vents (TV-1 and TV-2) have been installed where the easement crosses the existing permit boundary. This existing sanitary sewer line will also cross the northwest ~~and northeast~~ corner~~s~~ of the proposed permit boundary. The second is an electric easement that crosses the eastern permit boundary. Passive trench vent pipes will also be installed in or near these underground utilities within 6 months after the approval of this permit amendment as shown on Figure III I-A-1 in Appendix III I-A. All future underground utilities which cross the permit boundary will be vented and monitored as well. Future passive trench vents will be installed within 60 days after utility construction. A construction detail for the passive trench vent pipes is provided on Figure III I-A-2. The vents will be equipped with monitoring ports to facilitate routine methane monitoring.

2.7 Land Use and Offsite Structures

Land use within a 1,000 foot radius of the site's permit boundary consists of residential, recreational, business, and open areas. The nearest residence is approximately 680 feet east of the permit boundary. A surrounding development map showing the structures within 1,000 feet of the permit boundary is presented in Appendix III I-B. Refer to Parts I/II, Section 7 for additional information on surrounding land use. With any future development around the facility, the LFG monitoring system will be reviewed and revised as needed to protect human health and the environment. All proposed changes to the LFG monitoring system will be submitted to the TCEQ for approval.

3.1.3 Proposed Passive Trench Vents

~~Five~~ Two passive trench vents will be installed in or near the underground utility trenches as discussed in Section 2.6 and shown on Figure III I-A-1. Given that the existing trench vent (TV-2) will be fully contained within the proposed permit boundary, the monitoring at this location will not be required once this permit is approved. As such, TV-2 will be relocated along the northwest corner of the proposed permit boundary. A typical detail of the future trench vents is shown on Figure III I-A-2. The underground utility locations will be identified and located by representatives of the utility easement owners. The installation of the new trench vents will occur within 6 months of the approval of this permit amendment and approvals from the easement owners.

3.1.4 Monitoring Procedures

Methane concentrations will be measured using a portable gas detection device pre-calibrated against reference methane and oxygen standards. The portable gas detection device will be equipped with a suction sampling line equipped with an air tight fitting. This fitting will match with a corresponding air tight fitting installed at the top of each probe and on each passive trench vent to enable gas samples to be drawn directly into the monitoring instrument without diluting the sample. The instrument is designed to give a direct reading of the methane concentration in two scales, either percent of the LEL or percent methane by volume. A qualified landfill representative or consultant will conduct the monitoring. The monitoring equipment will be maintained and calibrated in accordance with the manufacturer's recommended procedures prior to use.

Monitoring data will be recorded on the Landfill Gas Monitoring Report (LGMR) form shown in Appendix III I-C, or a similar form, and the data maintained in the facility's Site Operating Record. Probe and passive trench vent monitoring procedures will be as recommended by the gas detection device instrument manufacturer. Manufacturers' information on typical monitoring equipment used at the site is provided in Appendix III I-D.

If LFG monitoring determines that methane has been detected in concentrations exceeding a regulatory limit, notification procedures as described in Section 4 will be implemented.

3.1.5 Maintenance Procedures

As part of the overall maintenance program, routine inspection of the probes/trench vents will be conducted. Each time LFG monitoring is conducted, the sampler will inspect the integrity of the monitoring probes/trench vents. The sampler will record pertinent information on the LGMR form (Appendix III I-C) or similar form. Each probe/trench vent will be inspected for the following:

- Verification that the monitoring probe/trench vent is clearly numbered.
- Verification that the protective cover or piping is intact and is not bent or excessively corroded.
- Verification that the concrete pad is intact.

APPENDIX III I-A

LANDFILL GAS PROBE LOCATIONS

PROPOSED LANDFILL GAS PROBE/TRENCH VENT DETAILS

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Includes Figures III I-A-1 and III I-A-2

N

0 300 600
SCALE IN FEET

LIST OF REVISIONS:

1. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. REMOVED EASEMENTS.
3. UPDATED LOCATION OF TRENCH VENT TV-2R.
4. REMOVED TRENCH VENTS TV-3 AND TV-4.
5. RELABELED TRENCH VENT TV-5 TO TV-3.
6. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND:

- CURRENT PERMIT BOUNDARY (PERMIT NO. MSW-1312A)
- PROPOSED PERMIT BOUNDARY
- AUTHORIZED PRE-SUBTITLE D AREA LIMIT OF WASTE (PERMIT NO. MSW-1312A)
- AUTHORIZED SUBTITLE D AREA LIMIT OF WASTE (PERMIT NO. MSW-1312A)
- PROPOSED LIMITS OF WASTE
- 430 EXISTING CONTOURS
- N 7062000 STATE PLANE COORDINATES
- 33°92'00" GEODETIC COORDINATE SYSTEM
- (2) EASEMENT
- EXISTING FENCE
- EXISTING SUBTITLE D COMPOSITE LINER AREA
- CONSTRUCTED FINAL COVER
- GMP-1R EXISTING LANDFILL GAS MONITORING PROBE
- GMP-18 EXISTING LANDFILL GAS MONITORING PROBE (TO BE ABANDONED)
- (1) GMP-20 PROPOSED LANDFILL GAS MONITORING PROBE
- (3) TV-3 PROPOSED TRENCH VENT
- TV-1 EXISTING TRENCH VENT
- TV-2 EXISTING TRENCH VENT (TO BE ABANDONED)
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

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NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. (6) PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. LOCATIONS OF THE PROPOSED LANDFILL GAS MONITORING PROBES AND TRENCH VENTS ARE APPROXIMATE. ACTUAL LOCATIONS MAY VARY DUE TO FIELD CONDITIONS AT THE TIME OF INSTALLATION.
4. THIS 20-FOOT ELECTRICAL EASEMENT PROVIDES ELECTRICITY TO THE TEMPORARY MAINTENANCE AREA. THE EASEMENT WILL BE ABANDONED PRIOR TO DEVELOPMENT IN THIS AREA.

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DATE: 02/2012
FILE: 1339-351-17
CAD: III I-A-1 LFG PROBE LOCS.dwg

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REVIEWED BY: JHP

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REVISIONS

NO.	DATE	DESCRIPTION
1	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
LANDFILL GAS PROBE LOCATIONS

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DENTON COUNTY, TEXAS

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FIGURE III I-A-1

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G:\1339\351\EXPANSION 2009\PART III-SDP\III\III I-A-1 LFG PROBES.dwg, jwilson, 1:2

APPENDIX III I-B

SURROUNDING DEVELOPMENT MAP

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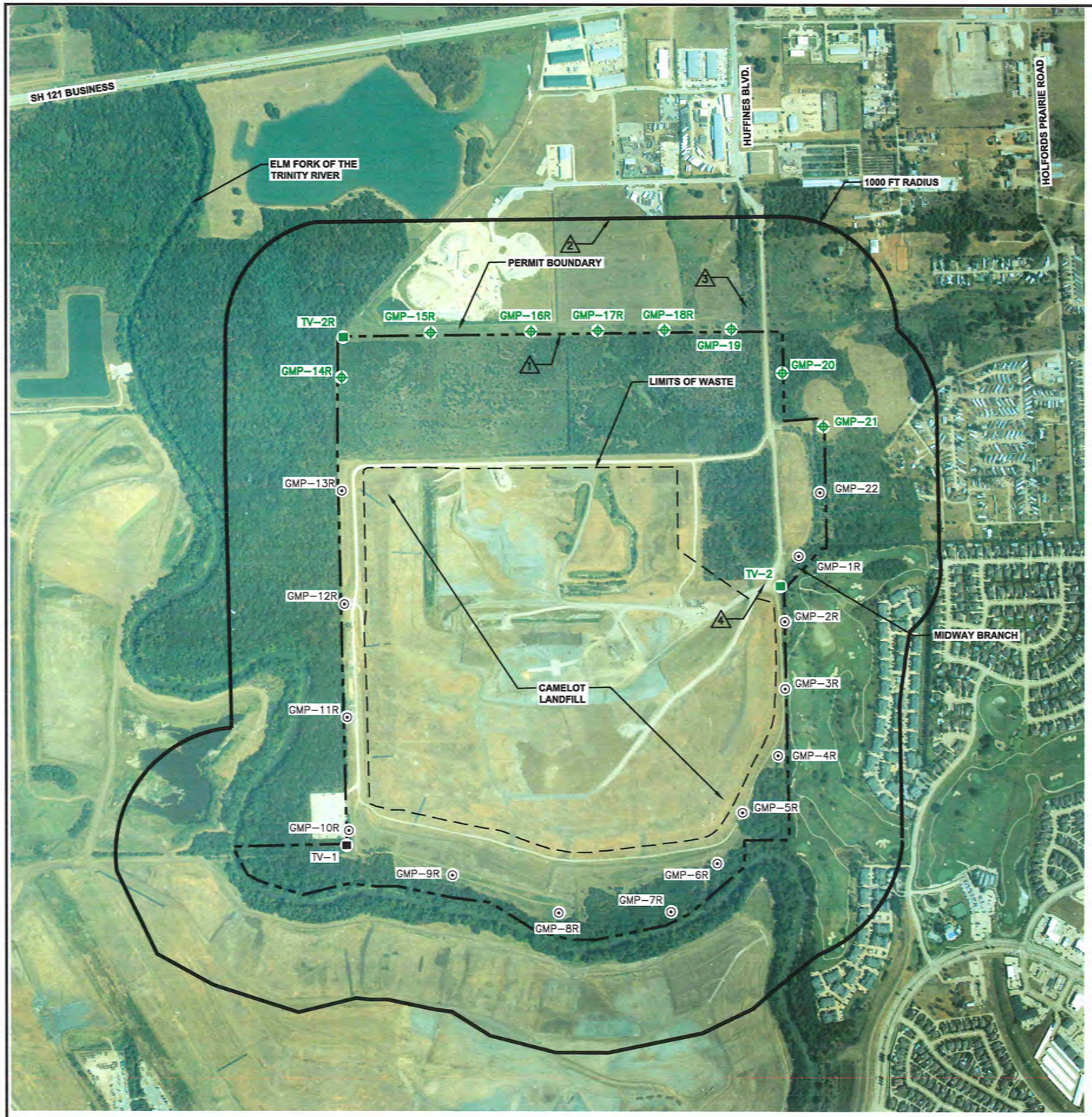
Includes Figure III I-B-1



N

0 500 1000
SCALE IN FEET

LEGEND:

- PERMIT BOUNDARY
- LIMIT OF WASTE
- 1,000 FT RADIUS
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- TV-2 — PROPOSED TRENCH VENT
- TV-1 — EXISTING TRENCH VENT
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. AERIAL PHOTOGRAPH PROVIDED BY METROPOLITAN AERIAL SURVEYS, FROM AERIAL PHOTOGRAPHY FLOWN ON AUGUST 28, 2010.

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY.
2. UPDATED 1,000 FT RADIUS.
3. REMOVED TRENCH VENT TV-3 AND TV-4.
4. RELABELED TRENCH VENT TV-5 AND TV-3.

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- [ ] CLIENT APPROVAL BY: _____

DATE: 02/2012
FILE: 1339-351-17
CAD: III I-B-1 DEVELOPEMNT MAP.dwg

DRAWN BY: VRS
DESIGN BY: SR
REVIEWED BY: JHP

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SURROUNDING DEVELOPMENT MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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COLUMBUS, OH
DENVER, CO

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(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

FIGURE III I-B-1

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O:\1339\351\EXPANSION 2009\PART III-SDP\III\III I-B-1 SURROUNDING DEVELOPMENT.dwg, sford, 1:2

APPENDIX III I-E

LANDFILL GAS COLLECTION AND CONTROL SYSTEM PLAN

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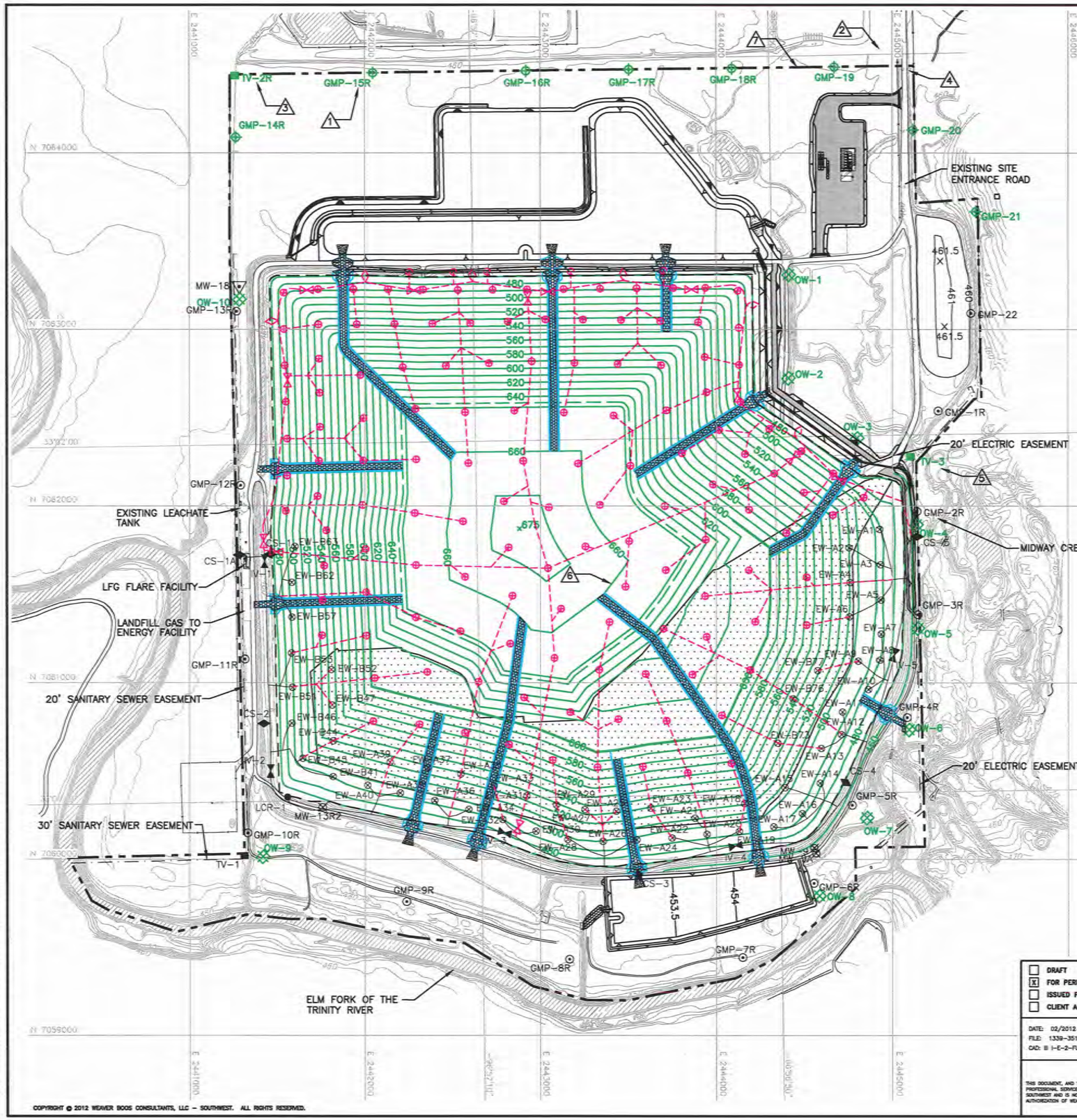
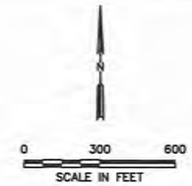
Includes Figures III I-E-1 Through III I-E-5





LEGEND

- PROPOSED PERMIT BOUNDARY
- PROPOSED LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- OVERLINER SYSTEM AREA
- (6) 600 — PROPOSED FINAL COVER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- PROPOSED DRAINAGE LETDOWN
- (2) EASEMENT
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- (1) GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- (3) TV-2R — PROPOSED TRENCH VENT
- TV-1 — EXISTING TRENCH VENT
- EW-A7 — EXISTING LFG EXTRACTION WELL
- EXISTING LFG COLLECTION PIPING
- CS-2 — EXISTING CONDENSATE SUMP
- IV-2 — EXISTING ISOLATION VALVE
- LCR-1 — EXISTING LEACHATE CLEANOUT RISER CONNECTION
- PROPOSED LFG EXTRACTION WELL
- PROPOSED LFG COLLECTION PIPING
- PROPOSED CONDENSATE SUMP
- PROPOSED ISOLATION VALVE
- PROPOSED LEACHATE CLEANOUT RISER CONNECTION
- (1) INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. REMOVED EASEMENTS.
3. UPDATED LOCATION OF TRENCH VENT TV-2R.
4. REMOVED TRENCH VENTS TV-3 AND TV-4.
5. RELABELED TRENCH VENT TV-5 TO TV-3.
6. REVISED FINAL COVER CONTOURS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. (7)
3. THE LOCATION AND NUMBER OF PROPOSED FUTURE EXTRACTION WELLS AND GCCS COMPONENTS ARE APPROXIMATE. EXACT NUMBER AND LOCATION WILL BE DETERMINED BASED ON SITE CONDITIONS AT THE TIME OF INSTALLATION.
4. IN THE OVERLINER AREA WHERE EXTRACTION WELLS HAVE BEEN INSTALLED PRIOR TO THE OVERLINER INSTALLATION, THE EXTRACTION WELLS WILL BE EXTENDED THROUGH THE OVERLINER AS SHOWN IN DETAIL LFG4 OR REDRILLED AS SHOWN IN DETAIL LFG5.

- [ ] DRAFT
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- [ ] CLIENT APPROVAL BY:

DATE: 02/2012
FILE: 1339-351-11
CAD: III I-E-2-FUTURE GCCS.DWG

DRAWN BY: VRS
DESIGN BY: SR
REVIEWED BY: JHP

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FUTURE GCCS LAYOUT

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE III I-E-2

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O:\1339\351\EXPANSION 2009\PART III-SDP\III\III I-E-2 FUTURE GCCS LAYOUT.dwg, jwilson, 1:2

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

VOLUME 5 OF 6

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised June 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

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Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B

This document is intended for permitting purposes only.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIJ
GEOTECHNICAL REPORT

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised June 2014

Revised August 2016

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Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B.9

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Table 6-3
Factor of Safety Summary for Long-Term Slope Stability Analyses

Description		Minimum Factor Safety Generated		Recommended Minimum Factor of Safety		Acceptable Factor of Safety	
Slope Designation	Method of Analysis	Total Stress	Effective Stress	Total Stress	Effective Stress	Total Stress	Effective Stress
Final Cover 1-1 (Massive)	Bishop-Circular	~~2.14~~ 2.21	~~2.17~~ 2.27	1.5	1.5	YES	YES
Final Cover 1-2 (Perimeter)	Bishop-Circular	~~4.26~~ 4.46	~~5.16~~ 5.44	1.5	1.5	YES	YES
Final Cover 1-3 (Side Slope)	Bishop-Circular	~~2.13~~ 2.20	~~2.13~~ 2.20	1.5	1.5	YES	YES
Final Cover 1-4	Rankine-Block	~~2.06~~ 2.29 (Peak), ~~1.86~~ 2.26 (Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES
Final Cover 2-1 (Massive)	Bishop-Circular	~~2.27~~ 3.12	~~2.28~~ 3.14	1.5	1.5	YES	YES
Final Cover 2-2 (Perimeter)	Bishop-Circular	~~6.49~~ 6.48	~~6.86~~ 6.85	1.5	1.5	YES	YES
Final Cover 2-3 (Side Slope)	Bishop-Circular	~~2.25~~ 3.04	~~2.26~~ 3.04	1.5	1.5	YES	YES
Final Cover 3-1 (Massive)	Bishop-Circular	~~2.31~~ 3.14	~~2.32~~ 3.16	1.5	1.5	YES	YES
Final Cover 3-2 (Perimeter)	Bishop-Circular	~~2.83~~ 6.48	~~3.32~~ 3.41	1.5	1.5	YES	YES
Final Cover 3-3 (Side Slope)	Bishop-Circular	~~2.26~~ 3.04	~~2.26~~ 3.03	1.5	1.5	YES	YES
Final Cover 4-1 (Massive)	Bishop-Circular	~~2.19~~ 2.81	~~2.20~~ 2.88	1.5	1.5	YES	YES
Final Cover 4-2 (Perimeter)	Bishop-Circular	~~4.74~~ 4.95	~~5.48~~ 5.97	1.5	1.5	YES	YES
Final Cover 4-3 (Side Slope)	Bishop-Circular	~~2.13~~ 2.93	~~2.13~~ 2.73	1.5	1.5	YES	YES
Final Cover 5-1 (Massive)	Bishop-Circular	~~2.23~~ 2.75	~~2.25~~ 2.77	1.5	1.5	YES	YES
Final Cover 5-2 (Perimeter)	Bishop-Circular	~~7.29~~ 7.28	~~8.31~~ 8.30	1.5	1.5	YES	YES
Final Cover 5-3 (Side Slope)	Bishop-Circular	~~2.14~~ 2.65	~~2.14~~ 7.65	1.5	1.5	YES	YES
Final Cover 6-1 (Massive)	Bishop-Circular	~~2.11~~ 2.07	~~2.11~~ 2.08	1.5	1.5	YES	YES
Final Cover 6-2 (Perimeter)	Bishop-Circular	~~5.20~~ 5.19	6.17	1.5	1.5	YES	YES
Final Cover 6-3 (Side Slope)	Bishop-Circular	~~2.01~~ 2.12	~~2.01~~ 2.12	1.5	1.5	YES	YES
Final Cover 6-4	Rankine-Block	~~1.93~~ 2.08 (Peak), ~~1.78~~ 1.99 (Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES
Overliner 1-1	Rankine-Block	~~2.17~~ 2.62 (Peak), ~~1.55~~ 2.04 (Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES
Overliner 2-1	Rankine-Block	~~2.13~~ 2.58 (Peak), ~~1.51~~ 2.00 (Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES
Overliner 3-1	Rankine-Block	~~2.05~~ 2.47 (Peak), ~~1.42~~ 1.86 (Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES
Overliner 4-1	Rankine-Block	~~2.08~~ 2.34 (Peak), ~~1.45~~ 1.74(Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES
Interim Fill Section I-1	Bishop-Circular	1.61		1.5		–	YES
Interim Fill Section I-2	Rankine-Block	1.59 (Peak), 1.44 (Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES
Overliner Interim Section IOL-1	Bishop-Circular	~~2.28~~ 2.76		1.5		–	YES
Overliner Interim Section IOL-2	Rankine-Block	~~2.10~~ 2.58 (Peak), ~~1.47~~ 1.78 (Residual)		1.5 (Peak), 1.0 (Residual)		YES	YES

7.3 Foundation Settlement

In general, landfill foundation settlement occurs as foundation materials consolidate due to the weight of the landfill. Foundation settlement was predicted using standard consolidation theory for soils. Consolidation data are provided in Appendix IIIJ-C. The excavation base grades are founded primarily in the unweathered shale. The settlement calculation was based on a maximum applied load of approximately ~~295.2~~ 248.3 feet of solid waste with unit weight of ~~79~~ 76 pcf and cover with an average saturated unit weight of 120 pcf. The consolidation test results indicate that the foundation soils are overconsolidated (i.e., consolidated in the geologic past from a load greater than the existing soil overburden). Two consolidation tests were performed on select samples to represent underlying soils and verify that any potential consolidation of underlying soils will not adversely impact the designed liner and overliner systems.

Based on the result of the settlement analysis using the consolidation testing performed on the shale, the subgrade consolidation will not exceed ~~1.47~~ 1.25 feet. The settlement of the liner system will be generally uniform and will not adversely affect the performance of the liner or leachate collection system. Strain for the liner system is calculated by using the calculated settlement. The maximum strain calculated is ~~0.0011~~ 0.0012 percent. This is well below the strain values that the liner system components (e.g., geomembrane, geocomposite, compacted clay) can withstand. These calculations are included in Appendix IIIJ-B-1. The final deflected shape of the liner will generally consist of gradual transitions with the differential settlement occurring over several hundred feet or more (horizontal projection). Based on the foregoing discussion, it is concluded that settlement will not adversely affect the liner system or flow in the leachate collection system.

7.4 Overliner Settlement

Overliner settlement occurs as foundation materials and underlying in-place solid waste consolidate due to the additional weight of the landfill. In general, foundation settlement is insignificant in comparison to the settlement of underlying in-place solid waste. Waste settlement consists of primary and secondary settlement.

Settlement of solid waste below the overliner occurs as the overliner, additional waste, and final cover are placed, and continues to occur for long periods of time as waste decomposes. Initially, municipal solid waste below the overliner will undergo primary settlement due to overliner construction, waste placed over the overliner, final cover, equipment, etc.; then waste below the overliner undergoes secondary settlement as the waste decomposes. Settlement analysis for the overliner system is presented in Appendix IIIJ-B-2.

The purpose of the overliner system settlement analysis is to (1) show that positive drainage is maintained for the overliner system consistent with the demonstration included in Appendix IIIC and (2) to verify that the strain induced on the overliner system

APPENDIX IIIJ-A-1

SLOPE STABILITY ANALYSIS FOR LANDFILL EXCAVATION CONFIGURATION

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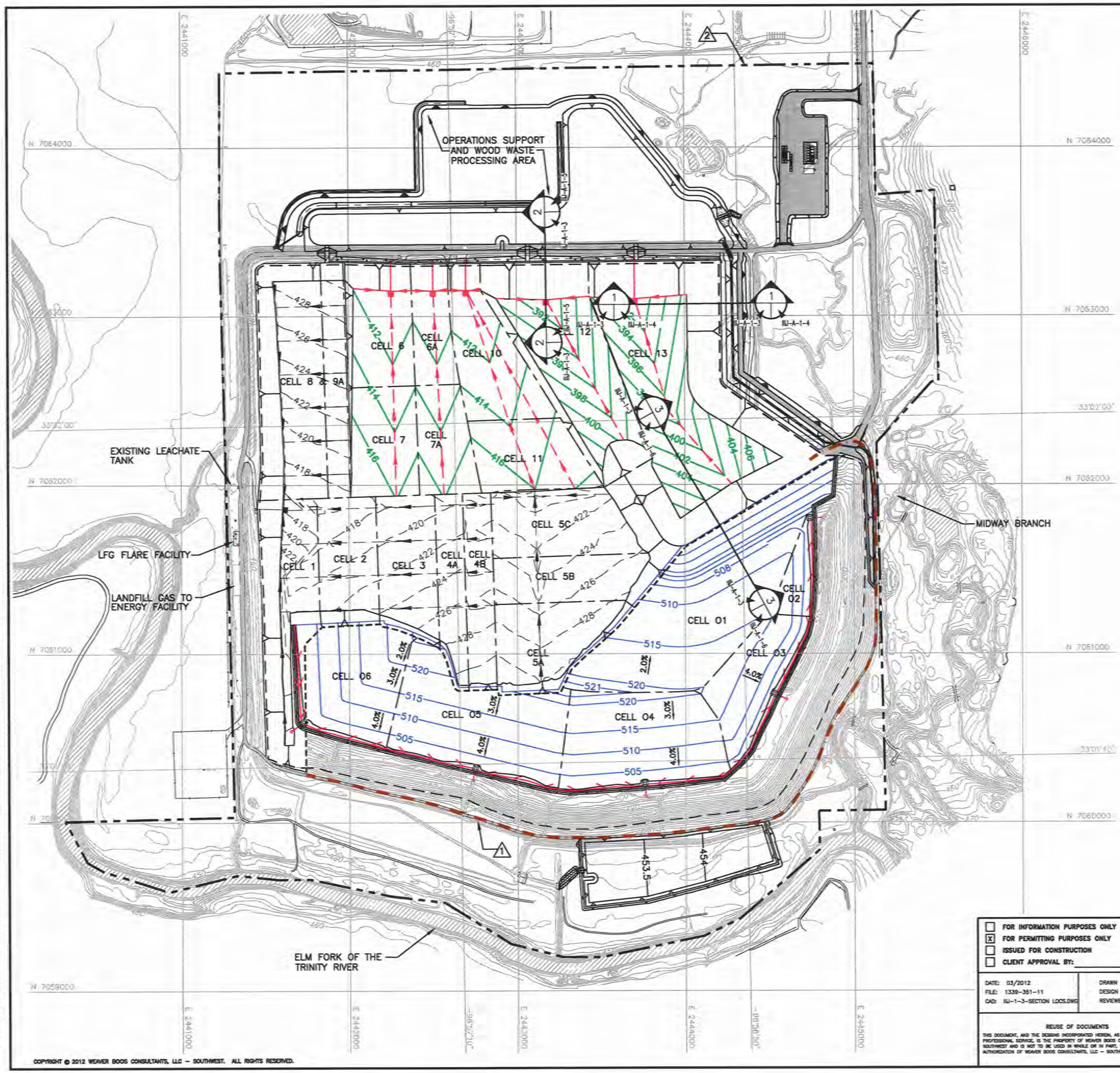

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- 3H:1V SLOPE (TYPICAL)
- EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PERMIT BOUNDARY INFORMATION.

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT SLOPE STABILITY SECTION LOCATIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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NAPERVILLE, IL
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APPENDIX IIIJ-A-2

SLOPE STABILITY ANALYSIS FOR INTERIM FILL SLOPE

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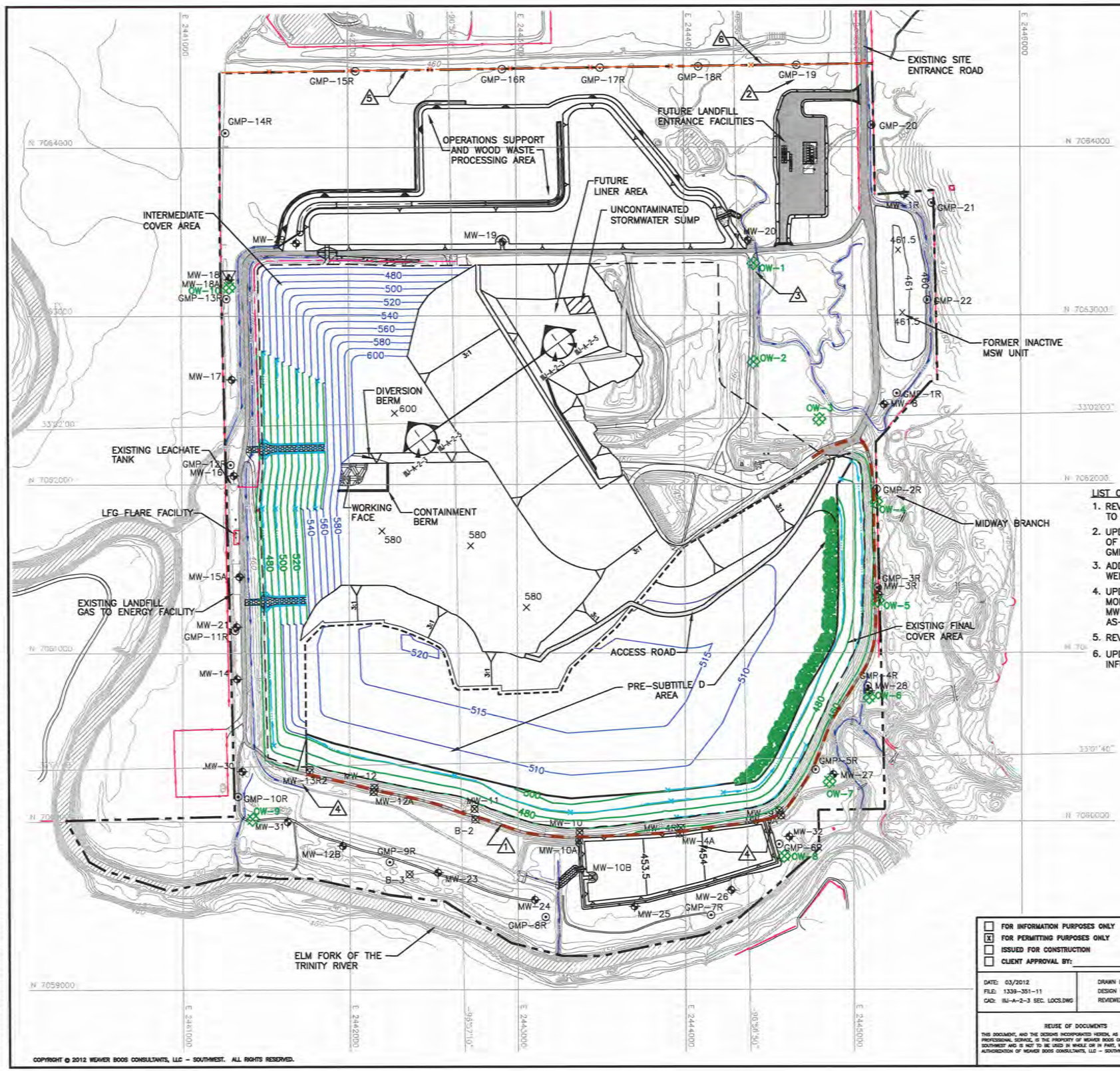

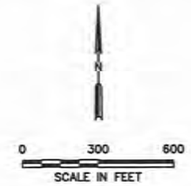

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 400 — PROPOSED FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- 560 — PROPOSED INTERMEDIATE COVER CONTOUR
- 600 — REGRADED BUFFER ZONE AREA
- LEACHATE FORCEMAIN
- EXISTING FENCE
- 5 — PROPOSED FENCE
- 1 — EXISTING SLURRY WALL
- 4 — MW-8 — EXISTING GROUNDWATER MONITORING WELL
- 2 — GMP-13 — EXISTING LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL
- 3 — OW-1 — PROPOSED WOODBINE MONITOR WELL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. REVISED PROPOSED FENCE LOCATION.
6. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. THE SECTOR DEVELOPMENT SHOWN IS FOR GENERAL CONDITIONS AND MAY NOT REFLECT THE EXACT CONFIGURATION OF THE LANDFILL. IF INTERIM 3H:1V SLOPES LONGER THAN 544 FEET ARE DEVELOPED DURING SITE OPERATIONS AN ADDITIONAL ANALYSIS WILL BE COMPLETED.

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	08/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SLOPE STABILITY SECTION LOCATION

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL · NAPERVILLE, IL · COLUMBUS, OH · DENVER, CO
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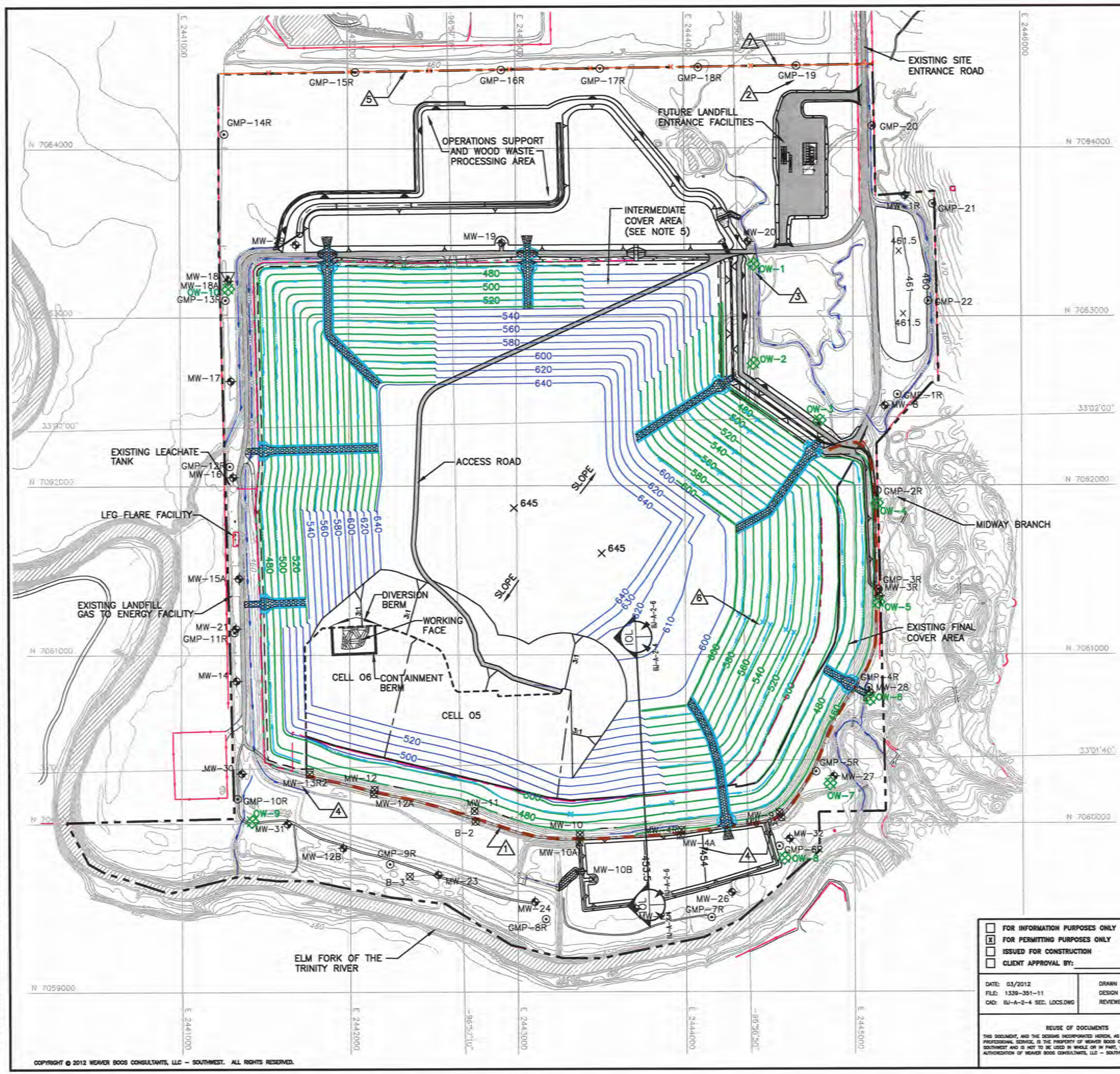

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- REGRADED BUFFER ZONE AREA
- PROPOSED FINAL COVER CONTOUR
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- PROPOSED INTERMEDIATE COVER CONTOUR
- LEACHATE FORCEMAIN
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING SLURRY WALL
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING LANDFILL GAS MONITORING PROBE
- OBSERVATION/MONITORING WELL
- PROPOSED WOODBINE MONITOR WELL
- INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PROPOSED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. UPDATED GROUNDWATER MONITORING WELLS MW-4A, MW-9A, AND MW-13R2 WITH AS-BUILT LOCATIONS.
5. REVISED PROPOSED FENCE LOCATION.
6. REVISED FINAL COVER CONTOURS.
7. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. THE SECTOR DEVELOPMENT SHOWN IS FOR GENERAL CONDITIONS AND MAY NOT REFLECT THE EXACT CONFIGURATION OF THE LANDFILL. IF INTERIM OVERLINER 5H:1V SLOPES LONGER THAN 455 FEET ARE DEVELOPED DURING SITE OPERATIONS AN ADDITIONAL ANALYSIS WILL BE COMPLETED.

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REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SLOPE STABILITY SECTION LOCATION

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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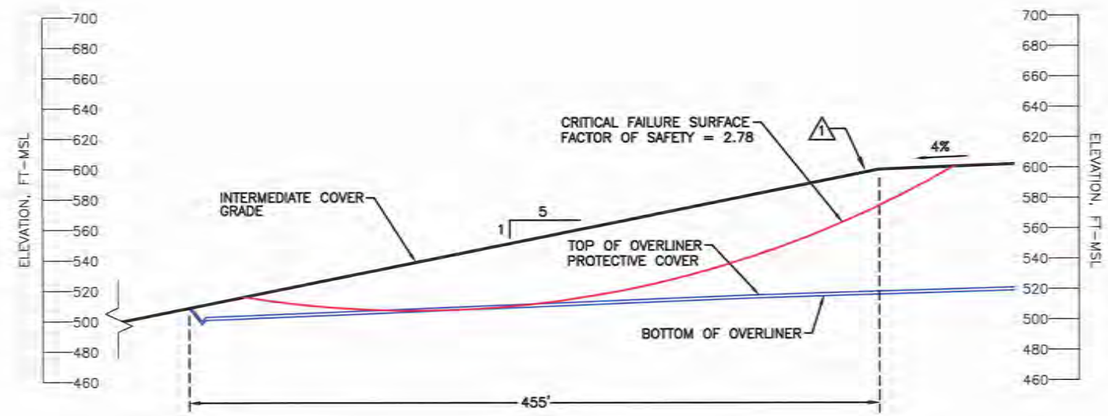

OVERLINER INTERIM SECTION (OL-1)

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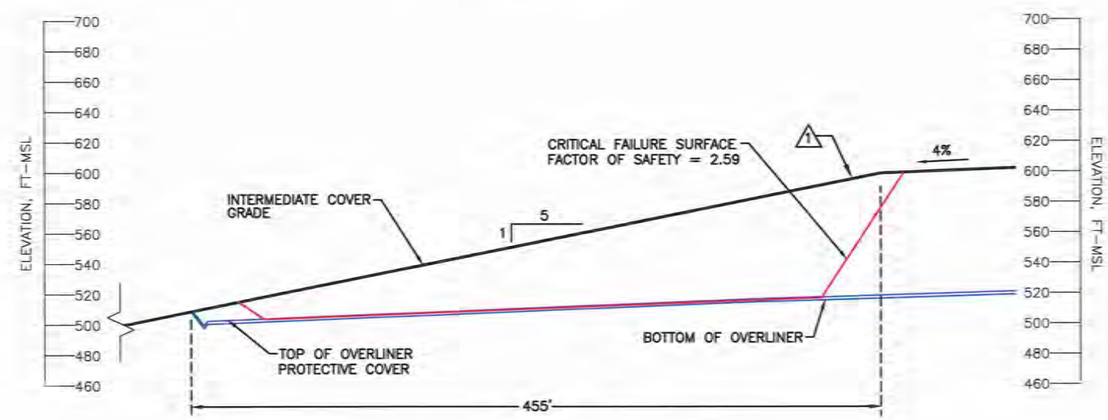
III-A-2-4 III-A-2-6



OVERLINER INTERIM SECTION (OL-2)

0 50 100
SCALE IN FEET

III-A-2-4 III-A-2-6

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED INTERMEDIATE COVER.
2. REVISED NOTE 2.

NOTES:

1. THESE SECTIONS WERE ESTABLISHED TO INDICATE THE MOST CRITICAL INTERIM SECTION DURING THE DEVELOPMENT OF THE LANDFILL BASED ON THE SEQUENCE OF DEVELOPMENT PLANS PROVIDED IN PARTS I AND II.
2. INTERIM CONDITION WAS ANALYZED CONSIDERING A 5H:1V SLOPE WITH A HORIZONTAL LENGTH OF 455 FEET OVER THE PRE-SUBTITLE D OVERLINER SYSTEM. IF INTERIM SLOPES LONGER THAN 455 FEET ARE DEVELOPED DURING SITE OPERATIONS, AN ADDITIONAL ANALYSIS WILL BE COMPLETED.

DRAFT

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NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SLOPE STABILITY INTERIM SECTIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

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SHEET IIIJ-A-2-6

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Factor of Safety Summary for Slope Stability

Description		Minimum Factor of Safety Generated	Recommended Minimum Factor of Safety	Acceptable Factor of Safety
Slope Designation	Method of Analysis			
Interim Fill Slope I-1	Bishop-Circular	1.61	1.5	YES
Overliner Interim Fill Slope IOL-1	Bishop-Circular	~~2.28~~ **2.78**	1.5	YES

Description		Minimum Factor of Safety Generated		Recommended Minimum Factor of Safety		Acceptable Factor of Safety	
Slope Designation	Method of Analysis	Peak	Residual	Peak	Residual	Peak	Residual
Interim Fill Slope I-2	Rankine-Block	1.59	1.44	1.5	1.0	NO	YES
Overliner Interim Fill Slope IOL-2	Rankine-Block	~~2.1~~ **2.59**	~~1.47~~ **1.78**	1.5	1.0	YES	YES

Minimum Required Interface Strength Parameters

Landfill Component	Interface	Peak		Residual	
		Adhesion (psf)	Friction Angle (degrees)	Adhesion (psf)	Friction Angle (degrees)
Liner/Overliner Systems	Protective Cover/Geocomposite	100	18	80	14
Liner/Overliner Systems	Geocomposite-Geonet/Smooth Geomembrane	100	13	80	8
Liner System	Geocomposite/Textured Geomembrane	100	21	80	10
Liner System	Smooth Geomembrane/Clay Liner	100	13	80	8
Liner System	Textured Geomembrane/Clay Liner	200	15	80	13
Overliner System	Textured Geomembrane/Geosynthetic Clay Liner	100	18	80	10
Overliner System	Geosynthetic Clay Liner/Subgrade	100	25	80	12

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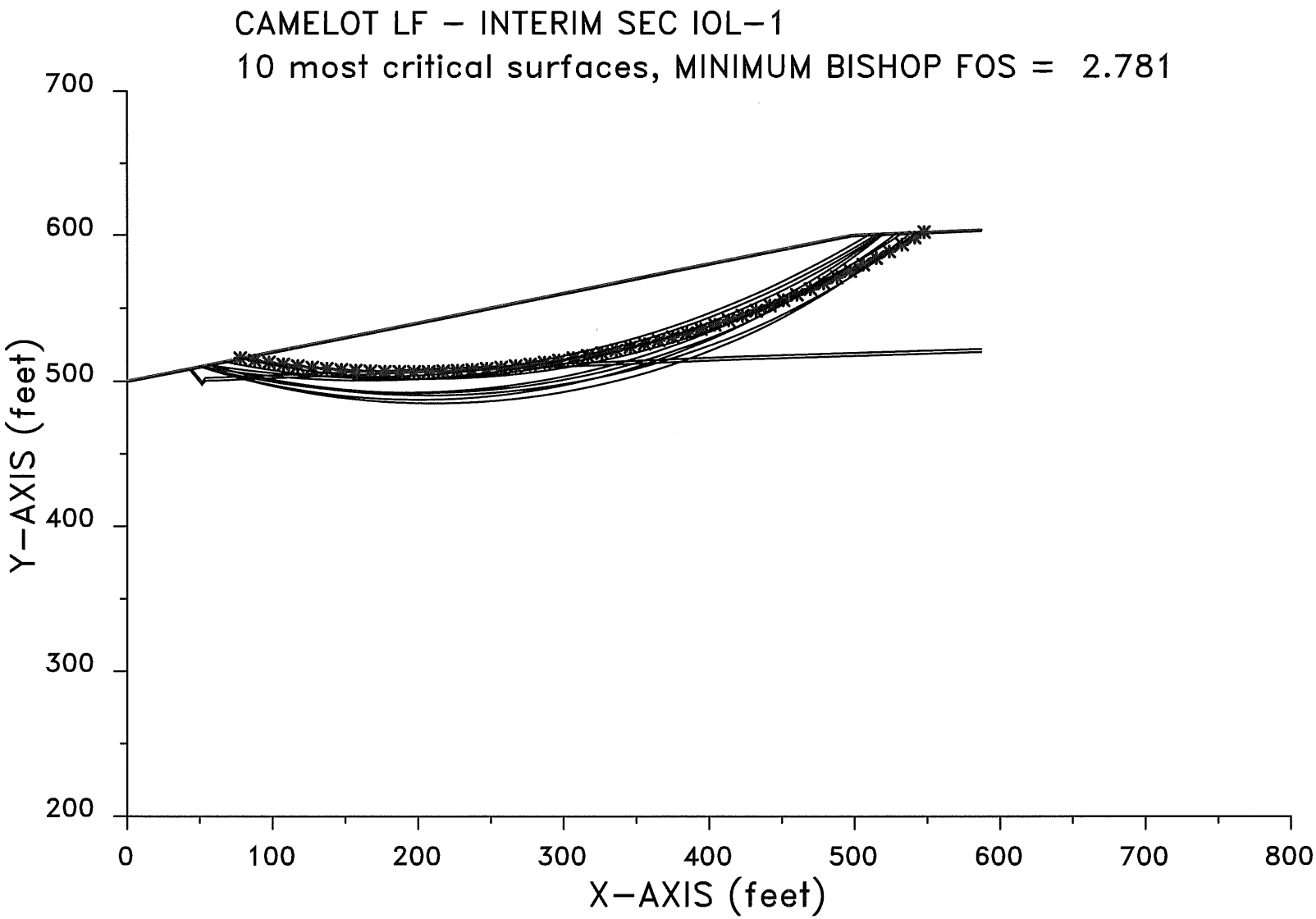

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*               using the               *
*            Method of Slices           *
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Problem Description : CAMELOT LF - INTERIM SEC IOL-1

SEGMENT BOUNDARY COORDINATES
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3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	500.4	45.7	509.5	3
2	45.7	509.5	498.2	600.0	3
3	498.2	600.0	587.1	603.6	3

25 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	499.4	43.2	508.0	1
2	43.2	508.0	44.6	508.3	2
3	44.6	508.3	45.7	508.5	1
4	45.7	508.5	498.2	599.0	1
5	498.2	599.0	587.1	602.6	1
6	44.6	508.3	51.6	499.6	2
7	51.6	499.6	53.8	502.4	2
8	53.8	502.4	67.7	502.9	2
9	67.7	502.9	169.0	507.0	2
10	169.0	507.0	196.8	508.1	2
11	196.8	508.1	294.0	512.0	2
12	294.0	512.0	325.1	513.2	2
13	325.1	513.2	419.0	517.0	2
14	419.0	517.0	585.7	522.0	2

15	585.7	522.0	587.1	522.0	2
16	43.2	508.0	51.6	497.6	1
17	51.6	497.6	53.8	500.4	1
18	53.8	500.4	67.7	500.9	1
19	67.7	500.9	169.0	505.0	1
20	169.0	505.0	196.8	506.1	1
21	196.8	506.1	294.0	510.0	1
22	294.0	510.0	325.1	511.2	1
23	325.1	511.2	419.0	515.0	1
24	419.0	515.0	585.7	520.0	1
25	585.7	520.0	587.1	520.0	1

ISOTROPIC Soil Parameters
---

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	65.0	65.0	288.0	23.00	.000	.0	0
2	115.0	120.0	100.0	16.00	.000	.0	0
3	115.0	120.0	100.0	16.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 50.0 ft
and x = 100.0 ft

Each surface terminates between x = 505.0 ft
and x = 555.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

10.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := -5.0 degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 50 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	77.78	515.92
2	87.66	514.37
3	97.56	512.96
4	107.48	511.69
5	117.41	510.57
6	127.36	509.58
7	137.33	508.73
8	147.30	508.02
9	157.29	507.46
10	167.28	507.03
11	177.27	506.75
12	187.27	506.60
13	197.27	506.60
14	207.27	506.74
15	217.27	507.02
16	227.26	507.44
17	237.24	508.00
18	247.22	508.70
19	257.18	509.54
20	267.14	510.52
21	277.07	511.64
22	286.99	512.91
23	296.89	514.31
24	306.77	515.85
25	316.63	517.53
26	326.47	519.35
27	336.27	521.30
28	346.05	523.40
29	355.80	525.63
30	365.51	528.00
31	375.19	530.51

32	384.84	533.15
33	394.44	535.93
34	404.01	538.84
35	413.54	541.89
36	423.02	545.07
37	432.45	548.39
38	441.84	551.83
39	451.17	555.41
40	460.46	559.12
41	469.69	562.96
42	478.87	566.94
43	487.99	571.03
44	497.05	575.26
45	506.06	579.62
46	515.00	584.10
47	523.87	588.71
48	532.68	593.44
49	541.42	598.29
50	547.90	602.01

**** Simplified BISHOP FOS = 2.781 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - INTERIM SEC IOL-1

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.781	192.50	1216.36	709.78	77.78	547.90	3.595E+08
2.	2.961	161.65	1175.90	672.85	55.56	510.39	3.318E+08
3.	2.966	190.06	1044.43	552.13	50.00	518.77	3.629E+08
4.	2.969	187.48	1101.65	600.24	66.67	518.33	3.278E+08
5.	2.970	200.49	1040.33	548.36	55.56	528.99	3.770E+08
6.	2.971	200.68	993.78	506.36	50.00	520.08	3.648E+08
7.	2.974	163.71	1170.30	669.67	50.00	515.82	3.606E+08
8.	2.974	205.94	1088.94	587.18	77.78	533.14	3.407E+08
9.	2.980	207.81	1051.20	560.80	55.56	543.23	4.158E+08
10.	2.981	210.64	1004.99	520.06	50.00	538.87	4.151E+08

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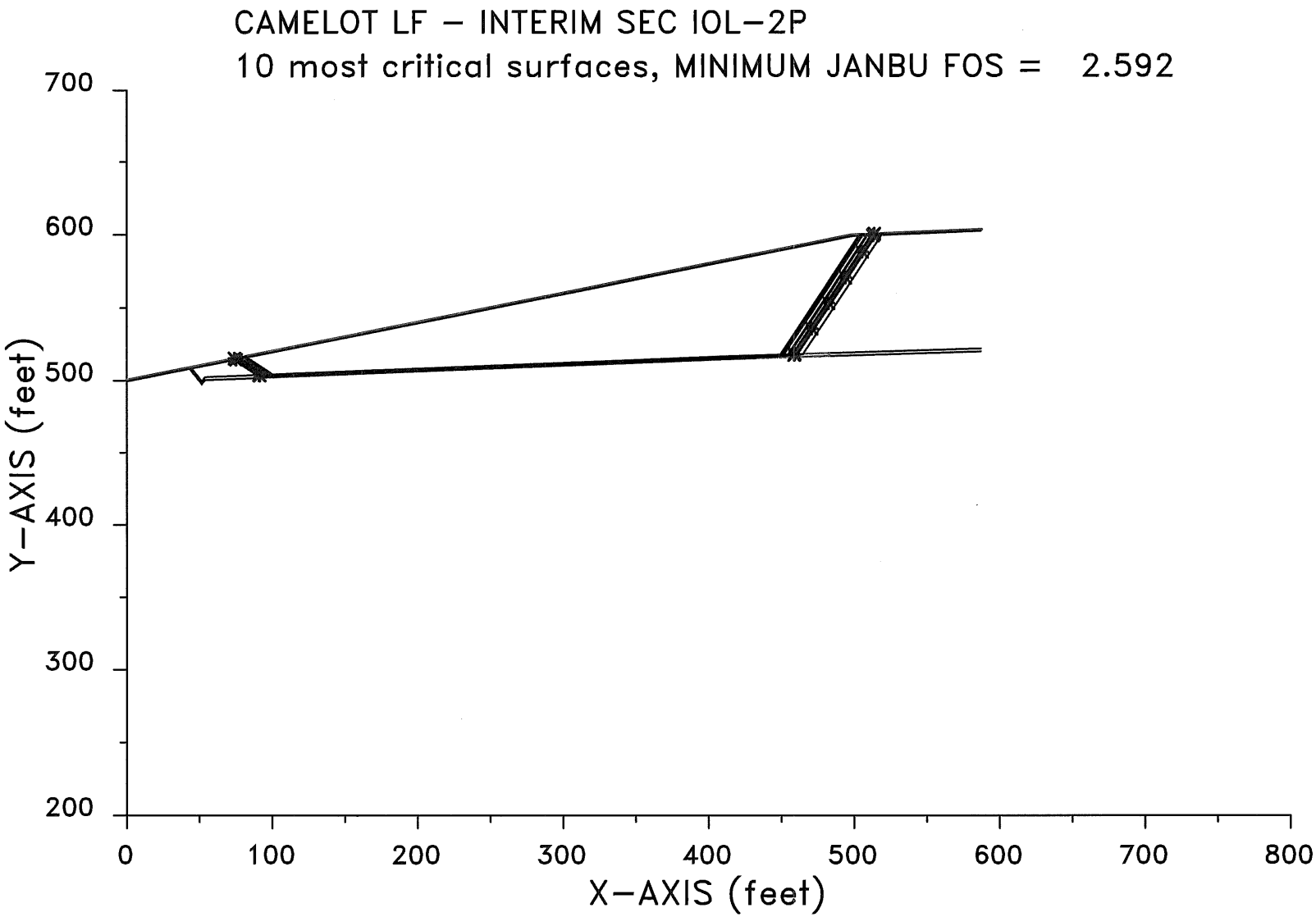

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Problem Description : CAMELOT LF - INTERIM SEC IOL-2P

SEGMENT BOUNDARY COORDINATES
---

3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	500.4	45.7	509.5	3
2	45.7	509.5	498.2	600.0	3
3	498.2	600.0	587.7	603.6	3

25 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	499.4	43.2	508.0	1
2	43.2	508.0	44.6	508.3	2
3	44.6	508.3	45.7	508.5	1
4	45.7	508.5	498.2	599.0	1
5	498.2	599.0	587.1	602.6	1
6	44.6	508.3	51.6	499.6	2
7	51.6	499.6	53.8	502.4	2
8	53.8	502.4	67.7	502.9	2
9	67.7	502.9	169.0	507.0	2
10	169.0	507.0	196.8	508.1	2
11	196.8	508.1	294.0	512.0	2
12	294.0	512.0	325.1	513.2	2
13	325.1	513.2	419.0	517.0	2
14	419.0	517.0	585.7	522.0	2

15	585.7	522.0	587.1	522.0	2
16	43.2	508.0	51.6	497.6	1
17	51.6	497.6	53.8	500.4	1
18	53.8	500.4	67.7	500.9	1
19	67.7	500.9	169.0	505.0	1
20	169.0	505.0	196.8	506.1	1
21	196.8	506.1	294.0	510.0	1
22	294.0	510.0	325.1	511.2	1
23	325.1	511.2	419.0	515.0	1
24	419.0	515.0	585.7	520.0	1
25	585.7	520.0	587.1	520.0	1

ISOTROPIC Soil Parameters
---

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	65.0	65.0	288.0	23.00	.000	.0	0
2	115.0	120.0	100.0	18.00	.000	.0	0
3	115.0	120.0	100.0	16.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

2 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 21.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	91.2	502.9	112.4	503.7	2.0
2	433.1	516.4	483.1	518.0	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	74.03	515.17
2	75.07	514.37
3	90.99	503.84
4	91.44	503.52
5	458.83	517.65
6	459.23	518.21
7	470.82	535.72
8	482.41	553.23
9	494.01	570.74
10	505.60	588.25
11	513.11	599.60
12	513.88	600.63

** Corrected JANBU FOS = 2.592 ** (Fo factor = 1.062)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	76.00	515.56
2	77.05	514.77
3	93.41	503.94
4	94.15	503.41
5	461.25	518.24
6	461.26	518.27
7	472.85	535.78
8	484.44	553.29
9	496.03	570.80
10	507.63	588.31
11	515.15	599.69
12	515.93	600.71

** Corrected JANBU FOS = 2.592 ** (Fo factor = 1.061)

Failure surface No. 3 specified by 12 coordinate points

Point	x-surf	y-surf

No.	(ft)	(ft)
1	72.68	514.90
2	73.73	514.11
3	89.34	503.78
4	91.65	502.09
5	450.55	517.38
6	450.97	517.96
7	462.56	535.47
8	474.15	552.98
9	485.74	570.49
10	497.33	588.01
11	504.78	599.27
12	505.56	600.30

** Corrected JANBU FOS = 2.593 ** (Fo factor = 1.062)

Failure surface No. 4 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	81.71	516.70
2	82.76	515.91
3	82.90	515.81
4	100.42	504.22
5	100.57	504.11
6	455.20	517.88
7	455.35	518.09
8	466.94	535.60
9	478.53	553.11
10	490.12	570.62
11	501.71	588.14
12	509.19	599.45
13	509.97	600.47

** Corrected JANBU FOS = 2.597 ** (Fo factor = 1.063)

Failure surface No. 5 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	74.69	515.30
2	75.74	514.51
3	91.80	503.88
4	93.16	502.89
5	464.74	518.11
6	464.93	518.38
7	476.52	535.89
8	488.11	553.40
9	499.70	570.91
10	511.29	588.42
11	518.85	599.84
12	519.62	600.86

** Corrected JANBU FOS = 2.597 ** (Fo factor = 1.061)

Failure surface No. 6 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	81.69	516.70
2	82.74	515.91
3	82.88	515.81
4	100.39	504.22
5	101.18	503.65
6	449.31	517.81
7	449.38	517.91
8	460.97	535.42
9	472.56	552.93
10	484.15	570.45
11	495.74	587.96
12	503.18	599.20
13	503.96	600.23

** Corrected JANBU FOS = 2.599 ** (Fo factor = 1.063)

Failure surface No. 7 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	79.92	516.34
2	80.97	515.55
3	98.22	504.14
4	98.80	503.72
5	457.20	517.65
6	457.57	518.16
7	469.16	535.67
8	480.75	553.18
9	492.34	570.69
10	503.93	588.20
11	511.43	599.54
12	512.21	600.56

** Corrected JANBU FOS = 2.599 ** (Fo factor = 1.062)

Failure surface No. 8 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	79.72	516.30
2	80.76	515.51
3	97.97	504.13
4	99.99	502.65
5	451.60	517.58

6	451.90	517.99
7	463.49	535.50
8	475.08	553.01
9	486.67	570.52
10	498.26	588.03
11	505.72	599.30
12	506.50	600.33

** Corrected JANBU FOS = 2.600 ** (Fo factor = 1.063)

Failure surface No. 9 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	77.51	515.86
2	78.55	515.07
3	95.26	504.02
4	95.38	503.92
5	448.60	517.02
6	449.24	517.91
7	460.83	535.42
8	472.42	552.93
9	484.01	570.44
10	495.60	587.95
11	503.04	599.20
12	503.82	600.23

** Corrected JANBU FOS = 2.600 ** (Fo factor = 1.063)

Failure surface No.10 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	75.86	515.53
2	76.91	514.74
3	93.24	503.93
4	95.06	502.61
5	453.85	517.02
6	454.61	518.07
7	466.20	535.58
8	477.79	553.09
9	489.38	570.60
10	500.97	588.11
11	508.45	599.42
12	509.23	600.44

** Corrected JANBU FOS = 2.600 ** (Fo factor = 1.062)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - INTERIM SEC IOL-2P

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.592	1.062	74.03	513.88	5.110E+05
2.	2.592	1.061	76.00	515.93	5.121E+05
3.	2.593	1.062	72.68	505.56	5.046E+05
4.	2.597	1.063	81.71	509.97	4.965E+05
5.	2.597	1.061	74.69	519.62	5.250E+05
6.	2.599	1.063	81.69	503.96	4.868E+05
7.	2.599	1.062	79.92	512.21	5.059E+05
8.	2.600	1.063	79.72	506.50	5.012E+05
9.	2.600	1.063	77.51	503.82	4.901E+05
10.	2.600	1.062	75.86	509.23	5.117E+05

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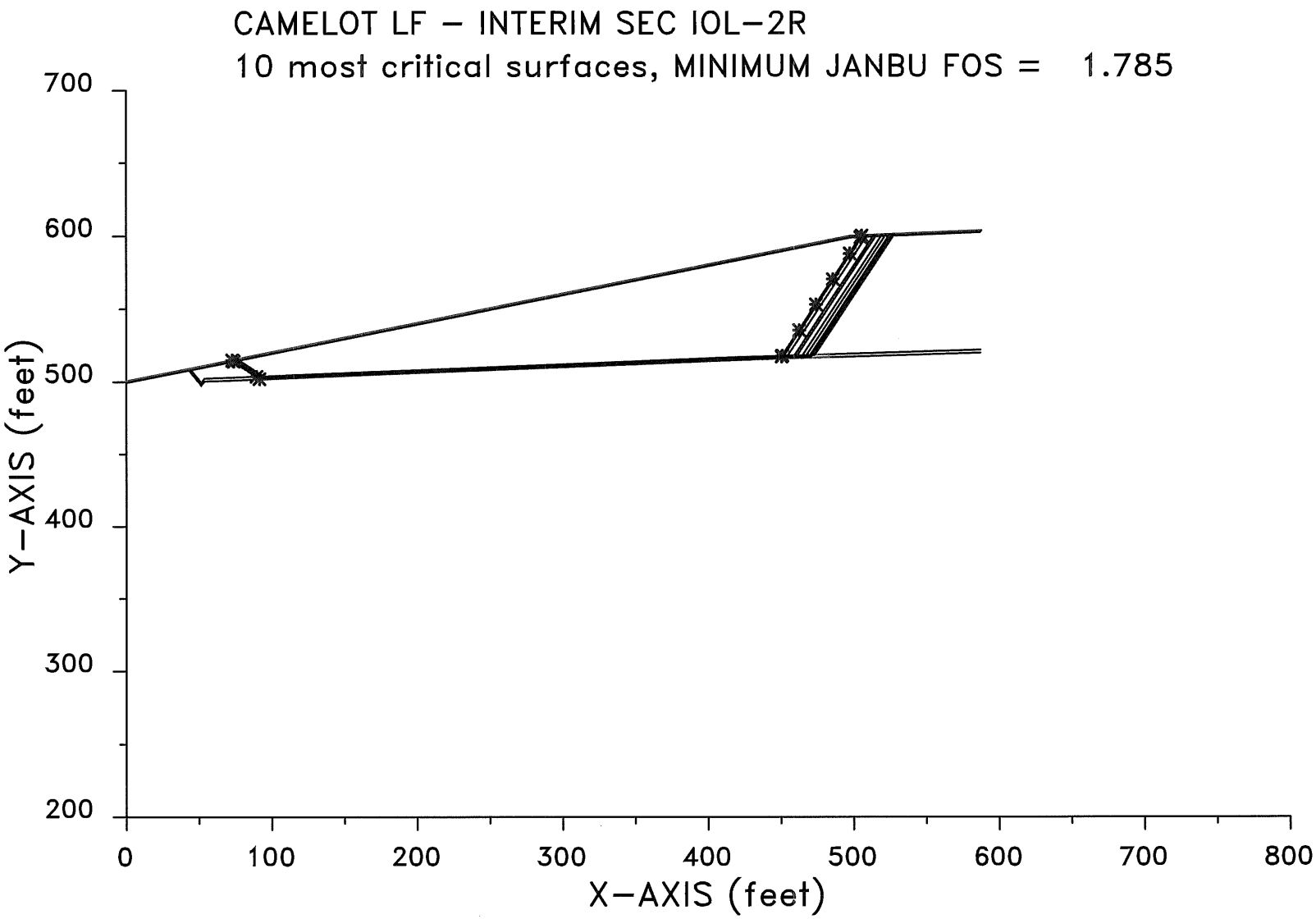

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Problem Description : CAMELOT LF - INTERIM SEC IOL-2R

SEGMENT BOUNDARY COORDINATES
---

3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	500.4	45.7	509.5	3
2	45.7	509.5	498.2	600.0	3
3	498.2	600.0	587.7	603.6	3

25 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	499.4	43.2	508.0	1
2	43.2	508.0	44.6	508.3	2
3	44.6	508.3	45.7	508.5	1
4	45.7	508.5	498.2	599.0	1
5	498.2	599.0	587.1	602.6	1
6	44.6	508.3	51.6	499.6	2
7	51.6	499.6	53.8	502.4	2
8	53.8	502.4	67.7	502.9	2
9	67.7	502.9	169.0	507.0	2
10	169.0	507.0	196.8	508.1	2
11	196.8	508.1	294.0	512.0	2
12	294.0	512.0	325.1	513.2	2
13	325.1	513.2	419.0	517.0	2
14	419.0	517.0	585.7	522.0	2

15	585.7	522.0	587.1	522.0	2
16	43.2	508.0	51.6	497.6	1
17	51.6	497.6	53.8	500.4	1
18	53.8	500.4	67.7	500.9	1
19	67.7	500.9	169.0	505.0	1
20	169.0	505.0	196.8	506.1	1
21	196.8	506.1	294.0	510.0	1
22	294.0	510.0	325.1	511.2	1
23	325.1	511.2	419.0	515.0	1
24	419.0	515.0	585.7	520.0	1
25	585.7	520.0	587.1	520.0	1

ISOTROPIC Soil Parameters
---

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	65.0	65.0	288.0	23.00	.000	.0	0
2	115.0	120.0	80.0	10.00	.000	.0	0
3	115.0	120.0	100.0	16.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

2 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 21.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	91.2	502.9	112.4	503.7	2.0
2	433.1	516.4	483.1	518.0	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	72.92	514.94
2	73.97	514.15
3	89.63	503.79
4	91.65	502.09
5	450.55	517.38
6	451.03	517.96
7	462.63	535.47
8	474.22	552.98
9	485.81	570.50
10	497.40	588.01
11	504.85	599.27
12	505.63	600.30

** Corrected JANBU FOS = 1.785 ** (Fo factor = 1.062)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	74.08	515.18
2	75.13	514.39
3	91.05	503.85
4	92.95	502.25
5	469.72	518.08
6	470.10	518.53
7	481.69	536.04
8	493.28	553.56
9	504.87	571.07
10	516.46	588.58
11	524.05	600.05
12	524.82	601.07

** Corrected JANBU FOS = 1.787 ** (Fo factor = 1.061)

Failure surface No. 3 specified by 12 coordinate points

Point	x-surf	y-surf

No.	(ft)	(ft)
1	74.83	515.33
2	75.88	514.54
3	91.98	503.88
4	93.16	502.89
5	464.74	518.11
6	464.96	518.38
7	476.55	535.89
8	488.14	553.40
9	499.73	570.91
10	511.32	588.42
11	518.88	599.84
12	519.65	600.86

** Corrected JANBU FOS = 1.787 ** (Fo factor = 1.061)

Failure surface No. 4 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	73.11	514.98
2	74.16	514.19
3	89.87	503.80
4	91.28	502.62
5	450.58	516.40
6	451.92	517.99
7	463.51	535.50
8	475.10	553.01
9	486.69	570.52
10	498.28	588.03
11	505.74	599.31
12	506.52	600.33

** Corrected JANBU FOS = 1.787 ** (Fo factor = 1.063)

Failure surface No. 5 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	74.07	515.17
2	75.12	514.38
3	91.04	503.84
4	91.44	503.52
5	458.83	517.65
6	459.30	518.21
7	470.89	535.72
8	482.48	553.23
9	494.07	570.74
10	505.66	588.26
11	513.17	599.61
12	513.95	600.63

** Corrected JANBU FOS = 1.787 ** (Fo factor = 1.062)

Failure surface No. 6 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	76.76	515.71
2	77.81	514.92
3	94.34	503.98
4	96.31	502.32
5	467.37	518.21
6	467.58	518.46
7	479.17	535.97
8	490.76	553.48
9	502.35	570.99
10	513.95	588.50
11	521.52	599.94
12	522.29	600.97

** Corrected JANBU FOS = 1.789 ** (Fo factor = 1.061)

Failure surface No. 7 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	76.05	515.57
2	77.10	514.78
3	93.47	503.94
4	95.06	502.61
5	453.85	517.02
6	454.73	518.07
7	466.32	535.58
8	477.91	553.09
9	489.50	570.61
10	501.09	588.12
11	508.57	599.42
12	509.35	600.45

** Corrected JANBU FOS = 1.789 ** (Fo factor = 1.062)

Failure surface No. 8 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	73.37	515.03
2	74.42	514.24
3	90.18	503.81
4	91.50	502.70
5	470.56	517.23
6	471.70	518.58
7	483.29	536.09

8	494.88	553.60
9	506.47	571.12
10	518.06	588.63
11	525.66	600.11
12	526.43	601.14

** Corrected JANBU FOS = 1.790 ** (Fo factor = 1.061)

Failure surface No. 9 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	76.08	515.58
2	77.13	514.79
3	93.51	503.94
4	94.15	503.41
5	461.25	518.24
6	461.27	518.27
7	472.86	535.78
8	484.45	553.29
9	496.04	570.80
10	507.63	588.31
11	515.16	599.69
12	515.93	600.71

** Corrected JANBU FOS = 1.790 ** (Fo factor = 1.061)

Failure surface No.10 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	75.49	515.46
2	76.54	514.67
3	92.79	503.92
4	94.28	502.66
5	473.23	518.34
6	473.48	518.63
7	485.07	536.15
8	496.66	553.66
9	508.25	571.17
10	519.84	588.68
11	527.46	600.18
12	528.23	601.21

** Corrected JANBU FOS = 1.793 ** (Fo factor = 1.061)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - INTERIM SEC IOL-2R

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.785	1.062	72.92	505.63	3.276E+05
2.	1.787	1.061	74.08	524.82	3.502E+05
3.	1.787	1.061	74.83	519.65	3.407E+05
4.	1.787	1.063	73.11	506.52	3.306E+05
5.	1.787	1.062	74.07	513.95	3.324E+05
6.	1.789	1.061	76.76	522.29	3.463E+05
7.	1.789	1.062	76.05	509.35	3.324E+05
8.	1.790	1.061	73.37	526.43	3.539E+05
9.	1.790	1.061	76.08	515.93	3.334E+05
10.	1.793	1.061	75.49	528.23	3.521E+05

* * * END OF FILE * * *

APPENDIX IIIJ-A-3

SLOPE STABILITY ANALYSIS FOR FINAL CONFIGURATION

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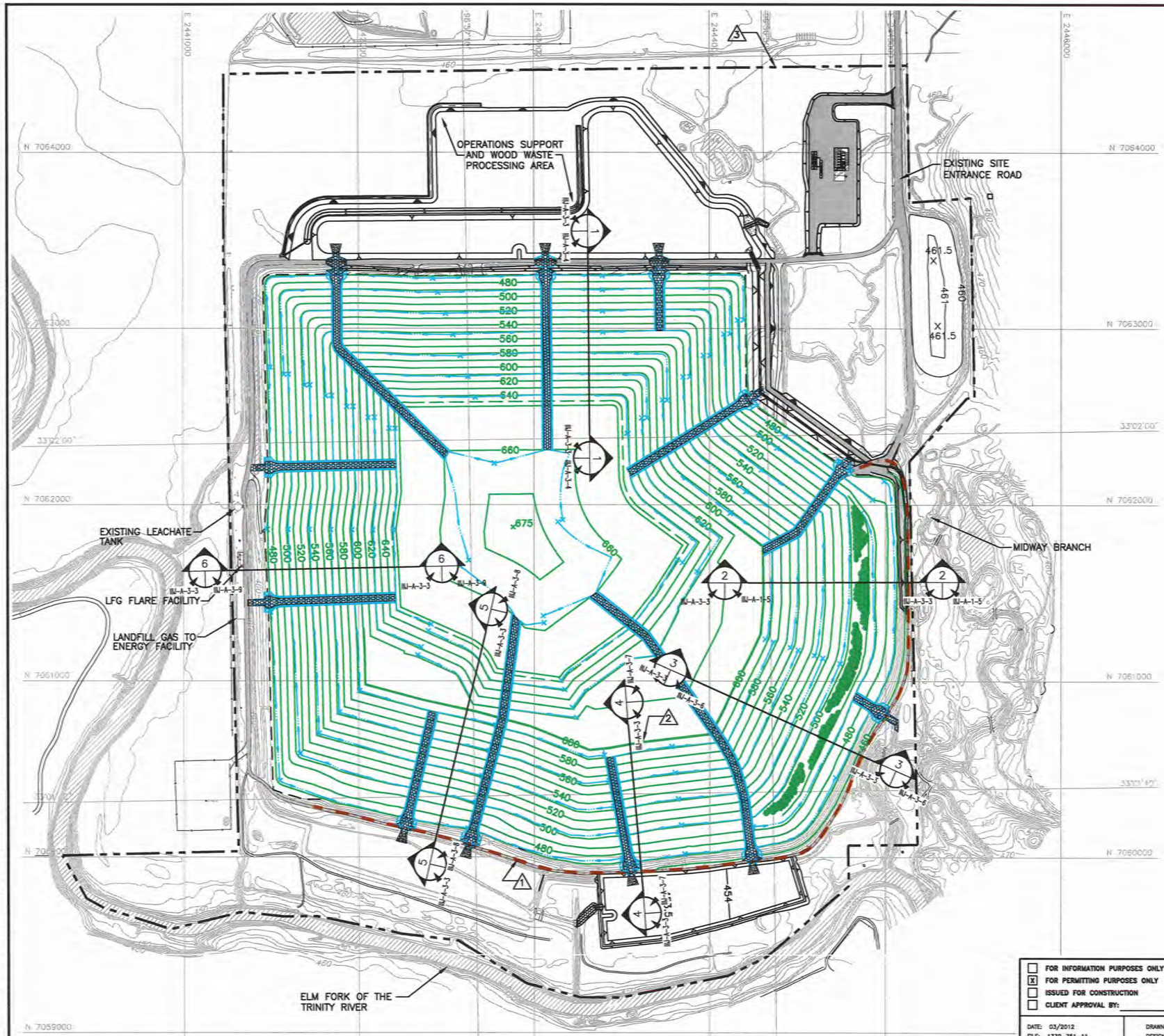
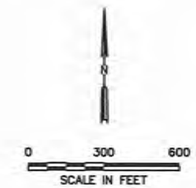
Includes pages IIIJ-A-3-1 through IIIJ-A-3-~~339~~371





LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 600 — PROPOSED FINAL COVER CONTOUR
- 2 — 600 — REGRADED BUFFER ZONE AREA
- PROPOSED LETDOWN STRUCTURE
- DRAINAGE SWALE
- CONSTRUCTED FINAL COVER
- LANDSCAPE BENCH
- 1 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. FINAL COVER SECTION LOCATIONS 2, 3, 4, AND 5 ARE OVERLINER SECTION LOCATIONS 1, 2, 3, AND 4 RESPECTIVELY.

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. REVISED FINAL COVER CONTOURS.
3. UPDATED PERMIT BOUNDARY INFORMATION.

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CAD: IIIJ-A-3-3-SECTION LOCS.DWG

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REVIEWED BY: JPY

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REVISIONS

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DENTON COUNTY, TEXAS

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SHEET IIIJ-A-3-3

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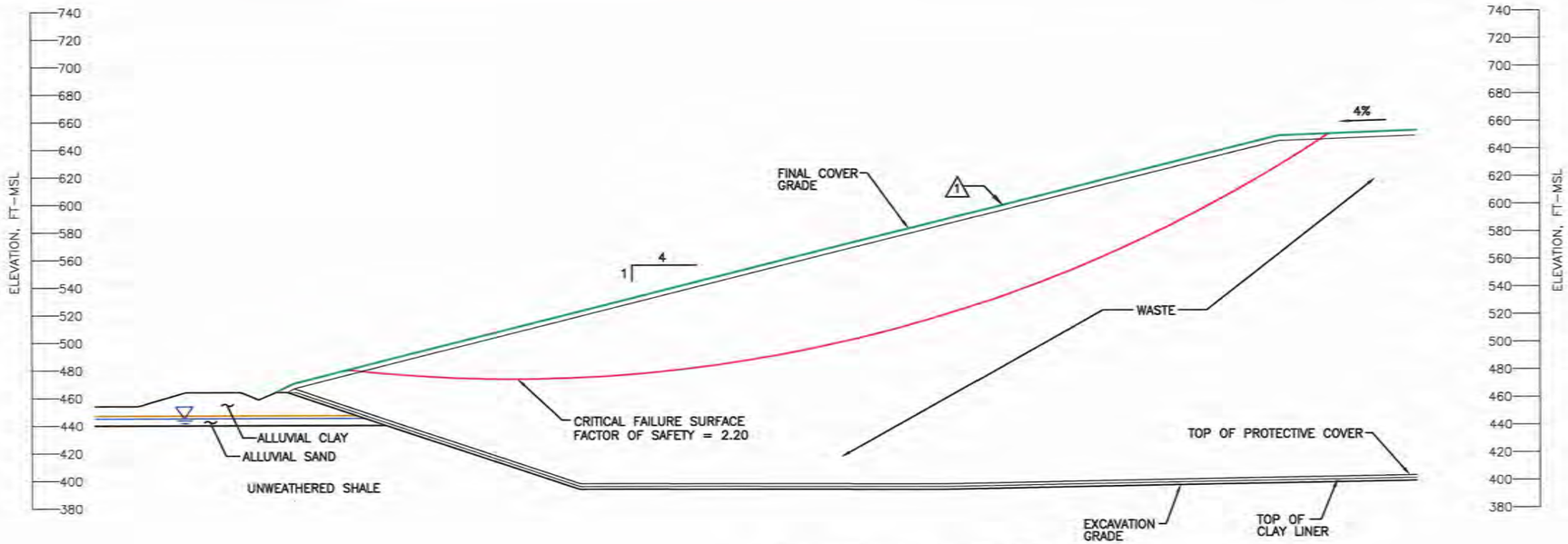

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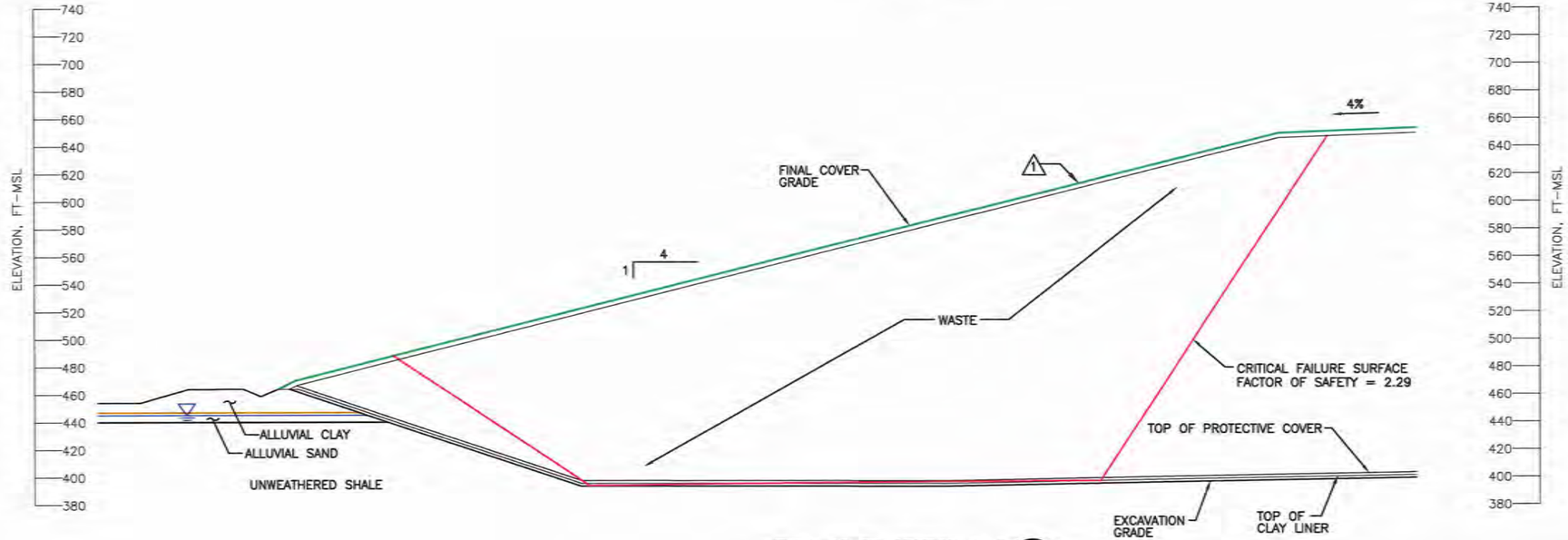
SCALE IN FEET



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SCALE IN FEET

1 INDICATES REVISION (SEE LIST OF REVISIONS)

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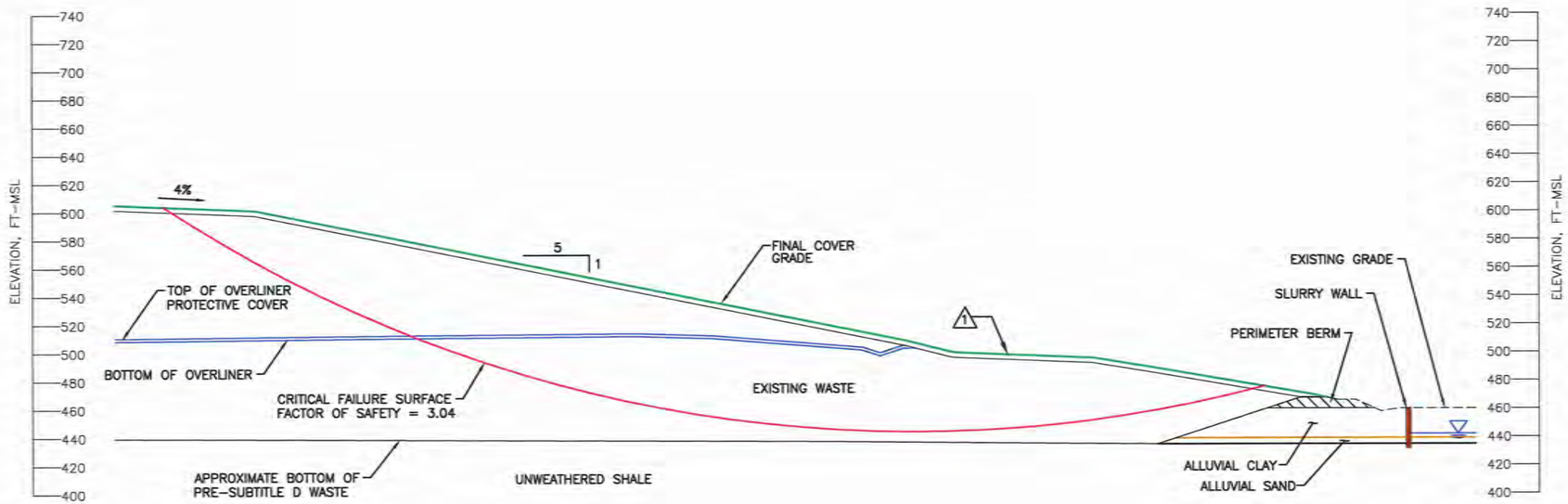

FINAL COVER SECTION 2-3 (2 / IIIJ-A-3-3 / IIIJ-A-3-5)

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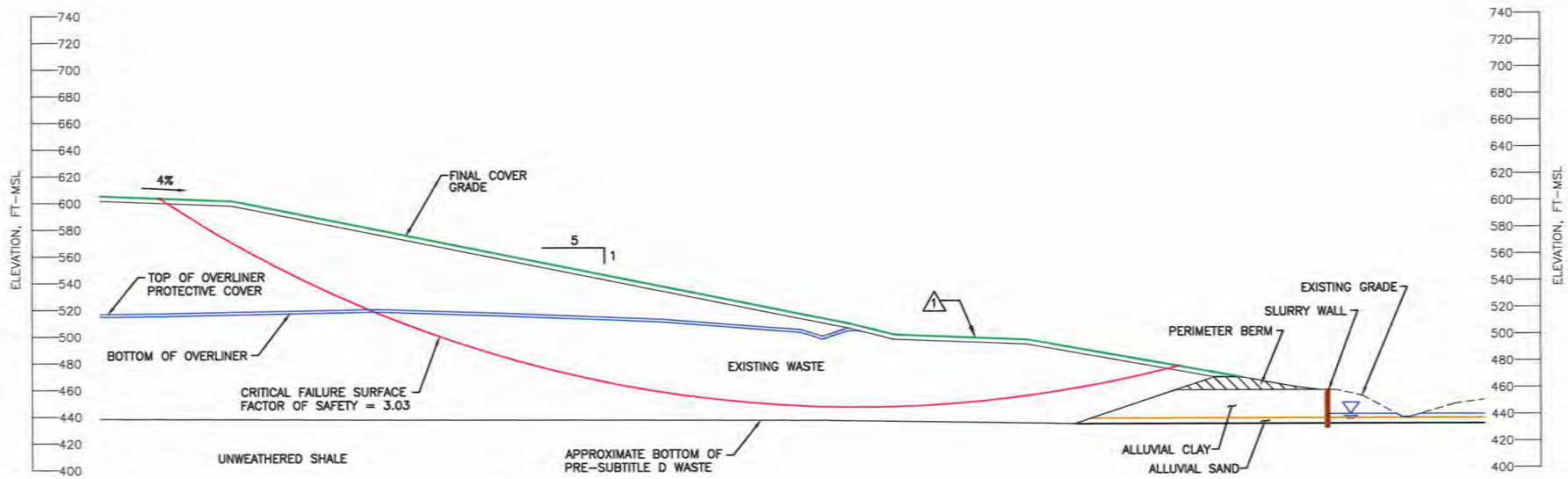

FINAL COVER SECTION 3-3 (3 / III-A-3-3 / III-A-3-6)

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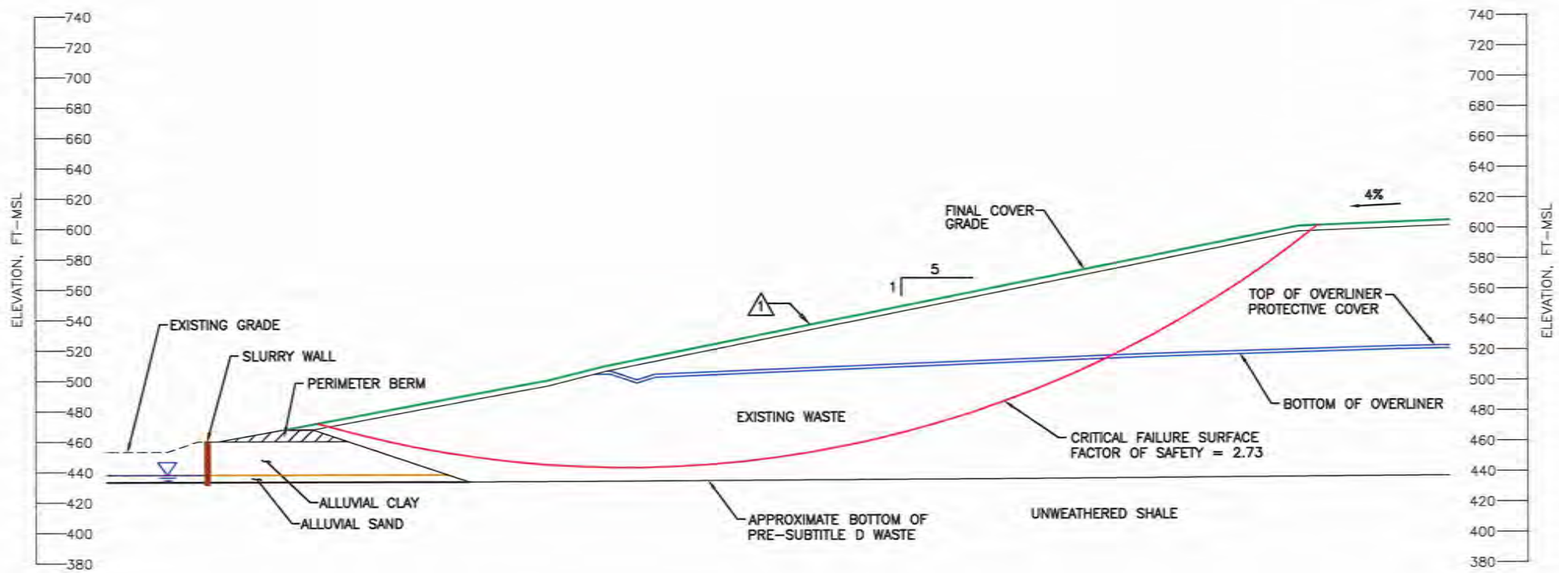

FINAL COVER SECTION 4-3 (4 / IIIJ-A-3-3 / IIIJ-A-3-7)

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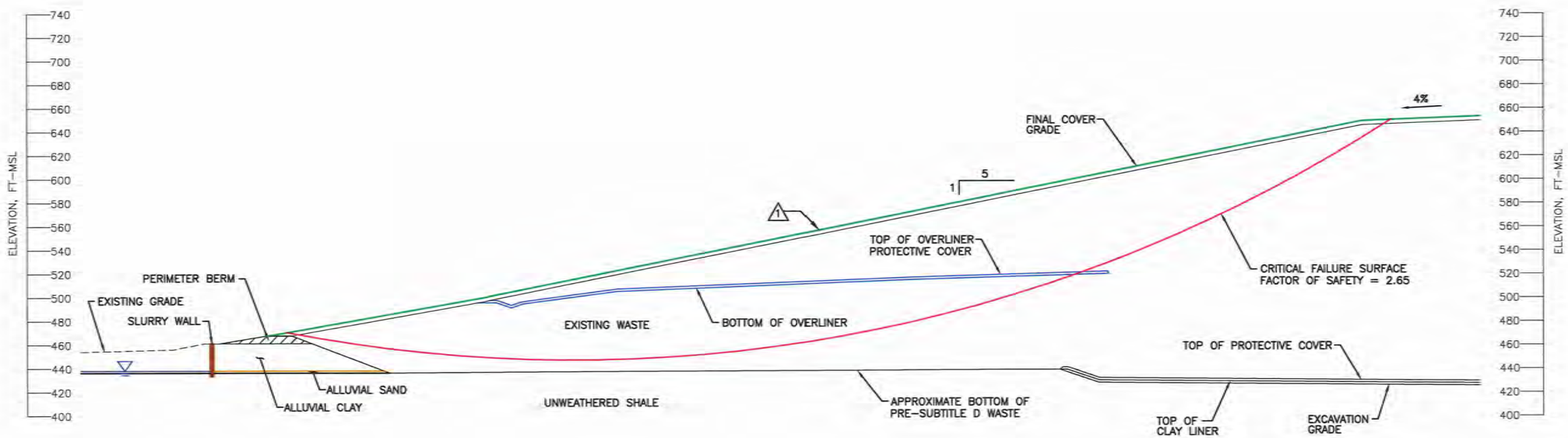

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FINAL COVER SECTION 5-3 (5 / IIIJ-A-3-3 / IIIJ-A-3-8)

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DATE: 03/2012 FILE: 1339-351-11 CAD: IIIJ-A-3-8-SECTIONS.DWG DRAWN BY: VRS DESIGN BY: JLG REVIEWED BY: JPY	REVISIONS NO. / DATE / DESCRIPTION 10 / 08/2016 / SEE LIST OF REVISIONS	Weaver Boos Consultants TBPE REGISTRATION NO. F-3727
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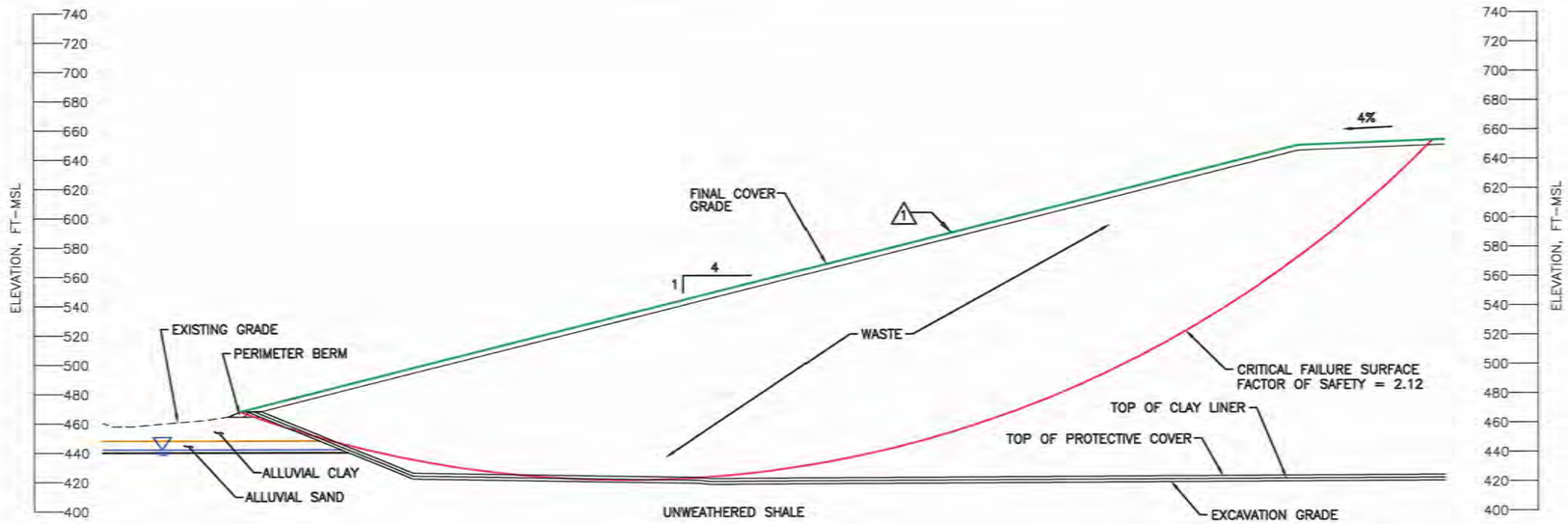
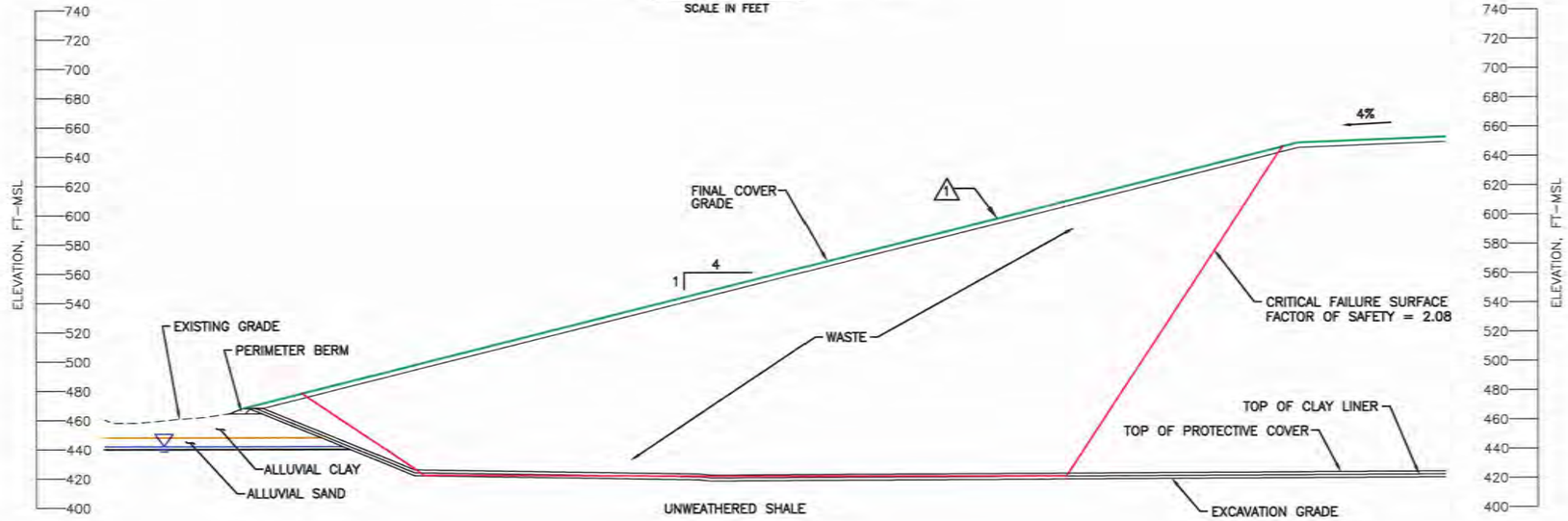


FINAL COVER SECTION 6-3 (6 / IIIJ-A-3-3 / IIIJ-A-3-9)

0 50 100
SCALE IN FEET



FINAL COVER SECTION 6-4 (6 / IIIJ-A-3-3 / IIIJ-A-3-9)

0 50 100
SCALE IN FEET

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MAJOR PERMIT AMENDMENT
SLOPE STABILITY
FINAL COVER SECTIONS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

FORT WORTH, TX
(817) 735-9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

SHEET IIIJ-A-3-9

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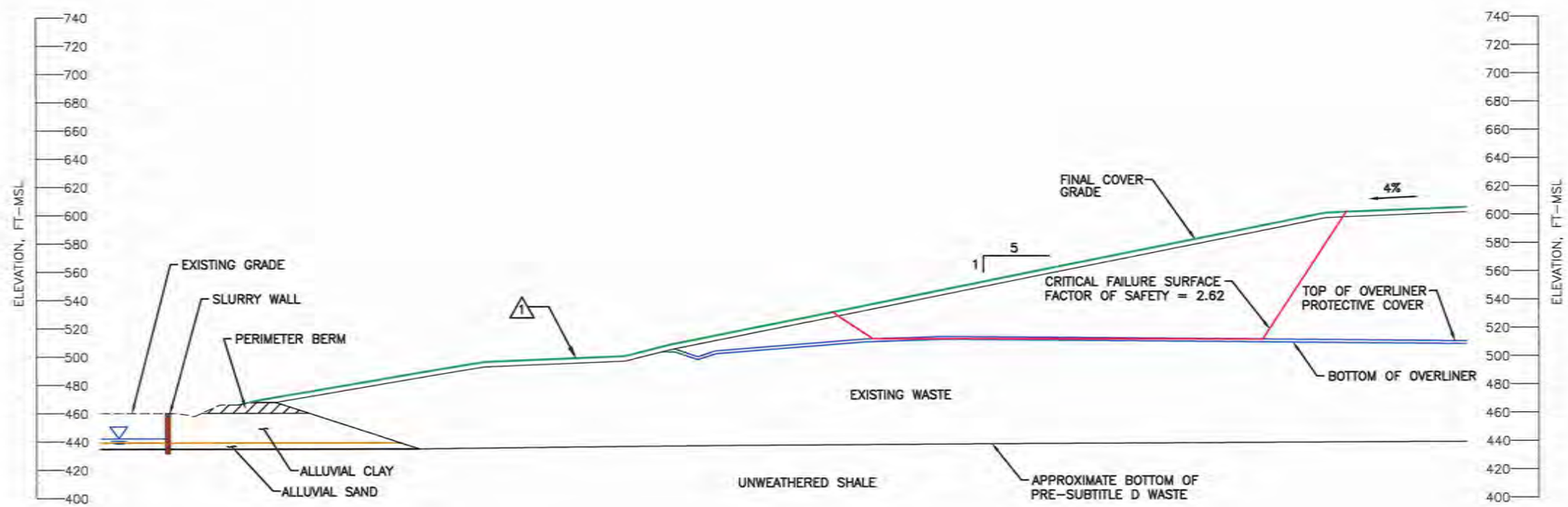

OVERLINER SECTION 1-1 (1: IIIJ-A-3-3, IIIJ-A-3-10)

0 50 100
SCALE IN FEET

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.

NOTE:

1. FINAL COVER SECTION LOCATIONS 2, 3, 4, AND 5 SHOWN ON SHEET IIIJ-A-3-3 ARE OVERLINER SECTION LOCATIONS 1, 2, 3, AND 4 RESPECTIVELY.

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DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-A-3-10-SECTIONS.DWG

DRAWN BY: VRS
DESIGN BY: JLG
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SLOPE STABILITY
OVERLINER SECTION
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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SHEET IIIJ-A-3-10

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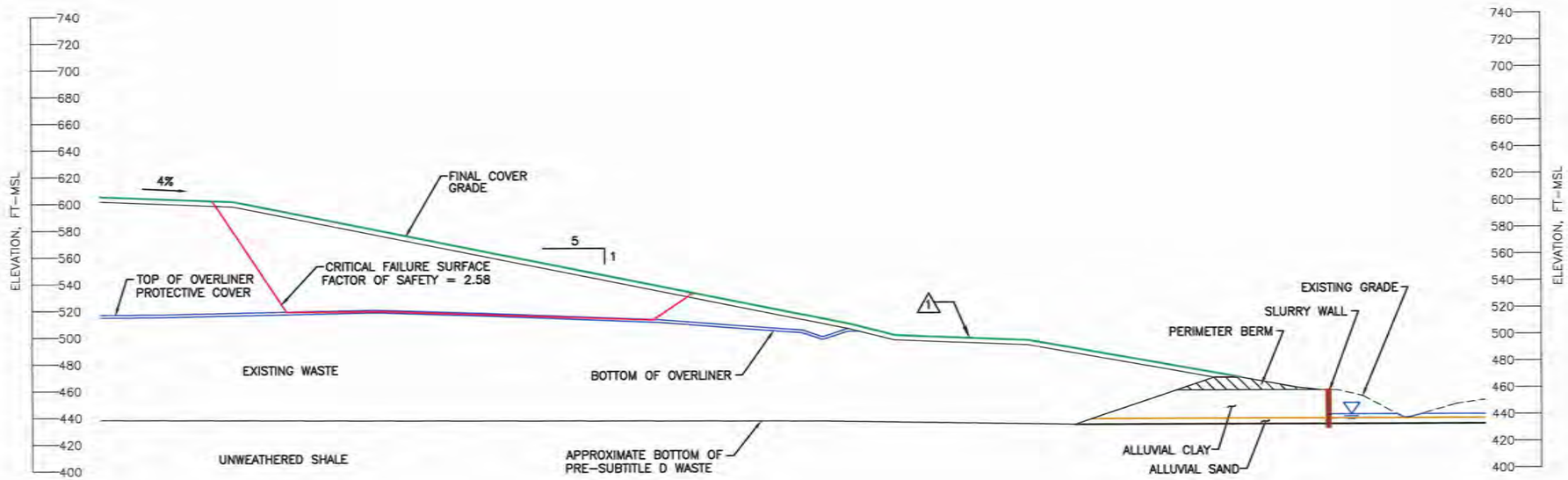

OVERLINER SECTION 2-1 (2 — IIIJ-A-3-3 / IIIJ-A-3-11)

0 50 100
SCALE IN FEET

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.

NOTE:

1. FINAL COVER SECTION LOCATIONS 2, 3, 4, AND 5 SHOWN ON SHEET IIIJ-A-3-3 ARE OVERLINER SECTION LOCATIONS 1, 2, 3, AND 4 RESPECTIVELY.

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REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SLOPE STABILITY
OVERLINER SECTION
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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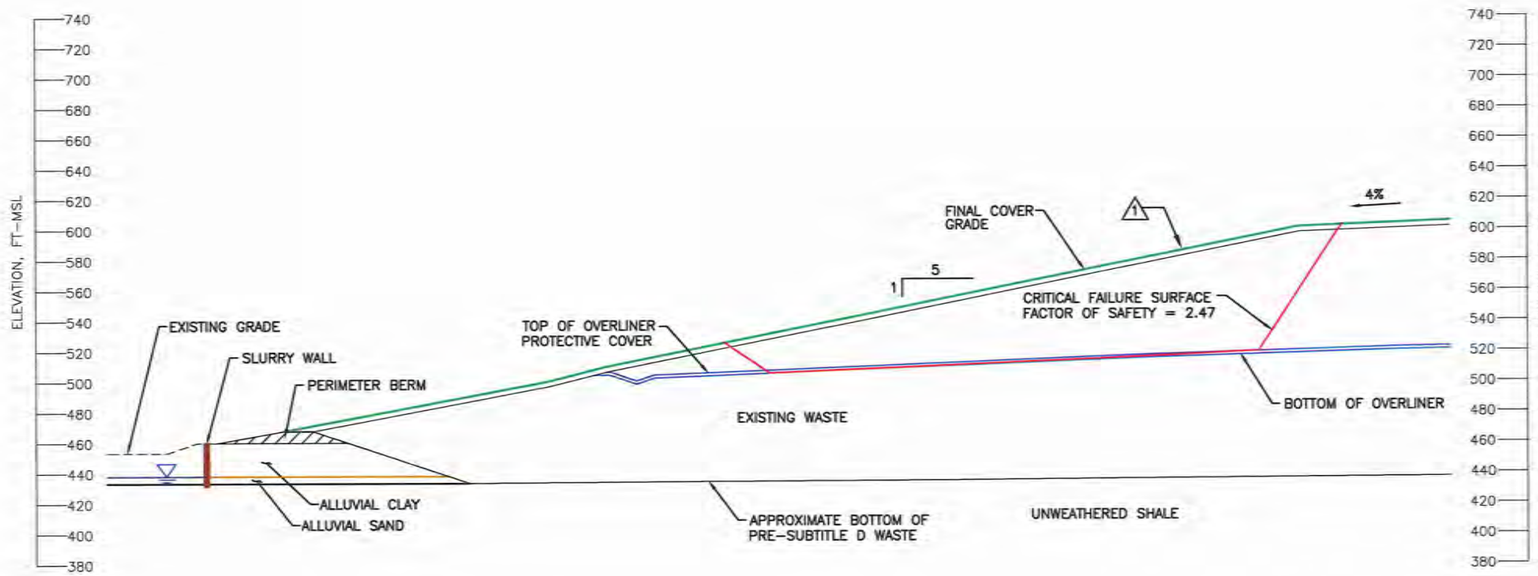

OVERLINER SECTION 3-1 (3) IIIJ-A-3-3 IIIJ-A-3-12

0 50 100
SCALE IN FEET

△1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.

NOTE:

1. FINAL COVER SECTION LOCATIONS 2, 3, 4, AND 5 SHOWN ON SHEET IIIJ-A-3-3 ARE OVERLINER SECTION LOCATIONS 1, 2, 3, AND 4 RESPECTIVELY.

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SLOPE STABILITY
OVERLINER SECTION
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
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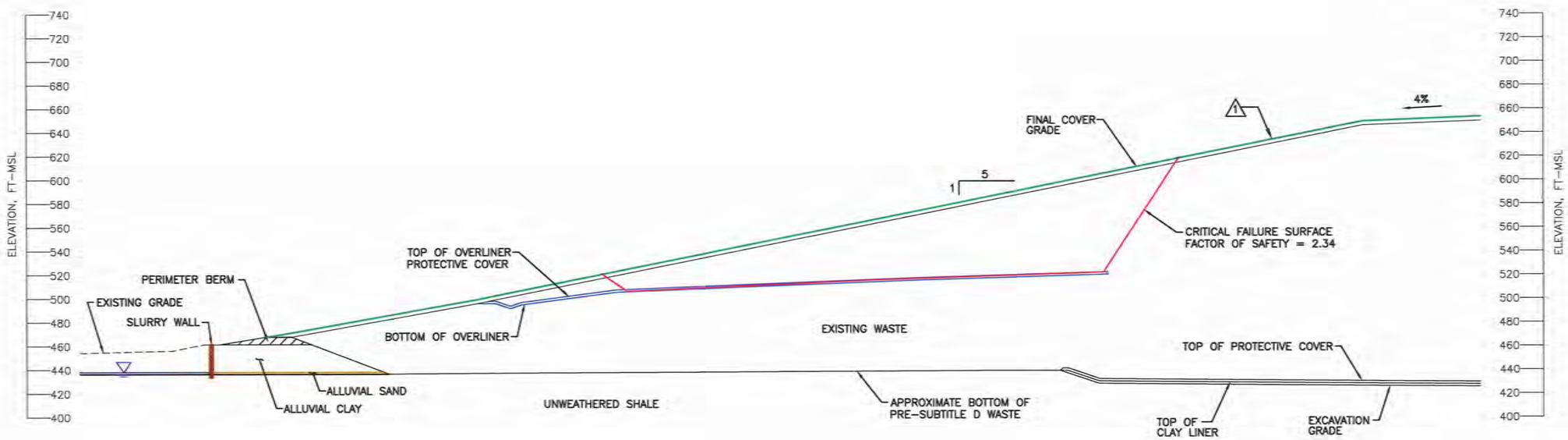

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED FINAL COVER CONTOURS.

OVERLINER SECTION 4–1 (4 / IIIJ-A-3-3 / IIIJ-A-3-13)

0 50 100
SCALE IN FEET

NOTE:

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REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
SLOPE STABILITY
OVERLINER SECTION
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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SHEET IIIJ-A-3-13

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Factor of Safety Summary for Long-Term Slope Stability

Description		Minimum Factor of Safety Generated		Recommended Minimum Factor of Safety		Acceptable Factor of Safety	
Slope Designation	Method of Analysis	Total Stress	Effective Stress	Total Stress	Effective Stress	Total Stress	Effective Stress
Final Cover 1-1 (Massive)	Bishop-Circular	~~2.14~~ **2.21**	~~2.17~~ **2.27**	1.3	1.5	YES	YES
Final Cover 1-2 (Perimeter)	Bishop-Circular	~~4.26~~ **4.46**	~~5.16~~ **5.44**	1.3	1.5	YES	YES
Final Cover 1-3 (Side Slope)	Bishop-Circular	~~2.13~~ **2.20**	~~2.13~~ **2.20**	1.3	1.5	YES	YES
Final Cover 2-1 (Massive)	Bishop-Circular	~~2.27~~ **3.12**	~~2.28~~ **3.14**	1.3	1.5	YES	YES
Final Cover 2-2 (Perimeter)	Bishop-Circular	~~6.49~~ **6.48**	~~6.86~~ **6.85**	1.3	1.5	YES	YES
Final Cover 2-3 (Side Slope)	Bishop-Circular	~~2.25~~ **3.04**	~~2.26~~ **3.04**	1.3	1.5	YES	YES
Final Cover 3-1 (Massive)	Bishop-Circular	~~2.31~~ **3.14**	~~2.32~~ **3.16**	1.3	1.5	YES	YES
Final Cover 3-2 (Perimeter)	Bishop-Circular	~~2.83~~ **2.92**	~~3.32~~ **3.41**	1.3	1.5	YES	YES
Final Cover 3-3 (Side Slope)	Bishop-Circular	~~2.26~~ **3.03**	~~2.26~~ **3.03**	1.3	1.5	YES	YES
Final Cover 4-1 (Massive)	Bishop-Circular	~~2.19~~ **2.81**	~~2.20~~ **2.88**	1.3	1.5	YES	YES
Final Cover 4-2 (Perimeter)	Bishop-Circular	~~4.74~~ **4.95**	~~5.48~~ **5.77**	1.3	1.5	YES	YES
Final Cover 4-3 (Side Slope)	Bishop-Circular	~~2.13~~ **2.73**	~~2.13~~ **2.73**	1.3	1.5	YES	YES
Final Cover 5-1 (Massive)	Bishop-Circular	~~2.23~~ **2.75**	~~2.25~~ **2.77**	1.3	1.5	YES	YES
Final Cover 5-2 (Perimeter)	Bishop-Circular	~~7.29~~ **7.28**	~~8.31~~ **8.30**	1.3	1.5	YES	YES
Final Cover 5-3 (Side Slope)	Bishop-Circular	~~2.14~~ **2.65**	~~2.14~~ **2.65**	1.3	1.5	YES	YES
Final Cover 6-1 (Massive)	Bishop-Circular	~~2.11~~ **2.07**	~~2.11~~ **2.08**	1.3	1.5	YES	YES
Final Cover 6-2 (Perimeter)	Bishop-Circular	~~5.20~~ **5.19**	6.17	1.3	1.5	YES	YES
Final Cover 6-3 (Side Slope)	Bishop-Circular	~~2.01~~ **2.12**	~~2.01~~ **2.12**	1.3	1.5	YES	YES

Description		Minimum Factor of Safety Generated		Recommended Minimum Factor of Safety		Acceptable Factor of Safety	
Slope Designation	Method of Analysis	Peak	Residual	Peak	Residual	Peak	Residual
Final Cover 1-4	Rankine-Block	~~2.06~~ **2.29**	~~1.86~~ **2.26**	1.5	1.0	YES	YES
Final Cover 6-4	Rankine-Block	~~1.93~~ **2.08**	~~1.78~~ **1.99**	1.5	1.0	YES	YES
Overliner 1-1	Rankine-Block	~~2.17~~ **2.62**	~~1.55~~ **2.04**	1.5	1.0	YES	YES
Overliner 2-1	Rankine-Block	~~2.13~~ **2.58**	~~1.51~~ **2.00**	1.5	1.0	YES	YES
Overliner 3-1	Rankine-Block	~~2.05~~ **2.47**	~~1.42~~ **1.86**	1.5	1.0	YES	YES
Overliner 4-1	Rankine-Block	~~2.08~~ **2.34**	~~1.45~~ **1.74**	1.5	1.0	YES	YES

Minimum Required Interface Strength Parameters

Landfill Component	Interface	Peak		Residual	
		Adhesion (psf)	Friction Angle (deg)	Adhesion (psf)	Friction Angle (deg)
Liner/FC/Overliner Systems	Protective Cover/Geocomposite	100	18	80	14
Liner/FC Systems	Geocomposite-Geonet/Smooth Geomembrane	100	13	80	8
Overliner System	Geocomposite-Geonet/Textured Geomembrane	100	21	80	10
Liner/FC Systems	Geocomposite/Textured Geomembrane	100	21	80	10
Liner/FC Systems	Smooth Geomembrane/Clay Liner	100	13	80	8
Liner/FC Systems	Textured Geomembrane/Clay Liner	200	15	80	10
Overliner System	Textured Geomembrane/Geosynthetic Clay Liner	100	18	80	10
Overliner System	Geosynthetic Clay Liner/Subgrade	100	25	80	12

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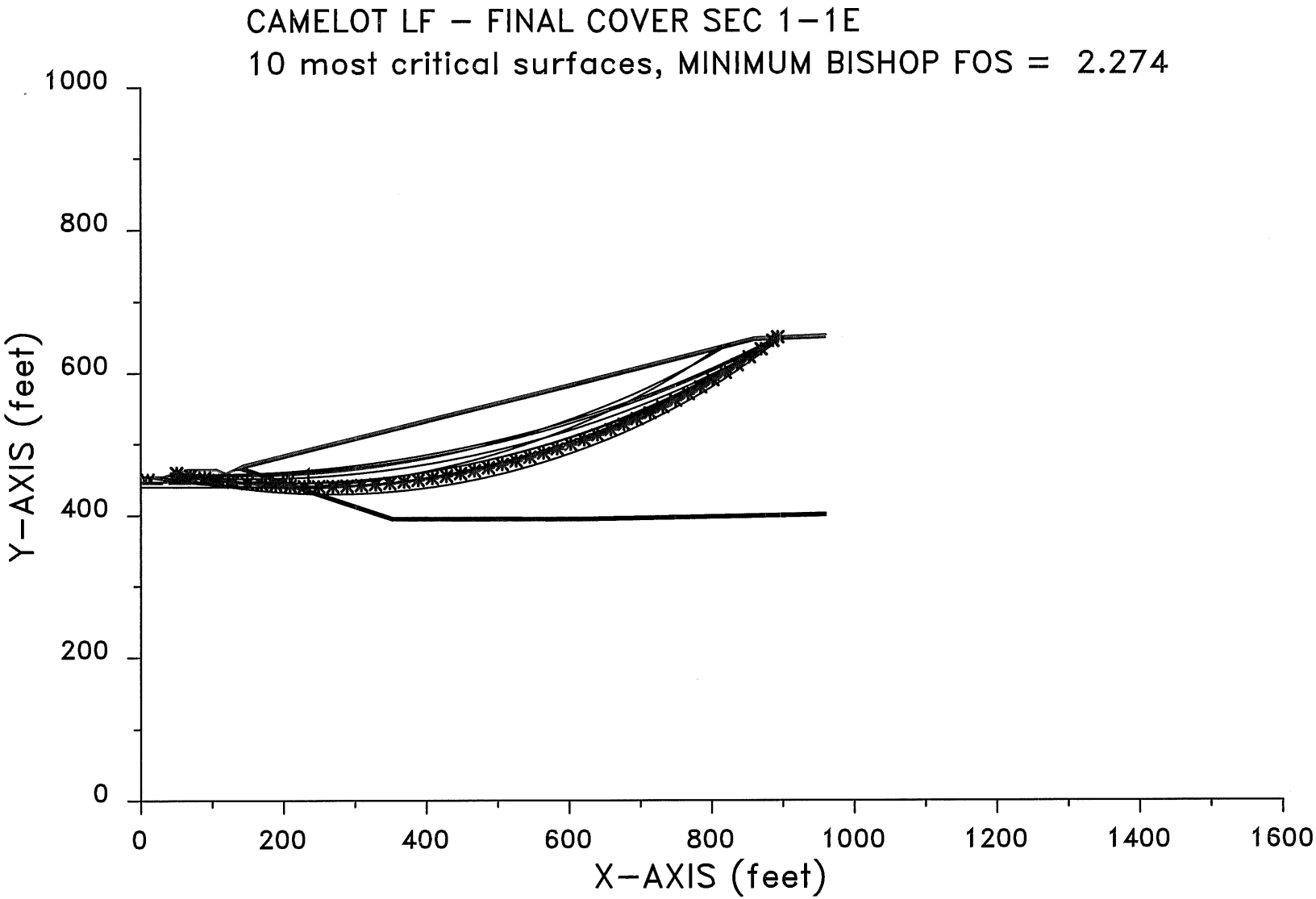

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Problem Description : CAMELOT LF - FINAL COVER SEC 1-1E

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	31.0	454.0	1
2	31.0	454.0	65.6	463.9	1
3	65.6	463.9	105.8	464.0	1
4	105.8	464.0	118.6	458.6	1
5	118.6	458.6	131.4	464.0	1
6	131.4	464.0	143.7	470.0	5
7	143.7	470.0	859.7	649.0	5
8	859.7	649.0	959.7	653.0	5

18 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	131.4	464.0	139.5	464.0	1
2	139.5	464.0	144.9	466.7	6
3	144.9	466.7	859.7	645.4	4
4	859.7	645.4	959.2	649.4	4
5	144.6	466.5	352.6	397.2	6
6	352.6	397.2	617.0	396.9	6
7	617.0	396.9	959.7	403.2	6
8	139.5	464.0	145.8	464.0	7
9	145.8	464.0	352.2	395.2	7

10	352.2	395.2	617.0	394.9	8
11	617.0	394.9	959.7	401.2	8
12	139.5	464.0	190.5	447.0	1
13	190.5	447.0	211.5	440.0	2
14	211.5	440.0	351.9	393.2	3
15	351.9	393.2	617.0	392.9	3
16	617.0	392.9	959.7	399.2	3
17	.0	447.0	190.5	447.0	2
18	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	445.00
2	196.50	445.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = .0 ft
and x = 50.0 ft

Each surface terminates between x = 800.0 ft
and x = 900.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 46 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	50.00	459.44
2	69.69	455.92
3	89.44	452.77
4	109.24	449.98
5	129.10	447.55
6	148.99	445.49
7	168.92	443.80
8	188.87	442.47
9	208.85	441.52
10	228.84	440.92
11	248.84	440.70
12	268.84	440.84

13	288.83	441.36
14	308.81	442.23
15	328.78	443.48
16	348.71	445.09
17	368.61	447.07
18	388.47	449.42
19	408.29	452.13
20	428.05	455.20
21	447.75	458.64
22	467.39	462.44
23	486.95	466.60
24	506.44	471.11
25	525.83	475.99
26	545.14	481.22
27	564.34	486.81
28	583.44	492.74
29	602.43	499.03
30	621.29	505.67
31	640.03	512.65
32	658.64	519.97
33	677.12	527.64
34	695.45	535.64
35	713.62	543.98
36	731.65	552.66
37	749.50	561.66
38	767.20	570.99
39	784.71	580.64
40	802.05	590.62
41	819.20	600.91
42	836.15	611.51
43	852.91	622.43
44	869.47	633.65
45	885.81	645.17
46	892.85	650.33

**** Simplified BISHOP FOS = 2.274 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-1E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.274	251.02	1528.28	1087.58	50.00	892.85	1.876E+09
2.	2.295	204.92	1725.57	1280.13	38.89	899.98	2.053E+09
3.	2.296	205.35	1697.38	1252.24	38.89	892.07	1.978E+09
4.	2.331	158.56	1929.40	1478.00	38.89	899.58	2.100E+09
5.	2.382	103.15	2170.53	1715.48	38.89	898.42	2.149E+09

6.	2.401	92.53	2211.61	1754.42	44.44	892.76	2.055E+09
7.	2.402	151.12	1778.37	1322.80	50.00	825.57	1.458E+09
8.	2.577	218.15	1605.35	1166.99	27.78	888.51	2.240E+09
9.	2.578	181.88	1547.00	1107.13	5.56	812.81	1.672E+09
10.	2.750	268.16	1444.40	1014.39	38.89	899.66	2.399E+09

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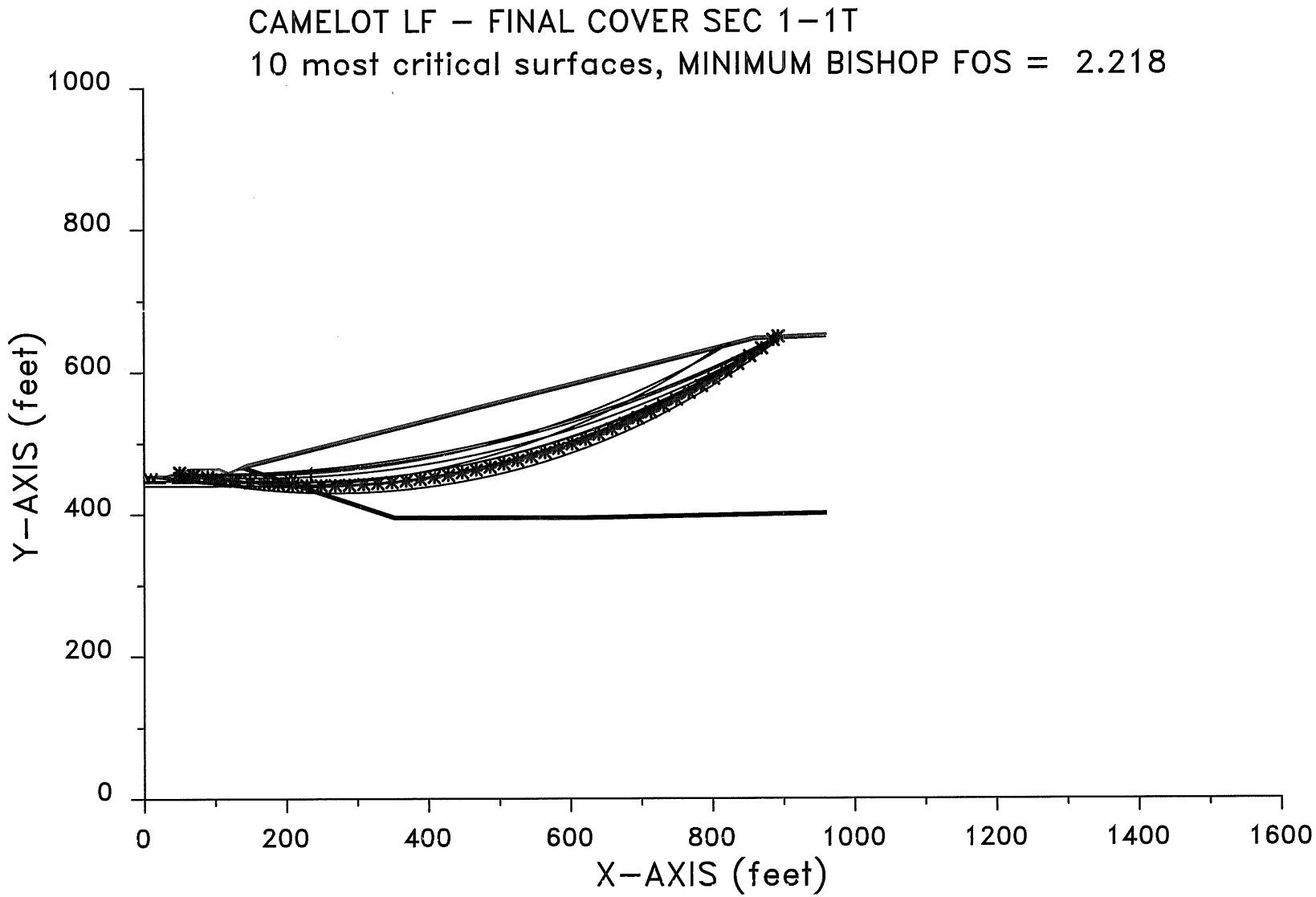

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Problem Description : CAMELOT LF - FINAL COVER SEC 1-1T

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

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5	118.6	458.6	131.4	464.0	1
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2	139.5	464.0	144.9	466.7	6
3	144.9	466.7	859.7	645.4	4
4	859.7	645.4	959.2	649.4	4
5	144.6	466.5	352.6	397.2	6
6	352.6	397.2	617.0	396.9	6
7	617.0	396.9	959.7	403.2	6
8	139.5	464.0	145.8	464.0	7
9	145.8	464.0	352.2	395.2	7

10	352.2	395.2	617.0	394.9	8
11	617.0	394.9	959.7	401.2	8
12	139.5	464.0	190.5	447.0	1
13	190.5	447.0	211.5	440.0	2
14	211.5	440.0	351.9	393.2	3
15	351.9	393.2	617.0	392.9	3
16	617.0	392.9	959.7	399.2	3
17	.0	447.0	190.5	447.0	2
18	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 2 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

1	.00	445.00
2	196.50	445.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = .0 ft
and x = 50.0 ft

Each surface terminates between x = 800.0 ft
and x = 900.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 46 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	50.00	459.44

2	69.69	455.92
3	89.44	452.77
4	109.24	449.98
5	129.10	447.55
6	148.99	445.49
7	168.92	443.80
8	188.87	442.47
9	208.85	441.52
10	228.84	440.92
11	248.84	440.70
12	268.84	440.84
13	288.83	441.36
14	308.81	442.23
15	328.78	443.48
16	348.71	445.09
17	368.61	447.07
18	388.47	449.42
19	408.29	452.13
20	428.05	455.20
21	447.75	458.64
22	467.39	462.44
23	486.95	466.60
24	506.44	471.11
25	525.83	475.99
26	545.14	481.22
27	564.34	486.81
28	583.44	492.74
29	602.43	499.03
30	621.29	505.67
31	640.03	512.65
32	658.64	519.97
33	677.12	527.64
34	695.45	535.64
35	713.62	543.98
36	731.65	552.66
37	749.50	561.66
38	767.20	570.99
39	784.71	580.64
40	802.05	590.62
41	819.20	600.91
42	836.15	611.51
43	852.91	622.43
44	869.47	633.65
45	885.81	645.17
46	892.85	650.33

**** Simplified BISHOP FOS = 2.218 ****

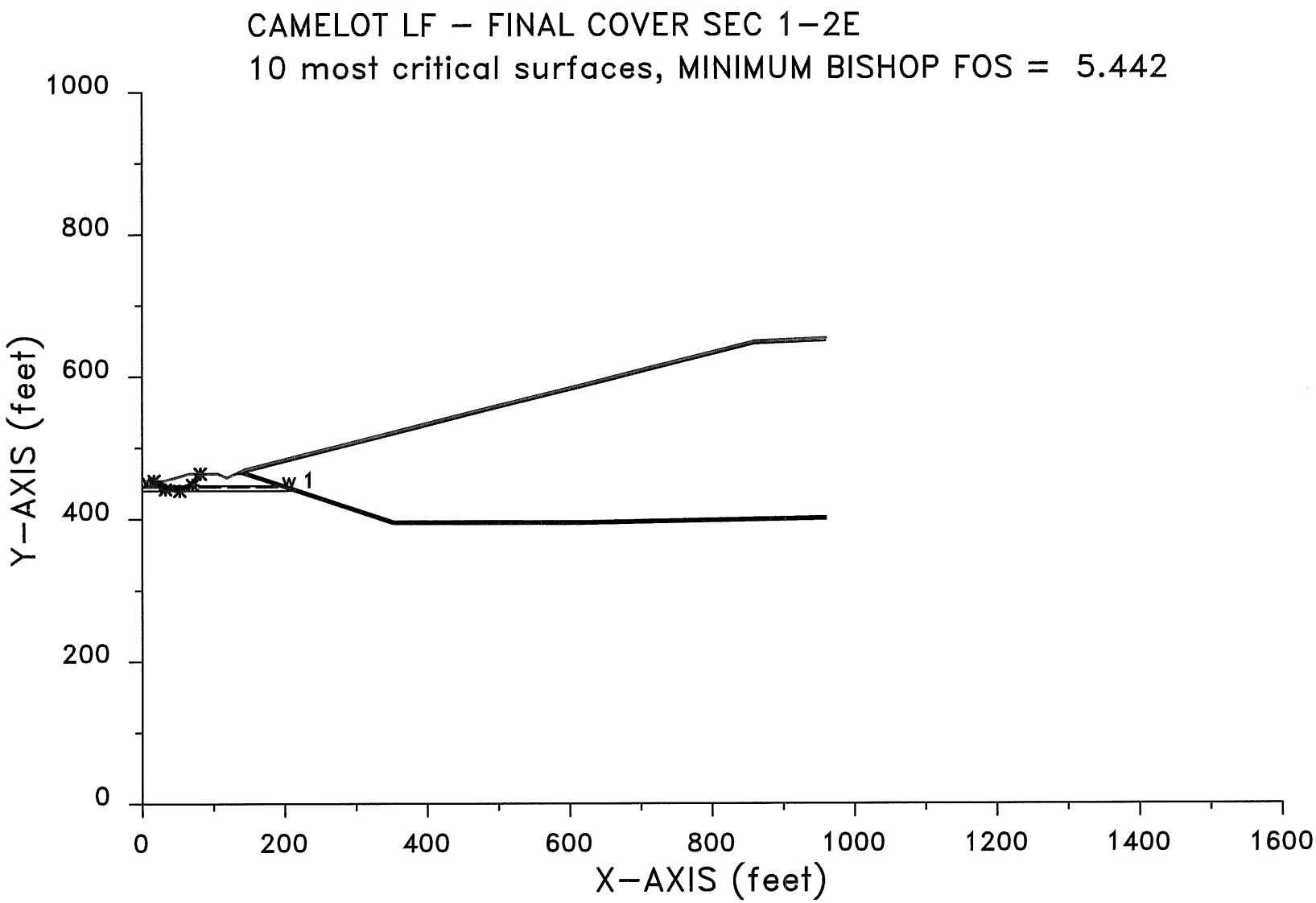
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-1T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.218	251.02	1528.28	1087.58	50.00	892.85	1.829E+09
2.	2.247	205.35	1697.38	1252.24	38.89	892.07	1.935E+09
3.	2.250	204.92	1725.57	1280.13	38.89	899.98	2.013E+09
4.	2.317	158.56	1929.40	1478.00	38.89	899.58	2.088E+09
5.	2.368	103.15	2170.53	1715.48	38.89	898.42	2.136E+09
6.	2.386	151.12	1778.37	1322.80	50.00	825.57	1.448E+09
7.	2.387	92.53	2211.61	1754.42	44.44	892.76	2.044E+09
8.	2.477	181.88	1547.00	1107.13	5.56	812.81	1.606E+09
9.	2.526	218.15	1605.35	1166.99	27.78	888.51	2.195E+09
10.	2.726	268.16	1444.40	1014.39	38.89	899.66	2.378E+09

* * * END OF FILE * * *

1-2E 2-16-16 13:35



XSTABL File: 1-2E 2-16-16 13:35

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 1-2E

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	31.0	454.0	1
2	31.0	454.0	65.6	463.9	1
3	65.6	463.9	105.8	464.0	1
4	105.8	464.0	118.6	458.6	1
5	118.6	458.6	131.4	464.0	1
6	131.4	464.0	143.7	470.0	5
7	143.7	470.0	859.7	649.0	5
8	859.7	649.0	959.7	653.0	5

18 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	131.4	464.0	139.5	464.0	1
2	139.5	464.0	144.9	466.7	6
3	144.9	466.7	859.7	645.4	4
4	859.7	645.4	959.2	649.4	4
5	144.6	466.5	352.6	397.2	6
6	352.6	397.2	617.0	396.9	6
7	617.0	396.9	959.7	403.2	6
8	139.5	464.0	145.8	464.0	7
9	145.8	464.0	352.2	395.2	7

10	352.2	395.2	617.0	394.9	8
11	617.0	394.9	959.7	401.2	8
12	139.5	464.0	190.5	447.0	1
13	190.5	447.0	211.5	440.0	2
14	211.5	440.0	351.9	393.2	3
15	351.9	393.2	617.0	392.9	3
16	617.0	392.9	959.7	399.2	3
17	.0	447.0	190.5	447.0	2
18	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	445.00
2	196.50	445.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

```
  10 Surfaces initiate from each of  10 points equally spaced
along the ground surface between  x =       .0 ft
                              and  x =     30.0 ft


Each surface terminates between   x =     60.0 ft
                              and   x =     80.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft


   20.0 ft line segments define each trial failure surface.


---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees


************************************************************
**     Factor of safety calculation for surface #    16    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  22.4007    **
**    This will be ignored for final summary of results    **
************************************************************


Circular surface (FOS= 22.4007) is defined by: xcenter =     23.63
ycenter =    520.97   Init. Pt. =      3.33   Seg. Length =  20.00
-------------------------------------------------------------------


*********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

*********************************************************************
      Negative effective stresses were calculated at the base of a slice.
      This warning is usually reported for cases where slices have low self
      weight and a relatively high "c" shear strength parameter.  In such
      cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

          ------------------------------------------------------------
          USER SELECTED option to maintain strength greater than zero
          ------------------------------------------------------------
```

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 5 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	16.67	454.00
2	32.74	442.10
3	52.64	440.06
4	70.80	448.43
5	81.50	463.94

**** Simplified BISHOP FOS = 5.442 ****

```
*****************************************************************
**                                                             **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**        1 surfaces were found to have MISLEADING FOS values.   **
**                                                             **
*****************************************************************
```

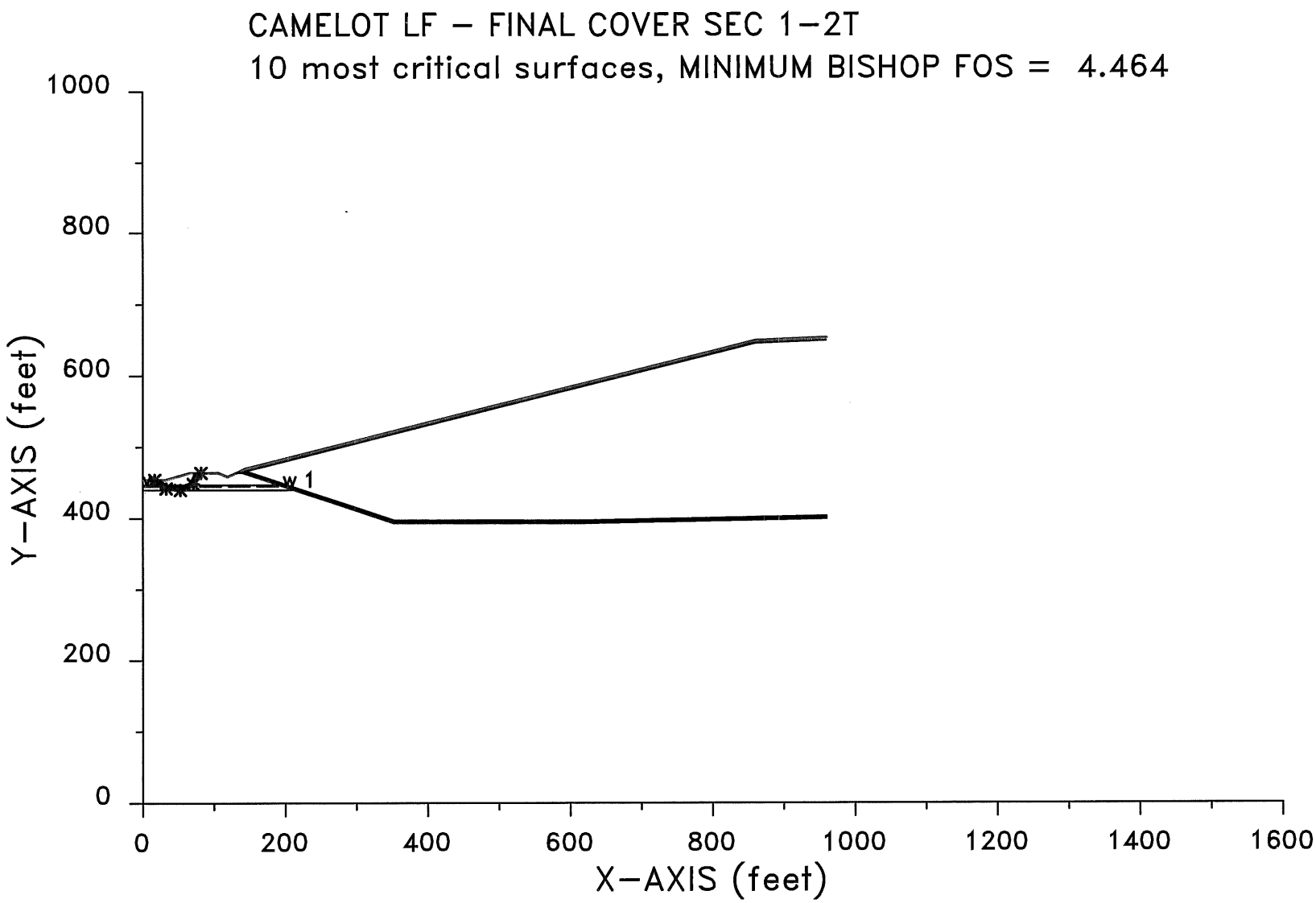
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-2E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	5.442	46.43	477.41	37.86	16.67	81.50	3.071E+06
2.	5.462	46.12	477.91	37.94	16.67	80.83	3.023E+06
3.	5.463	46.06	478.85	38.49	16.67	80.90	3.043E+06
4.	5.541	44.80	479.82	38.19	16.67	78.26	2.833E+06
5.	5.569	45.92	475.97	33.97	20.00	76.09	2.353E+06
6.	5.623	47.83	479.45	35.32	23.33	78.33	2.302E+06
7.	5.633	48.52	480.50	36.55	23.33	79.72	2.454E+06
8.	5.634	49.05	475.21	33.34	23.33	78.82	2.340E+06
9.	5.638	49.55	476.75	34.71	23.33	80.22	2.475E+06
10.	5.648	42.72	486.72	43.98	13.33	79.49	3.324E+06

* * * END OF FILE * * *

1-2T 2-16-16 13:45



XSTABL File: 1-2T 2-16-16 13:45

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 1-2T

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	31.0	454.0	1
2	31.0	454.0	65.6	463.9	1
3	65.6	463.9	105.8	464.0	1
4	105.8	464.0	118.6	458.6	1
5	118.6	458.6	131.4	464.0	1
6	131.4	464.0	143.7	470.0	5
7	143.7	470.0	859.7	649.0	5
8	859.7	649.0	959.7	653.0	5

18 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	131.4	464.0	139.5	464.0	1
2	139.5	464.0	144.9	466.7	6
3	144.9	466.7	859.7	645.4	4
4	859.7	645.4	959.2	649.4	4
5	144.6	466.5	352.6	397.2	6
6	352.6	397.2	617.0	396.9	6
7	617.0	396.9	959.7	403.2	6
8	139.5	464.0	145.8	464.0	7
9	145.8	464.0	352.2	395.2	7
10	352.2	395.2	617.0	394.9	8

11	617.0	394.9	959.7	401.2	8
12	139.5	464.0	190.5	447.0	1
13	190.5	447.0	211.5	440.0	2
14	211.5	440.0	351.9	393.2	3
15	351.9	393.2	617.0	392.9	3
16	617.0	392.9	959.7	399.2	3
17	.0	447.0	190.5	447.0	2
18	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 2 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	445.00
2	196.50	445.00

```
A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.

  100 trial surfaces will be generated and analyzed.

  10 Surfaces initiate from each of  10 points equally spaced
along the ground surface between  x =       .0 ft
                              and  x =     30.0 ft

Each surface terminates between   x =     60.0 ft
                            and   x =     80.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft

   20.0 ft line segments define each trial failure surface.

---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees

*************************************************************
**     Factor of safety calculation for surface #    16    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  20.8585    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 20.8585) is defined by: xcenter =     23.63
ycenter =    520.97   Init. Pt. =      3.33   Seg. Length =  20.00
-------------------------------------------------------------------

***********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

***********************************************************************
      Negative effective stresses were calculated at the base of a slice.
      This warning is usually reported for cases where slices have low self
      weight and a relatively high "c" shear strength parameter.  In such
      cases, this effect can only be eliminated by reducing the "c" value.

***********************************************************************
```

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 5 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	16.67	454.00
2	32.74	442.10
3	52.64	440.06
4	70.80	448.43
5	81.50	463.94

**** Simplified BISHOP FOS = 4.464 ****

```
*****************************************************************
**                                                             **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**        1 surfaces were found to have MISLEADING FOS values.   **
**                                                             **
*****************************************************************
```

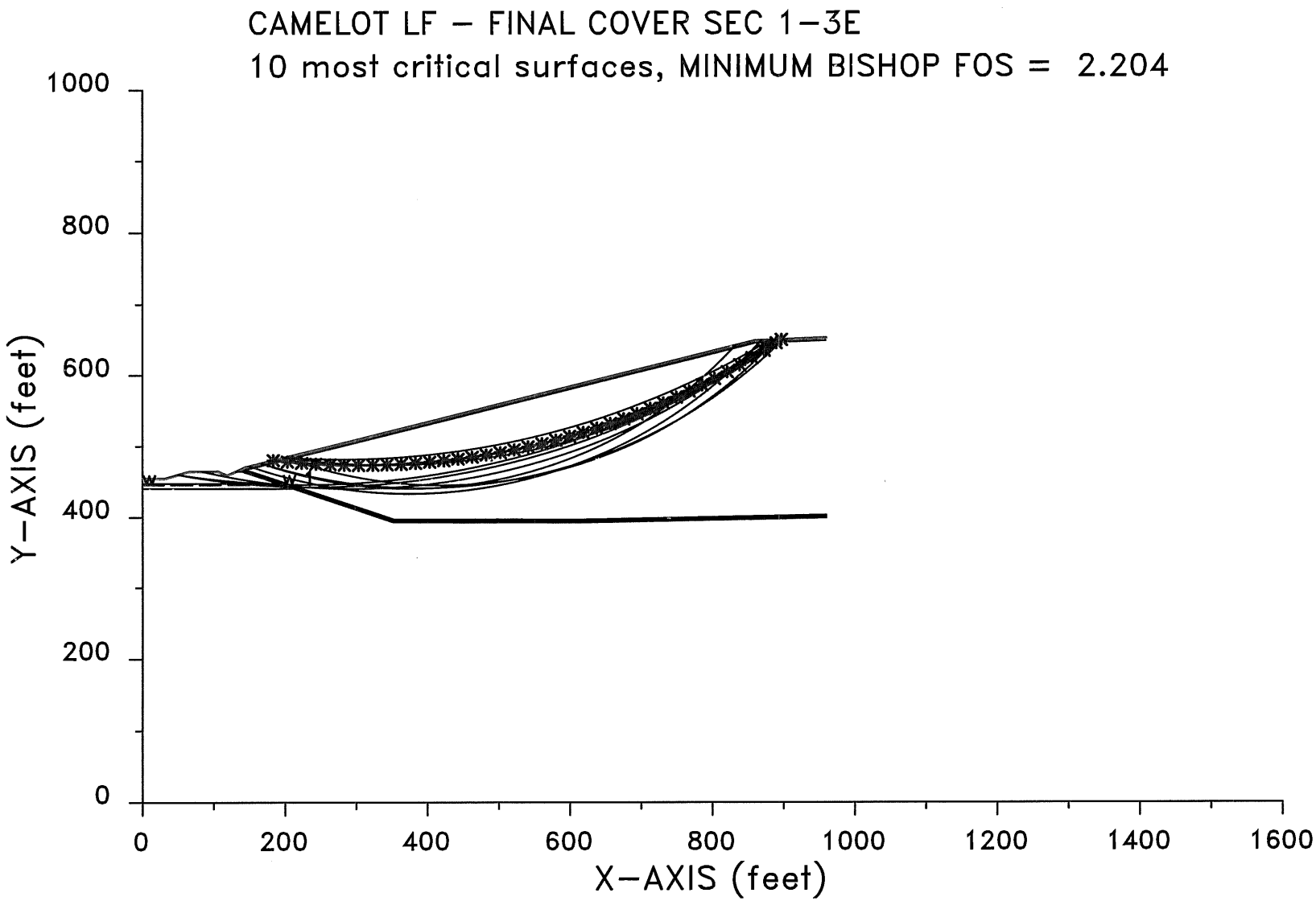
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-2T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	4.464	46.43	477.41	37.86	16.67	81.50	2.519E+06
2.	4.514	46.12	477.91	37.94	16.67	80.83	2.498E+06
3.	4.537	46.06	478.85	38.49	16.67	80.90	2.527E+06
4.	4.699	44.80	479.82	38.19	16.67	78.26	2.403E+06
5.	4.748	40.17	481.27	40.67	10.00	76.69	2.676E+06
6.	4.751	45.92	475.97	33.97	20.00	76.09	2.007E+06
7.	4.773	49.05	475.21	33.34	23.33	78.82	1.982E+06
8.	4.774	49.55	476.75	34.71	23.33	80.22	2.096E+06
9.	4.862	42.72	486.72	43.98	13.33	79.49	2.862E+06
10.	4.874	41.39	474.04	34.47	13.33	73.20	2.162E+06

* * * END OF FILE * * *

1-3E 2-13-16 16:41



XSTABL File: 1-3E 2-13-16 16:41

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 1-3E

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	31.0	454.0	1
2	31.0	454.0	65.6	463.9	1
3	65.6	463.9	105.8	464.0	1
4	105.8	464.0	118.6	458.6	1
5	118.6	458.6	131.4	464.0	1
6	131.4	464.0	143.7	470.0	5
7	143.7	470.0	859.7	649.0	5
8	859.7	649.0	959.7	653.0	5

18 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	131.4	464.0	139.5	464.0	1
2	139.5	464.0	144.9	466.7	6
3	144.9	466.7	859.7	645.4	4
4	859.7	645.4	959.2	649.4	4
5	144.6	466.5	352.6	397.2	6
6	352.6	397.2	617.0	396.9	6
7	617.0	396.9	959.7	403.2	6
8	139.5	464.0	145.8	464.0	7
9	145.8	464.0	352.2	395.2	7

10	352.2	395.2	617.0	394.9	8
11	617.0	394.9	959.7	401.2	8
12	139.5	464.0	190.5	447.0	1
13	190.5	447.0	211.5	440.0	2
14	211.5	440.0	351.9	393.2	3
15	351.9	393.2	617.0	392.9	3
16	617.0	392.9	959.7	399.2	3
17	.0	447.0	190.5	447.0	2
18	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	445.00
2	196.50	445.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 50.0 ft
and x = 200.0 ft

Each surface terminates between x = 800.0 ft
and x = 900.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 39 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	183.33	479.91
2	203.22	477.83
3	223.15	476.12
4	243.11	474.78
5	263.08	473.81
6	283.07	473.22
7	303.07	472.99
8	323.07	473.14
9	343.07	473.66
10	363.05	474.55
11	383.01	475.81
12	402.94	477.45

13	422.84	479.45
14	442.70	481.82
15	462.51	484.57
16	482.26	487.68
17	501.96	491.15
18	521.59	495.00
19	541.14	499.21
20	560.61	503.78
21	579.99	508.71
22	599.28	514.00
23	618.47	519.65
24	637.54	525.65
25	656.51	532.01
26	675.35	538.72
27	694.06	545.78
28	712.64	553.19
29	731.07	560.94
30	749.36	569.03
31	767.50	577.46
32	785.48	586.23
33	803.29	595.33
34	820.93	604.75
35	838.39	614.51
36	855.66	624.59
37	872.74	634.99
38	889.63	645.70
39	896.88	650.49

**** Simplified BISHOP FOS = 2.204 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-3E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.204	305.13	1548.42	1075.43	183.33	896.88	1.291E+09
2.	2.205	344.54	1429.84	956.74	200.00	899.63	1.207E+09
3.	2.232	294.25	1369.78	930.07	83.33	883.10	1.619E+09
4.	2.233	389.81	1165.03	724.51	166.67	899.92	1.351E+09
5.	2.240	279.17	1641.84	1160.47	200.00	881.34	1.140E+09
6.	2.243	375.03	1104.60	671.83	150.00	869.06	1.250E+09
7.	2.266	374.42	1058.58	618.75	166.67	831.87	9.929E+08
8.	2.271	420.82	1081.02	636.48	200.00	889.22	1.130E+09
9.	2.276	244.57	1548.18	1105.99	50.00	890.17	1.857E+09
10.	2.284	229.59	1600.93	1155.53	50.00	886.17	1.832E+09

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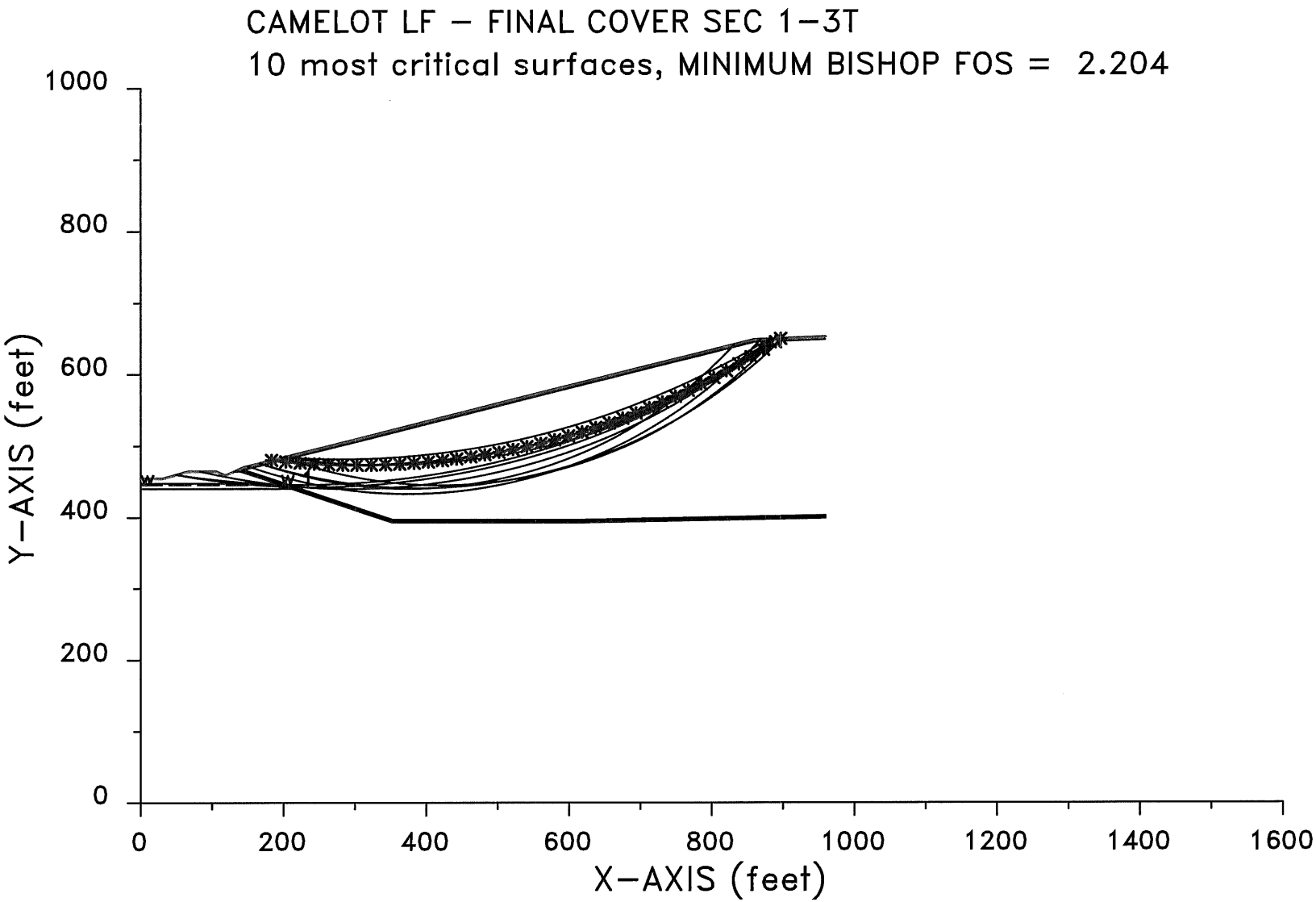
1-3T 2-16-16 13:47



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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*  Ver. 5.208                96 - 2046  *
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```

Problem Description : CAMELOT LF - FINAL COVER SEC 1-3T

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	31.0	454.0	1
2	31.0	454.0	65.6	463.9	1
3	65.6	463.9	105.8	464.0	1
4	105.8	464.0	118.6	458.6	1
5	118.6	458.6	131.4	464.0	1
6	131.4	464.0	143.7	470.0	5
7	143.7	470.0	859.7	649.0	5
8	859.7	649.0	959.7	653.0	5

18 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	131.4	464.0	139.5	464.0	1
2	139.5	464.0	144.9	466.7	6
3	144.9	466.7	859.7	645.4	4
4	859.7	645.4	959.2	649.4	4
5	144.6	466.5	352.6	397.2	6
6	352.6	397.2	617.0	396.9	6
7	617.0	396.9	959.7	403.2	6
8	139.5	464.0	145.8	464.0	7
9	145.8	464.0	352.2	395.2	7

10	352.2	395.2	617.0	394.9	8
11	617.0	394.9	959.7	401.2	8
12	139.5	464.0	190.5	447.0	1
13	190.5	447.0	211.5	440.0	2
14	211.5	440.0	351.9	393.2	3
15	351.9	393.2	617.0	392.9	3
16	617.0	392.9	959.7	399.2	3
17	.0	447.0	190.5	447.0	2
18	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 2 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

1	.00	445.00
2	196.50	445.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 50.0 ft
and x = 200.0 ft

Each surface terminates between x = 800.0 ft
and x = 900.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 39 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	183.33	479.91

2	203.22	477.83
3	223.15	476.12
4	243.11	474.78
5	263.08	473.81
6	283.07	473.22
7	303.07	472.99
8	323.07	473.14
9	343.07	473.66
10	363.05	474.55
11	383.01	475.81
12	402.94	477.45
13	422.84	479.45
14	442.70	481.82
15	462.51	484.57
16	482.26	487.68
17	501.96	491.15
18	521.59	495.00
19	541.14	499.21
20	560.61	503.78
21	579.99	508.71
22	599.28	514.00
23	618.47	519.65
24	637.54	525.65
25	656.51	532.01
26	675.35	538.72
27	694.06	545.78
28	712.64	553.19
29	731.07	560.94
30	749.36	569.03
31	767.50	577.46
32	785.48	586.23
33	803.29	595.33
34	820.93	604.75
35	838.39	614.51
36	855.66	624.59
37	872.74	634.99
38	889.63	645.70
39	896.88	650.49

**** Simplified BISHOP FOS = 2.204 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-3T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.204	305.13	1548.42	1075.43	183.33	896.88	1.291E+09
2.	2.205	344.54	1429.84	956.74	200.00	899.63	1.207E+09
3.	2.211	294.25	1369.78	930.07	83.33	883.10	1.604E+09

4.	2.227	244.57	1548.18	1105.99	50.00	890.17	1.816E+09
5.	2.233	389.81	1165.03	724.51	166.67	899.92	1.351E+09
6.	2.240	279.17	1641.84	1160.47	200.00	881.34	1.140E+09
7.	2.243	375.03	1104.60	671.83	150.00	869.06	1.250E+09
8.	2.256	229.59	1600.93	1155.53	50.00	886.17	1.810E+09
9.	2.266	374.42	1058.58	618.75	166.67	831.87	9.929E+08
10.	2.271	420.82	1081.02	636.48	200.00	889.22	1.130E+09

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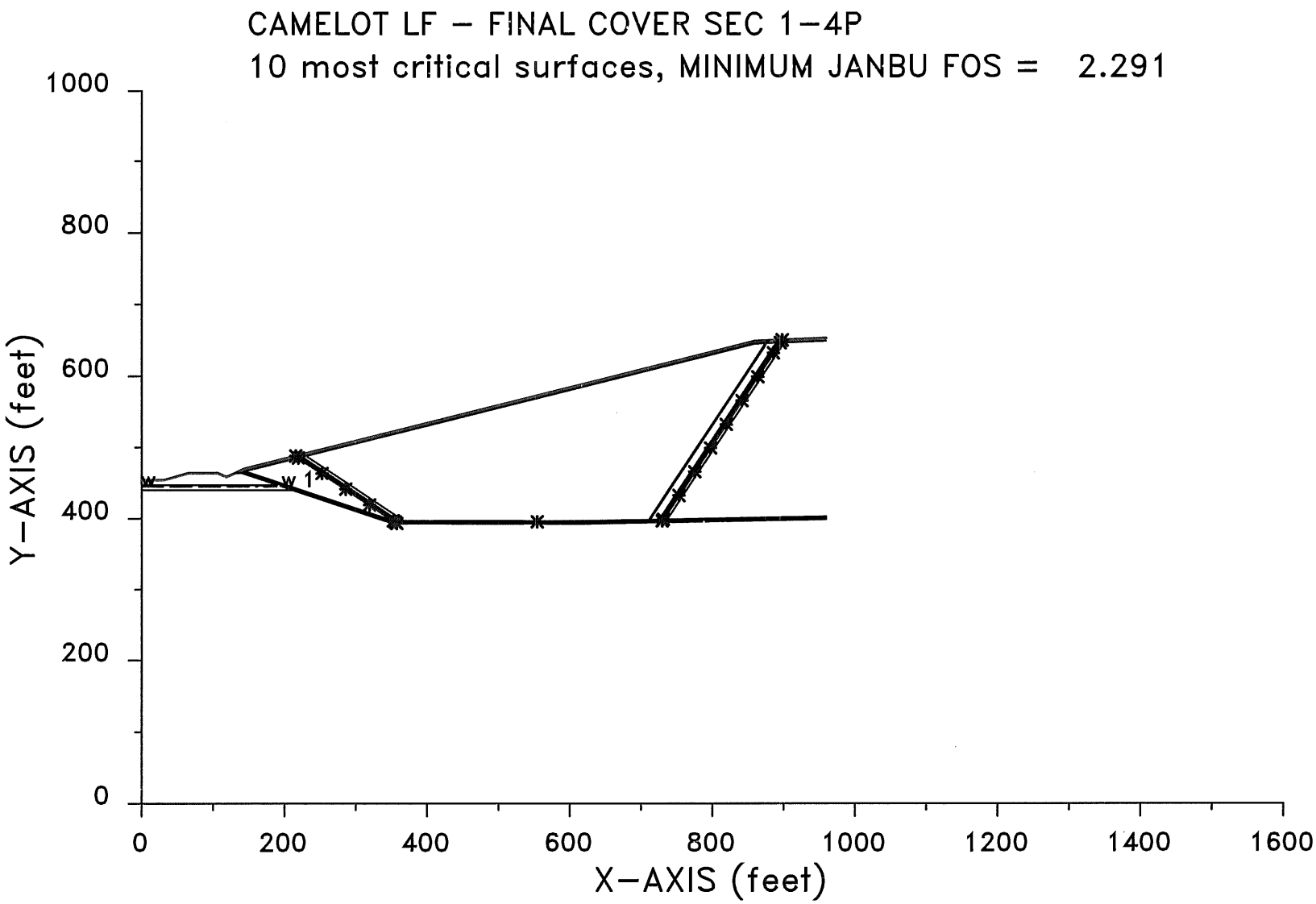
1-4P 2-13-16 17:39



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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 1-4P

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	31.0	454.0	1
2	31.0	454.0	65.6	463.9	1
3	65.6	463.9	105.8	464.0	1
4	105.8	464.0	118.6	458.6	1
5	118.6	458.6	131.4	464.0	1
6	131.4	464.0	143.7	470.0	5
7	143.7	470.0	859.7	649.0	5
8	859.7	649.0	959.7	653.0	5

24 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	131.4	464.0	139.5	464.0	1
2	139.5	464.0	139.6	464.1	7
3	139.6	464.1	144.9	466.7	6
4	144.9	466.7	859.7	645.4	4
5	859.7	645.4	959.2	649.4	4
6	144.6	466.5	352.6	397.2	6
7	352.6	397.2	617.0	396.9	6
8	617.0	396.9	959.7	403.2	6
9	139.6	464.1	145.8	464.1	7

10	145.8	464.1	352.2	395.2	7
11	352.2	395.2	617.0	395.0	8
12	617.0	395.0	959.7	401.3	8
13	139.7	464.0	145.8	464.0	6
14	145.8	464.0	352.2	395.1	6
15	352.2	395.1	617.0	394.9	6
16	617.0	394.9	959.7	401.2	6
17	139.5	464.0	139.7	464.0	1
18	139.7	464.0	190.5	447.0	1
19	190.5	447.0	211.5	440.0	2
20	211.5	440.0	351.9	393.2	3
21	351.9	393.2	617.0	392.9	3
22	617.0	392.9	959.7	399.2	3
23	.0	447.0	190.5	447.0	2
24	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	13.00	.000	.0	0
8	115.0	120.0	100.0	13.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	445.00
2	196.50	445.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 40.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	356.4	395.2	406.4	395.1	4.0
2	537.0	395.0	587.0	394.9	4.0
3	684.4	396.1	734.4	397.0	4.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 23 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	215.88	488.04
2	219.46	485.34
3	252.56	463.43
4	285.92	441.35
5	319.27	419.28
6	352.63	397.20
7	355.29	395.20
8	355.41	395.10
9	357.47	393.55
10	554.45	395.80
11	729.65	396.93

12	729.68	396.97
13	729.76	397.07
14	731.21	399.00
15	753.29	432.36
16	775.37	465.71
17	797.45	499.07
18	819.52	532.42
19	841.60	565.78
20	863.68	599.13
21	885.76	632.49
22	895.25	646.83
23	898.04	650.53

** Corrected JANBU FOS = 2.291 ** (Fo factor = 1.087)

Failure surface No. 2 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.30	488.65
2	221.89	485.95
3	222.56	485.51
4	255.92	463.43
5	289.27	441.35
6	322.63	419.27
7	355.98	397.20
8	358.64	395.20
9	358.76	395.10
10	360.53	393.76
11	573.62	395.94
12	731.60	398.44
13	732.04	399.01
14	754.12	432.37
15	776.19	465.73
16	798.27	499.08
17	820.35	532.44
18	842.43	565.79
19	864.50	599.15
20	886.58	632.50
21	896.09	646.86
22	898.88	650.57

** Corrected JANBU FOS = 2.295 ** (Fo factor = 1.087)

Failure surface No. 3 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	215.30	487.90
2	218.89	485.20
3	251.00	463.94
4	284.36	441.87
5	317.71	419.79

6	351.07	397.71
7	354.40	395.20
8	354.53	395.10
9	356.46	393.64
10	578.58	393.19
11	712.26	398.07
12	712.70	398.66
13	734.78	432.01
14	756.86	465.37
15	778.94	498.73
16	801.01	532.08
17	823.09	565.44
18	845.17	598.79
19	867.24	632.15
20	876.46	646.07
21	879.26	649.78

** Corrected JANBU FOS = 2.301 ** (Fo factor = 1.087)

Failure surface No. 4 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.15	488.61
2	221.74	485.91
3	222.35	485.51
4	255.71	463.43
5	289.06	441.35
6	322.42	419.27
7	355.77	397.20
8	357.38	395.99
9	578.10	394.10
10	727.06	395.13
11	728.43	396.95
12	728.51	397.05
13	729.96	398.98
14	752.04	432.33
15	774.12	465.69
16	796.20	499.04
17	818.27	532.40
18	840.35	565.75
19	862.43	599.11
20	884.51	632.46
21	893.98	646.78
22	896.77	650.48

** Corrected JANBU FOS = 2.302 ** (Fo factor = 1.087)

Failure surface No. 5 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.55	488.71

2	222.14	486.01
3	222.90	485.51
4	256.26	463.43
5	289.61	441.35
6	322.97	419.27
7	356.32	397.20
8	357.10	396.61
9	564.63	393.02
10	733.73	395.09
11	735.23	397.07
12	735.31	397.17
13	736.76	399.10
14	758.84	432.46
15	780.92	465.81
16	802.99	499.17
17	825.07	532.52
18	847.15	565.88
19	869.23	599.23
20	891.30	632.59
21	900.88	647.06
22	903.67	650.76

** Corrected JANBU FOS = 2.303 ** (Fo factor = 1.087)

Failure surface No. 6 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.45	488.69
2	222.04	485.98
3	222.76	485.51
4	256.12	463.43
5	289.47	441.35
6	322.83	419.27
7	356.18	397.20
8	358.48	395.47
9	568.23	393.39
10	722.88	395.45
11	723.95	396.87
12	724.03	396.97
13	725.48	398.89
14	747.56	432.25
15	769.64	465.61
16	791.71	498.96
17	813.79	532.32
18	835.87	565.67
19	857.95	599.03
20	880.02	632.38
21	889.43	646.60
22	892.22	650.30

** Corrected JANBU FOS = 2.306 ** (Fo factor = 1.087)

Failure surface No. 7 specified by 23 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	226.60	490.73
2	230.19	488.02
3	234.01	485.49
4	267.36	463.42
5	300.72	441.34
6	334.07	419.26
7	367.43	397.18
8	370.08	395.19
9	370.12	395.16
10	565.98	394.66
11	723.41	395.61
12	724.36	396.87
13	724.45	396.98
14	725.90	398.90
15	747.97	432.26
16	770.05	465.61
17	792.13	498.97
18	814.21	532.32
19	836.28	565.68
20	858.36	599.03
21	880.44	632.39
22	889.85	646.61
23	892.65	650.32

** Corrected JANBU FOS = 2.309 ** (Fo factor = 1.087)

Failure surface No. 8 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.83	488.78
2	222.42	486.08
3	223.29	485.51
4	256.64	463.43
5	290.00	441.35
6	323.36	419.27
7	356.71	397.20
8	359.37	395.19
9	359.49	395.09
10	359.89	394.80
11	537.56	396.21
12	710.13	397.42
13	711.04	398.63
14	733.12	431.98
15	755.20	465.34
16	777.27	498.70
17	799.35	532.05
18	821.43	565.41
19	843.51	598.76
20	865.58	632.12
21	874.78	646.01

22	877.57	649.71

** Corrected JANBU FOS = 2.313 ** (Fo factor = 1.087)

Failure surface No. 9 specified by 24 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.65	488.74
2	222.24	486.03
3	223.04	485.51
4	256.39	463.43
5	289.75	441.35
6	323.11	419.27
7	356.46	397.20
8	359.12	395.19
9	359.24	395.09
10	361.11	393.69
11	562.81	393.64
12	726.07	395.11
13	727.45	396.93
14	727.53	397.03
15	728.98	398.96
16	751.06	432.31
17	773.14	465.67
18	795.21	499.02
19	817.29	532.38
20	839.37	565.74
21	861.45	599.09
22	883.52	632.45
23	892.98	646.74
24	895.77	650.44

** Corrected JANBU FOS = 2.313 ** (Fo factor = 1.087)

Failure surface No.10 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	221.11	489.35
2	224.69	486.65
3	226.43	485.50
4	259.78	463.42
5	293.14	441.35
6	326.49	419.27
7	359.85	397.19
8	362.50	395.19
9	362.63	395.09
10	364.00	394.06
11	556.94	395.34
12	711.46	397.82
13	712.08	398.65
14	734.16	432.00

15	756.24	465.36
16	778.31	498.71
17	800.39	532.07
18	822.47	565.43
19	844.54	598.78
20	866.62	632.14
21	875.83	646.05
22	878.63	649.76

** Corrected JANBU FOS = 2.316 ** (Fo factor = 1.087)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-4P

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.291	1.087	215.88	898.04	2.483E+06
2.	2.295	1.087	218.30	898.88	2.483E+06
3.	2.301	1.087	215.30	879.26	2.400E+06
4.	2.302	1.087	218.15	896.77	2.486E+06
5.	2.303	1.087	218.55	903.67	2.531E+06
6.	2.306	1.087	218.45	892.22	2.468E+06
7.	2.309	1.087	226.60	892.65	2.425E+06
8.	2.313	1.087	218.83	877.57	2.364E+06
9.	2.313	1.087	218.65	895.77	2.500E+06
10.	2.316	1.087	221.11	878.63	2.371E+06

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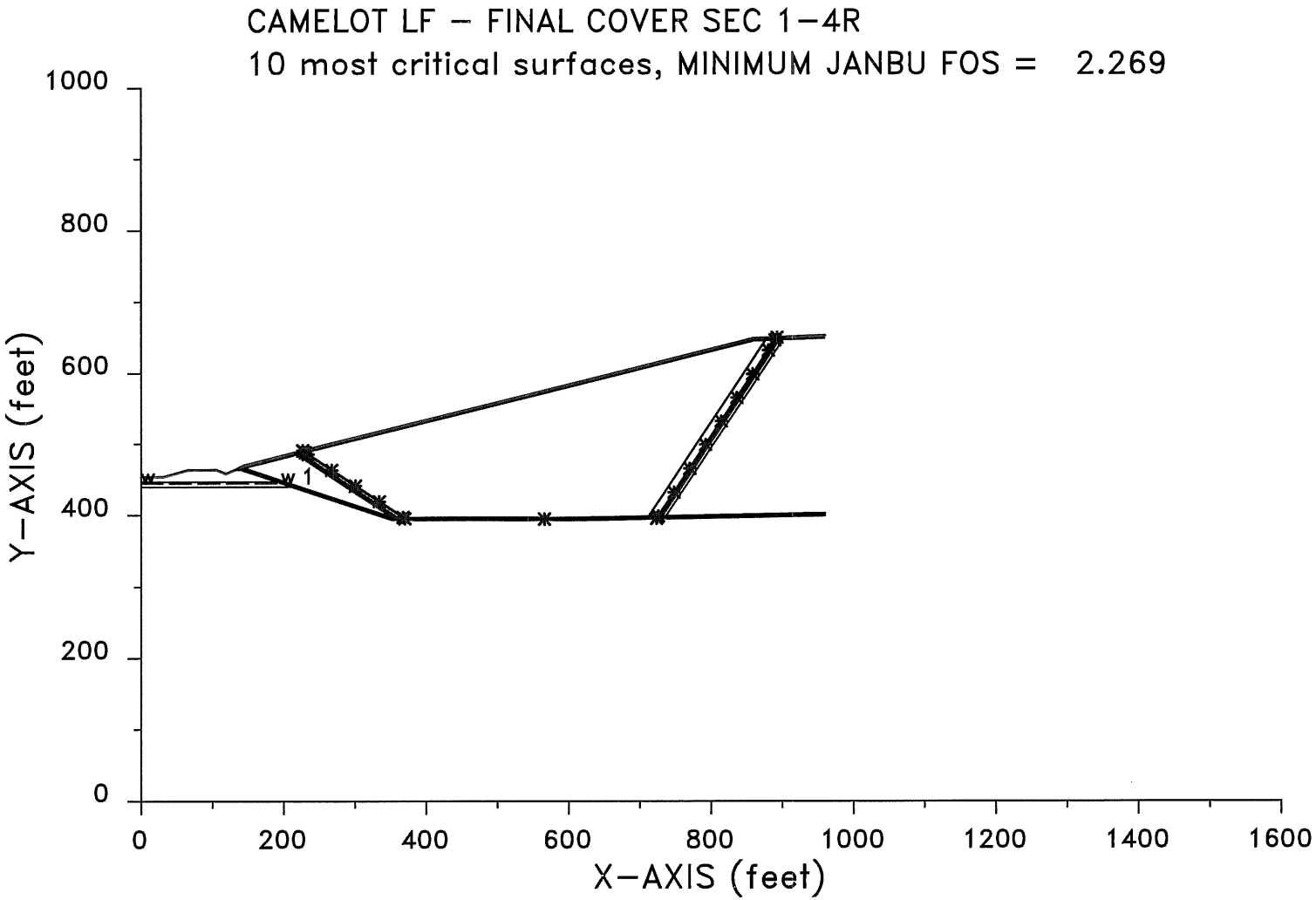

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Problem Description : CAMELOT LF - FINAL COVER SEC 1-4R

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	31.0	454.0	1
2	31.0	454.0	65.6	463.9	1
3	65.6	463.9	105.8	464.0	1
4	105.8	464.0	118.6	458.6	1
5	118.6	458.6	131.4	464.0	1
6	131.4	464.0	143.7	470.0	5
7	143.7	470.0	859.7	649.0	5
8	859.7	649.0	959.7	653.0	5

24 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	131.4	464.0	139.5	464.0	1
2	139.5	464.0	139.6	464.1	7
3	139.6	464.1	144.9	466.7	6
4	144.9	466.7	859.7	645.4	4
5	859.7	645.4	959.2	649.4	4
6	144.6	466.5	352.6	397.2	6
7	352.6	397.2	617.0	396.9	6
8	617.0	396.9	959.7	403.2	6
9	139.6	464.1	145.8	464.1	7

10	145.8	464.1	352.2	395.2	7
11	352.2	395.2	617.0	395.0	8
12	617.0	395.0	959.7	401.3	8
13	139.7	464.0	145.8	464.0	6
14	145.8	464.0	352.2	395.1	6
15	352.2	395.1	617.0	394.9	6
16	617.0	394.9	959.7	401.2	6
17	139.5	464.0	139.7	464.0	1
18	139.7	464.0	190.5	447.0	1
19	190.5	447.0	211.5	440.0	2
20	211.5	440.0	351.9	393.2	3
21	351.9	393.2	617.0	392.9	3
22	617.0	392.9	959.7	399.2	3
23	.0	447.0	190.5	447.0	2
24	.0	440.0	211.5	440.0	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	80.0	8.00	.000	.0	0
8	115.0	120.0	80.0	8.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	445.00
2	196.50	445.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 40.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	356.4	395.2	406.4	395.1	4.0
2	537.0	395.0	587.0	394.9	4.0
3	684.4	396.1	734.4	397.0	4.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 23 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	226.60	490.73
2	230.19	488.02
3	234.01	485.49
4	267.37	463.42
5	300.72	441.34
6	334.08	419.26
7	367.43	397.18
8	370.08	395.19
9	370.12	395.16
10	565.98	394.66
11	723.41	395.61

12	724.36	396.87
13	724.45	396.98
14	725.91	398.90
15	747.98	432.26
16	770.06	465.61
17	792.14	498.97
18	814.21	532.32
19	836.29	565.68
20	858.37	599.03
21	880.45	632.39
22	889.86	646.61
23	892.65	650.32

** Corrected JANBU FOS = 2.269 ** (Fo factor = 1.087)

Failure surface No. 2 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	227.64	490.98
2	231.22	488.28
3	235.44	485.49
4	268.79	463.41
5	302.15	441.34
6	335.50	419.26
7	368.86	397.18
8	370.52	395.93
9	576.66	394.90
10	711.04	396.48
11	711.15	396.63
12	711.24	396.73
13	712.69	398.66
14	734.77	432.01
15	756.85	465.37
16	778.93	498.73
17	801.00	532.08
18	823.08	565.44
19	845.16	598.79
20	867.24	632.15
21	876.45	646.07
22	879.25	649.78

** Corrected JANBU FOS = 2.272 ** (Fo factor = 1.088)

Failure surface No. 3 specified by 23 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	215.88	488.05
2	219.47	485.34
3	252.57	463.43
4	285.93	441.35
5	319.28	419.28

6	352.64	397.20
7	355.30	395.20
8	355.41	395.10
9	357.47	393.55
10	554.45	395.80
11	729.65	396.93
12	729.68	396.97
13	729.77	397.07
14	731.22	399.00
15	753.30	432.36
16	775.38	465.71
17	797.45	499.07
18	819.53	532.42
19	841.61	565.78
20	863.69	599.13
21	885.76	632.49
22	895.26	646.83
23	898.05	650.53

** Corrected JANBU FOS = 2.276 ** (Fo factor = 1.087)

Failure surface No. 4 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.31	488.65
2	221.90	485.95
3	222.57	485.51
4	255.93	463.43
5	289.28	441.35
6	322.64	419.27
7	355.99	397.20
8	358.65	395.20
9	358.76	395.10
10	360.53	393.76
11	573.62	395.94
12	731.60	398.44
13	732.04	399.01
14	754.12	432.37
15	776.19	465.73
16	798.27	499.08
17	820.35	532.44
18	842.43	565.79
19	864.50	599.15
20	886.58	632.50
21	896.09	646.86
22	898.88	650.57

** Corrected JANBU FOS = 2.288 ** (Fo factor = 1.087)

Failure surface No. 5 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	218.15	488.61
2	221.74	485.91
3	222.35	485.51
4	255.71	463.43
5	289.06	441.35
6	322.42	419.27
7	355.77	397.20
8	357.38	395.99
9	578.10	394.10
10	727.06	395.13
11	728.43	396.95
12	728.52	397.05
13	729.97	398.98
14	752.05	432.33
15	774.13	465.69
16	796.20	499.04
17	818.28	532.40
18	840.36	565.75
19	862.44	599.11
20	884.51	632.46
21	893.99	646.78
22	896.78	650.48

** Corrected JANBU FOS = 2.293 ** (Fo factor = 1.087)

Failure surface No. 6 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	215.31	487.90
2	218.90	485.20
3	251.02	463.94
4	284.38	441.86
5	317.73	419.78
6	351.09	397.70
7	354.41	395.20
8	354.53	395.10
9	356.46	393.64
10	578.58	393.19
11	712.26	398.07
12	712.70	398.66
13	734.78	432.01
14	756.86	465.37
15	778.94	498.73
16	801.01	532.08
17	823.09	565.44
18	845.17	598.79
19	867.24	632.15
20	876.46	646.07
21	879.26	649.78

** Corrected JANBU FOS = 2.295 ** (Fo factor = 1.087)

Failure surface No. 7 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.55	488.71
2	222.14	486.01
3	222.90	485.51
4	256.26	463.43
5	289.61	441.35
6	322.97	419.27
7	356.32	397.20
8	357.10	396.61
9	564.63	393.02
10	733.73	395.09
11	735.23	397.07
12	735.32	397.18
13	736.77	399.10
14	758.85	432.46
15	780.92	465.81
16	803.00	499.17
17	825.08	532.52
18	847.16	565.88
19	869.23	599.23
20	891.31	632.59
21	900.89	647.06
22	903.68	650.76

** Corrected JANBU FOS = 2.299 ** (Fo factor = 1.087)

Failure surface No. 8 specified by 24 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	226.57	490.72
2	230.15	488.01
3	233.96	485.49
4	267.32	463.42
5	300.67	441.34
6	334.03	419.26
7	367.38	397.18
8	370.03	395.19
9	370.15	395.09
10	372.48	393.33
11	576.40	394.79
12	725.22	396.44
13	725.56	396.90
14	725.65	397.00
15	727.10	398.92
16	749.18	432.28
17	771.26	465.63
18	793.33	498.99
19	815.41	532.35
20	837.49	565.70
21	859.57	599.06

22	881.64	632.41
23	891.08	646.66
24	893.87	650.37

** Corrected JANBU FOS = 2.299 ** (Fo factor = 1.087)

Failure surface No. 9 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	218.45	488.69
2	222.04	485.98
3	222.76	485.51
4	256.12	463.43
5	289.47	441.35
6	322.83	419.27
7	356.18	397.20
8	358.48	395.47
9	568.23	393.39
10	722.88	395.45
11	723.95	396.87
12	724.04	396.97
13	725.49	398.89
14	747.57	432.25
15	769.64	465.61
16	791.72	498.96
17	813.80	532.32
18	835.88	565.67
19	857.95	599.03
20	880.03	632.38
21	889.44	646.60
22	892.23	650.30

** Corrected JANBU FOS = 2.299 ** (Fo factor = 1.087)

Failure surface No.10 specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	221.12	489.35
2	224.70	486.65
3	226.44	485.50
4	259.79	463.42
5	293.15	441.35
6	326.50	419.27
7	359.86	397.19
8	362.51	395.19
9	362.63	395.09
10	364.00	394.06
11	556.94	395.34
12	711.46	397.82
13	712.08	398.65
14	734.16	432.00

15	756.24	465.36
16	778.31	498.71
17	800.39	532.07
18	822.47	565.43
19	844.54	598.78
20	866.62	632.14
21	875.83	646.05
22	878.63	649.76

** Corrected JANBU FOS = 2.305 ** (Fo factor = 1.087)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 1-4R

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.269	1.087	226.60	892.65	2.372E+06
2.	2.272	1.088	227.64	879.25	2.284E+06
3.	2.276	1.087	215.88	898.05	2.463E+06
4.	2.288	1.087	218.31	898.88	2.474E+06
5.	2.293	1.087	218.15	896.78	2.473E+06
6.	2.295	1.087	215.31	879.26	2.393E+06
7.	2.299	1.087	218.55	903.68	2.525E+06
8.	2.299	1.087	226.57	893.87	2.423E+06
9.	2.299	1.087	218.45	892.23	2.458E+06
10.	2.305	1.087	221.12	878.63	2.356E+06

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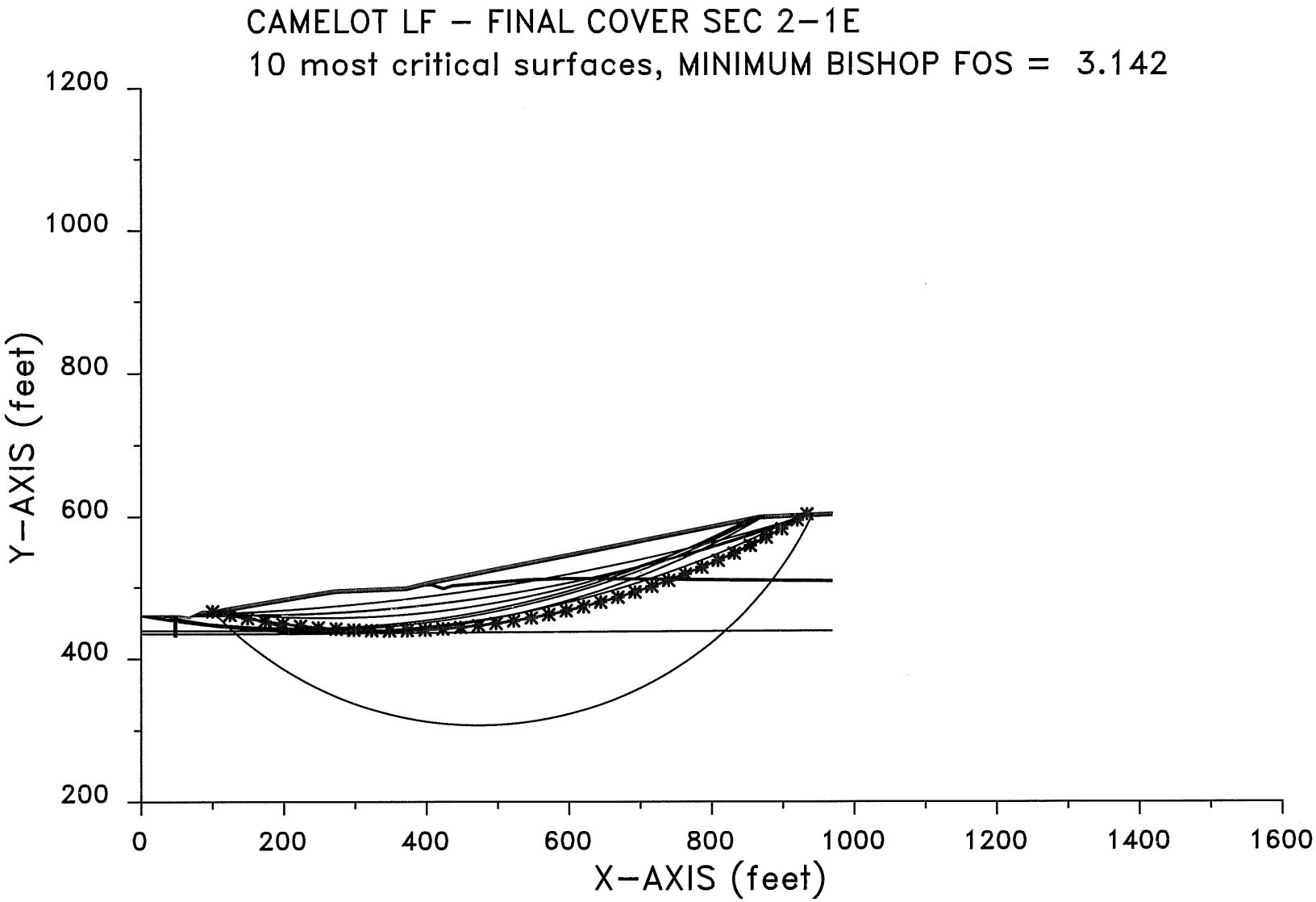

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Problem Description : CAMELOT LF - FINAL COVER SEC 2-1E

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = .0 ft
and x = 100.0 ft

Each surface terminates between x = 842.0 ft
and x = 942.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

25.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 36 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	100.00	466.42
2	124.46	461.26
3	149.03	456.64
4	173.70	452.57
5	198.45	449.04
6	223.27	446.06
7	248.15	443.62
8	273.08	441.74
9	298.04	440.40
10	323.03	439.62
11	348.03	439.38
12	373.03	439.70
13	398.01	440.57
14	422.97	441.99
15	447.89	443.95
16	472.77	446.47
17	497.58	449.54
18	522.32	453.15
19	546.97	457.30
20	571.52	462.00
21	595.97	467.24
22	620.29	473.02
23	644.48	479.33
24	668.53	486.17
25	692.42	493.54
26	716.14	501.44
27	739.68	509.85
28	763.03	518.79
29	786.17	528.23
30	809.11	538.19
31	831.81	548.65
32	854.29	559.60
33	876.51	571.05
34	898.48	582.99
35	920.18	595.40
36	933.82	603.62

**** Simplified BISHOP FOS = 3.142 ****

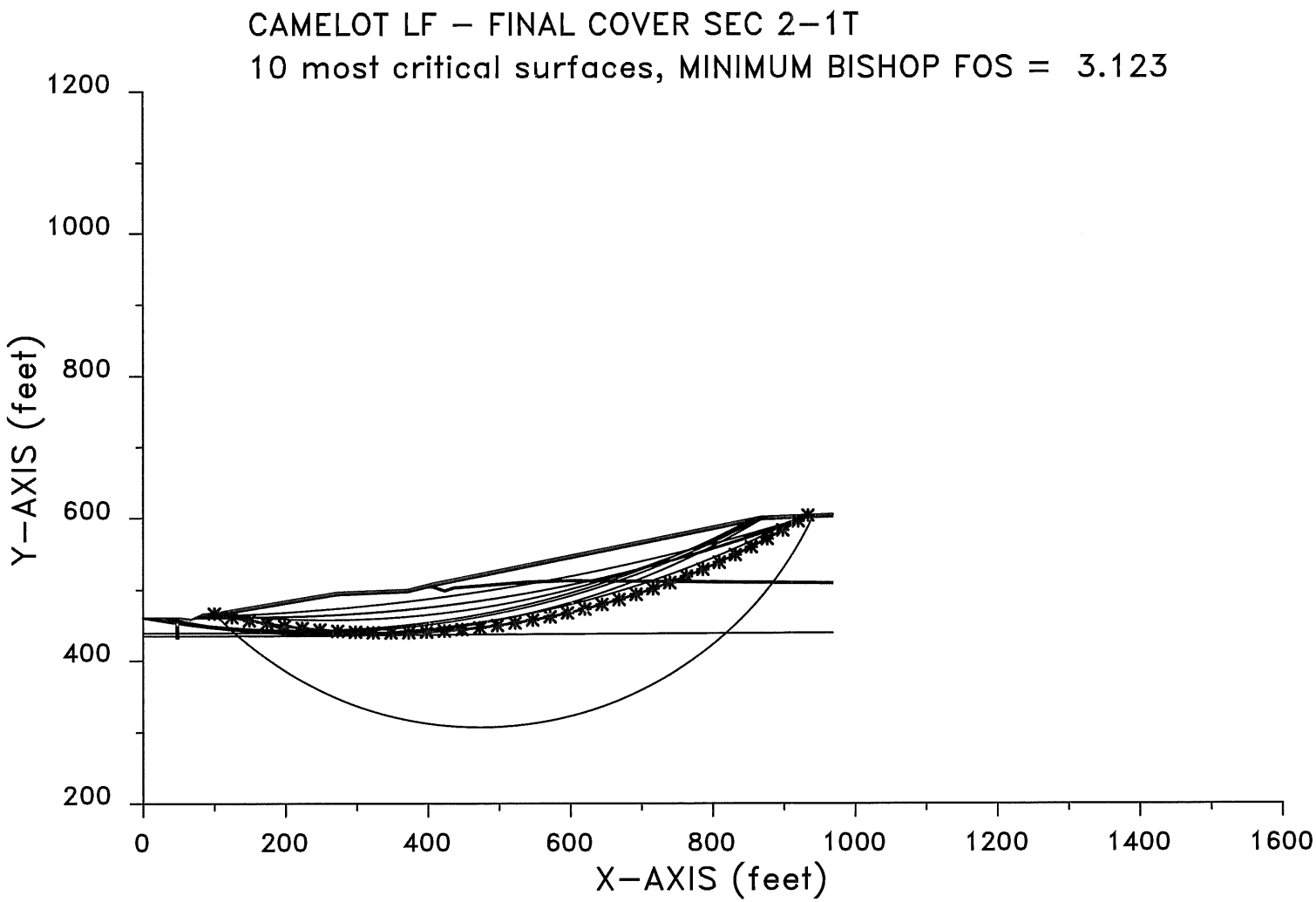
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 2-1E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.142	346.15	1573.35	1133.97	100.00	933.82	1.844E+09
2.	3.341	257.47	1834.27	1376.89	100.00	869.73	1.416E+09
3.	3.350	254.55	1882.56	1445.16	.00	926.81	2.351E+09
4.	3.352	272.46	1610.24	1174.83	33.33	874.19	1.738E+09
5.	3.480	231.32	1788.13	1348.12	.00	870.33	1.855E+09
6.	3.484	154.51	2663.07	2201.78	77.78	933.16	2.281E+09
7.	3.486	148.73	2741.94	2280.42	77.78	941.90	2.388E+09
8.	3.495	226.58	1793.82	1351.12	11.11	856.67	1.732E+09
9.	3.785	-3.82	3672.38	3210.78	77.78	941.53	2.679E+09
10.	3.944	473.59	824.82	517.71	100.00	941.77	2.225E+09

* * * END OF FILE * * *

2-1T 2-16-16 17:04



XSTABL File: 2-1T 2-16-16 17:04

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 2-1T

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = .0 ft
and x = 100.0 ft

Each surface terminates between x = 842.0 ft
and x = 942.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

25.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 36 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	100.00	466.42
2	124.46	461.26
3	149.03	456.64
4	173.70	452.57
5	198.45	449.04
6	223.27	446.06
7	248.15	443.62
8	273.08	441.74
9	298.04	440.40
10	323.03	439.62
11	348.03	439.38
12	373.03	439.70
13	398.01	440.57
14	422.97	441.99
15	447.89	443.95
16	472.77	446.47
17	497.58	449.54
18	522.32	453.15
19	546.97	457.30
20	571.52	462.00
21	595.97	467.24
22	620.29	473.02
23	644.48	479.33
24	668.53	486.17
25	692.42	493.54
26	716.14	501.44
27	739.68	509.85
28	763.03	518.79
29	786.17	528.23
30	809.11	538.19
31	831.81	548.65
32	854.29	559.60
33	876.51	571.05
34	898.48	582.99
35	920.18	595.40
36	933.82	603.62

**** Simplified BISHOP FOS = 3.123 ****

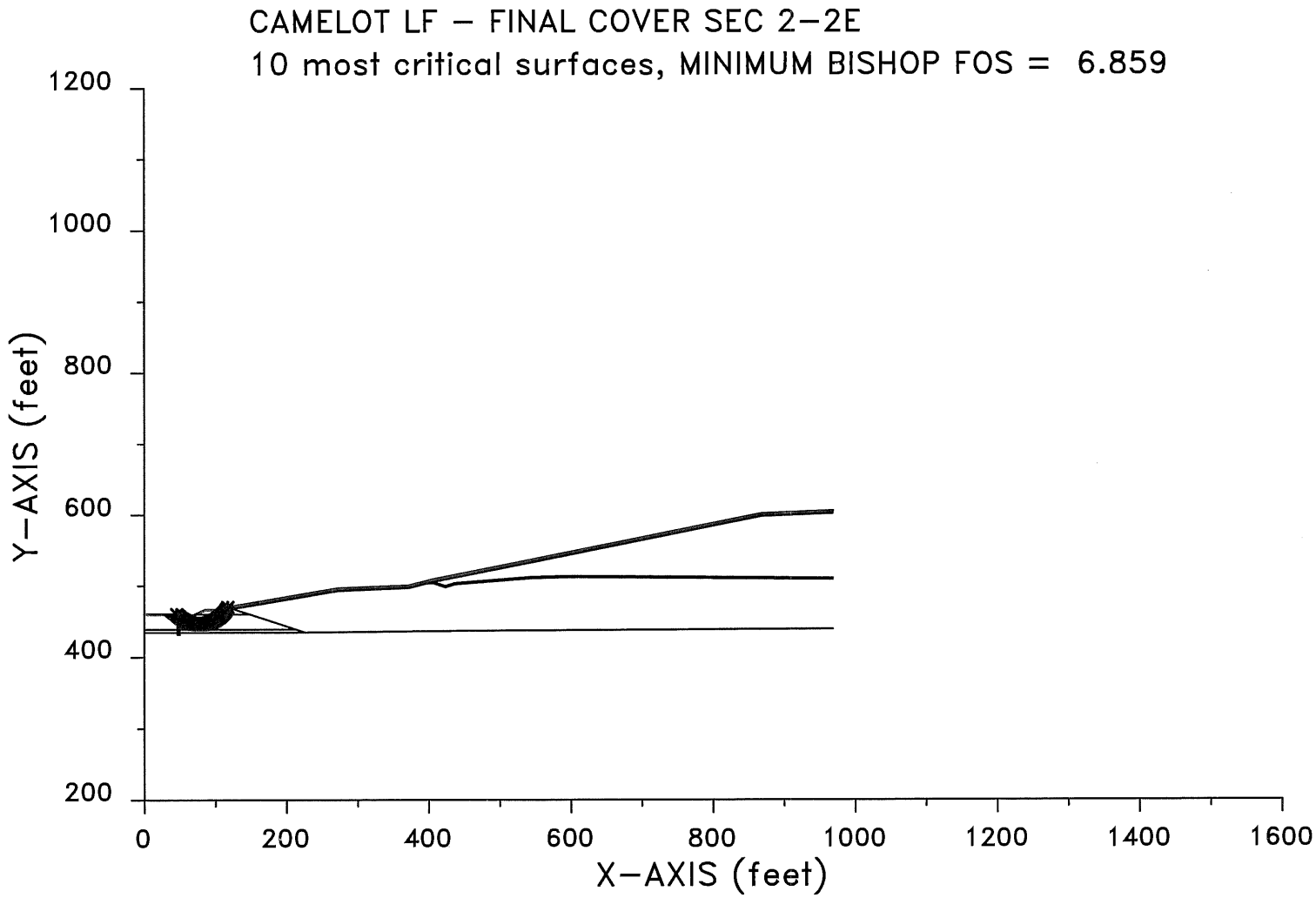
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 2-1T

	FOS (BISHOP)	Circle x-coord (ft)	Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.123	346.15	1573.35	1133.97	100.00	933.82	1.833E+09
2.	3.283	272.46	1610.24	1174.83	33.33	874.19	1.702E+09
3.	3.297	254.55	1882.56	1445.16	.00	926.81	2.314E+09
4.	3.312	257.47	1834.27	1376.89	100.00	869.73	1.404E+09
5.	3.438	154.51	2663.07	2201.78	77.78	933.16	2.251E+09
6.	3.441	148.73	2741.94	2280.42	77.78	941.90	2.358E+09
7.	3.452	231.32	1788.13	1348.12	.00	870.33	1.840E+09
8.	3.467	226.58	1793.82	1351.12	11.11	856.67	1.718E+09
9.	3.730	-3.82	3672.38	3210.78	77.78	941.53	2.640E+09
10.	3.934	473.59	824.82	517.71	100.00	941.77	2.219E+09

* * * END OF FILE * * *

2-2E 2-16-16 16:53



XSTABL File: 2-2E 2-16-16 16:53

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 2-2E

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 10.0 ft
and x = 50.0 ft

Each surface terminates between x = 80.0 ft
and x = 120.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

2.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

```
************************************************************
**     Factor of safety calculation for surface #     2    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  36.2992    **
**    This will be ignored for final summary of results    **
************************************************************
```

```
Circular surface (FOS= 36.2992) is defined by: xcenter =     46.33
ycenter =    540.86   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #     3    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  30.3174    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 30.3174) is defined by: xcenter =     47.83
ycenter =    613.39   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #     5    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  83.0997    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 83.0997) is defined by: xcenter =     43.24
ycenter =    567.01   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #     6    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  20.7143    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 20.7143) is defined by: xcenter =     51.15
ycenter =    602.73   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #     7    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  49.6348    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 49.6348) is defined by: xcenter =     44.64
```

```
ycenter =    593.05   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #     8    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  32.4557    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 32.4557) is defined by: xcenter =     47.05
ycenter =    501.46   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    10    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  45.3151    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 45.3151) is defined by: xcenter =     45.46
ycenter =    535.02   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    11    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  38.3336    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 38.3336) is defined by: xcenter =     48.33
ycenter =    500.38   Init. Pt. =     14.44   Seg. Length =   2.00
-------------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    13    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  40.7779    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 40.7779) is defined by: xcenter =     48.35
ycenter =    493.56   Init. Pt. =     14.44   Seg. Length =   2.00
```

```
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    14    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was 179.3295    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS=179.3295) is defined by: xcenter =     46.73
ycenter =    490.87   Init. Pt. =     14.44   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    18    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  30.1254    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 30.1254) is defined by: xcenter =     48.95
ycenter =    647.03   Init. Pt. =     14.44   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    20    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  22.0680    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 22.0680) is defined by: xcenter =     50.81
ycenter =    516.89   Init. Pt. =     14.44   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    23    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  30.2986    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 30.2986) is defined by: xcenter =     51.49
ycenter =    601.21   Init. Pt. =     18.89   Seg. Length =   2.00
-----------------------------------------------------------------
```

```
**********************************************************
**     Factor of safety calculation for surface #    24    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  26.0078    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 26.0078) is defined by: xcenter =     51.70
ycenter =    531.25   Init. Pt. =     18.89   Seg. Length =   2.00
-------------------------------------------------------------------


**********************************************************
**     Factor of safety calculation for surface #    27    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  21.0787    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 21.0787) is defined by: xcenter =     54.35
ycenter =    555.37   Init. Pt. =     18.89   Seg. Length =   2.00
-------------------------------------------------------------------


**********************************************************
**     Factor of safety calculation for surface #    30    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  24.5398    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 24.5398) is defined by: xcenter =     52.67
ycenter =    626.47   Init. Pt. =     18.89   Seg. Length =   2.00
-------------------------------------------------------------------


**********************************************************
**     Factor of safety calculation for surface #    42    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  30.0056    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 30.0056) is defined by: xcenter =     54.39
ycenter =    515.58   Init. Pt. =     27.78   Seg. Length =   2.00
-------------------------------------------------------------------
```

```
**************************************************************
**     Factor of safety calculation for surface #    45     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  36.1070     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS= 36.1070) is defined by: xcenter =     54.26
ycenter =    486.45   Init. Pt. =     27.78   Seg. Length =   2.00
-------------------------------------------------------------------


**************************************************************
**     Factor of safety calculation for surface #    47     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  30.0596     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS= 30.0596) is defined by: xcenter =     55.09
ycenter =    590.82   Init. Pt. =     27.78   Seg. Length =   2.00
-------------------------------------------------------------------


**************************************************************
**     Factor of safety calculation for surface #    48     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  21.9710     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS= 21.9710) is defined by: xcenter =     57.21
ycenter =    611.83   Init. Pt. =     27.78   Seg. Length =   2.00
-------------------------------------------------------------------


*********************************************************************
        --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)

*********************************************************************
     This warning is usually reported for cases where slices near the toe
     of the slide mass have steep, negative base angles.  Generally, this
     error condition can be avoided by "raising" the lower angular limit
     boundary to prevent generation of such deep failure surfaces.

*********************************************************************


        Surface No:    51        Slice No:  1        m_alpha =  -.100620
```

```
Alpha =  -25.38 deg     Phi =  11.00 deg        FOS =   .083


    ************************************************************
    **     Factor of safety calculation for surface #    51    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was 171.6721    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS=171.6721) is defined by: xcenter =     53.96
ycenter =    503.48   Init. Pt. =     32.22   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    54    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  53.2366    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 53.2366) is defined by: xcenter =     55.54
ycenter =    482.06   Init. Pt. =     32.22   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    55    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  22.6489    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 22.6489) is defined by: xcenter =     59.06
ycenter =    582.95   Init. Pt. =     32.22   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    68    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  26.6086    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 26.6086) is defined by: xcenter =     58.58
ycenter =    484.12   Init. Pt. =     36.67   Seg. Length =   2.00
```

```
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    70    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  56.5717    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 56.5717) is defined by: xcenter =     57.35
ycenter =    480.52   Init. Pt. =     36.67   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    74    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  43.1538    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 43.1538) is defined by: xcenter =     59.60
ycenter =    477.58   Init. Pt. =     41.11   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    77    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  23.4047    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 23.4047) is defined by: xcenter =     60.62
ycenter =    493.16   Init. Pt. =     41.11   Seg. Length =   2.00
-----------------------------------------------------------------


*********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)

*********************************************************************
      This warning is usually reported for cases where slices near the toe
      of the slide mass have steep, negative base angles.  Generally, this
      error condition can be avoided by "raising" the lower angular limit
      boundary to prevent generation of such deep failure surfaces.

*********************************************************************
```

```
Surface No:    84        Slice No:  1        m_alpha =  -.103407
Alpha =  -24.92 deg      Phi =  11.00 deg        FOS =   .081


**************************************************************
**     Factor of safety calculation for surface #    84     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was 263.8987     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS=263.8987) is defined by: xcenter =     60.10
ycenter =    488.94   Init. Pt. =     45.56   Seg. Length =   2.00
-------------------------------------------------------------------


**************************************************************
**     Factor of safety calculation for surface #    90     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  39.8924     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS= 39.8924) is defined by: xcenter =     61.58
ycenter =    483.81   Init. Pt. =     45.56   Seg. Length =   2.00
-------------------------------------------------------------------


*********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)

*********************************************************************
      This warning is usually reported for cases where slices near the toe
      of the slide mass have steep, negative base angles.  Generally, this
      error condition can be avoided by "raising" the lower angular limit
      boundary to prevent generation of such deep failure surfaces.

*********************************************************************


Surface No:    98        Slice No:  1        m_alpha =  -.119302
Alpha =  -22.57 deg      Phi =  11.00 deg        FOS =   .072


**************************************************************
**     Factor of safety calculation for surface #    98     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  76.6334     **
```

```
**    This will be ignored for final summary of results    **
*************************************************************
```

Circular surface (FOS= 76.6334) is defined by: xcenter = 62.56
ycenter = 487.62 Init. Pt. = 50.00 Seg. Length = 2.00

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 44 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	45.56	460.00
2	46.99	458.60
3	48.48	457.27
4	50.03	456.01
5	51.63	454.81
6	53.29	453.69
7	54.99	452.64
8	56.74	451.67
9	58.53	450.78
10	60.36	449.97
11	62.22	449.24
12	64.11	448.59
13	66.03	448.03
14	67.98	447.55
15	69.94	447.16
16	71.91	446.86
17	73.90	446.65
18	75.90	446.52
19	77.90	446.49
20	79.90	446.54
21	81.89	446.68
22	83.88	446.91
23	85.86	447.22
24	87.81	447.63
25	89.75	448.12
26	91.67	448.69
27	93.56	449.35
28	95.41	450.10
29	97.23	450.92
30	99.02	451.82
31	100.76	452.81
32	102.46	453.87
33	104.10	455.00
34	105.70	456.21
35	107.24	457.48

36	108.72	458.82
37	110.14	460.23
38	111.50	461.70
39	112.79	463.23
40	114.02	464.81
41	115.17	466.45
42	116.24	468.13
43	117.25	469.86
44	117.35	470.06

**** Simplified BISHOP FOS = 6.859 ****

```
*******************************************************************
**                                                               **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**       30 surfaces were found to have MISLEADING FOS values.   **
**                                                               **
*******************************************************************
```

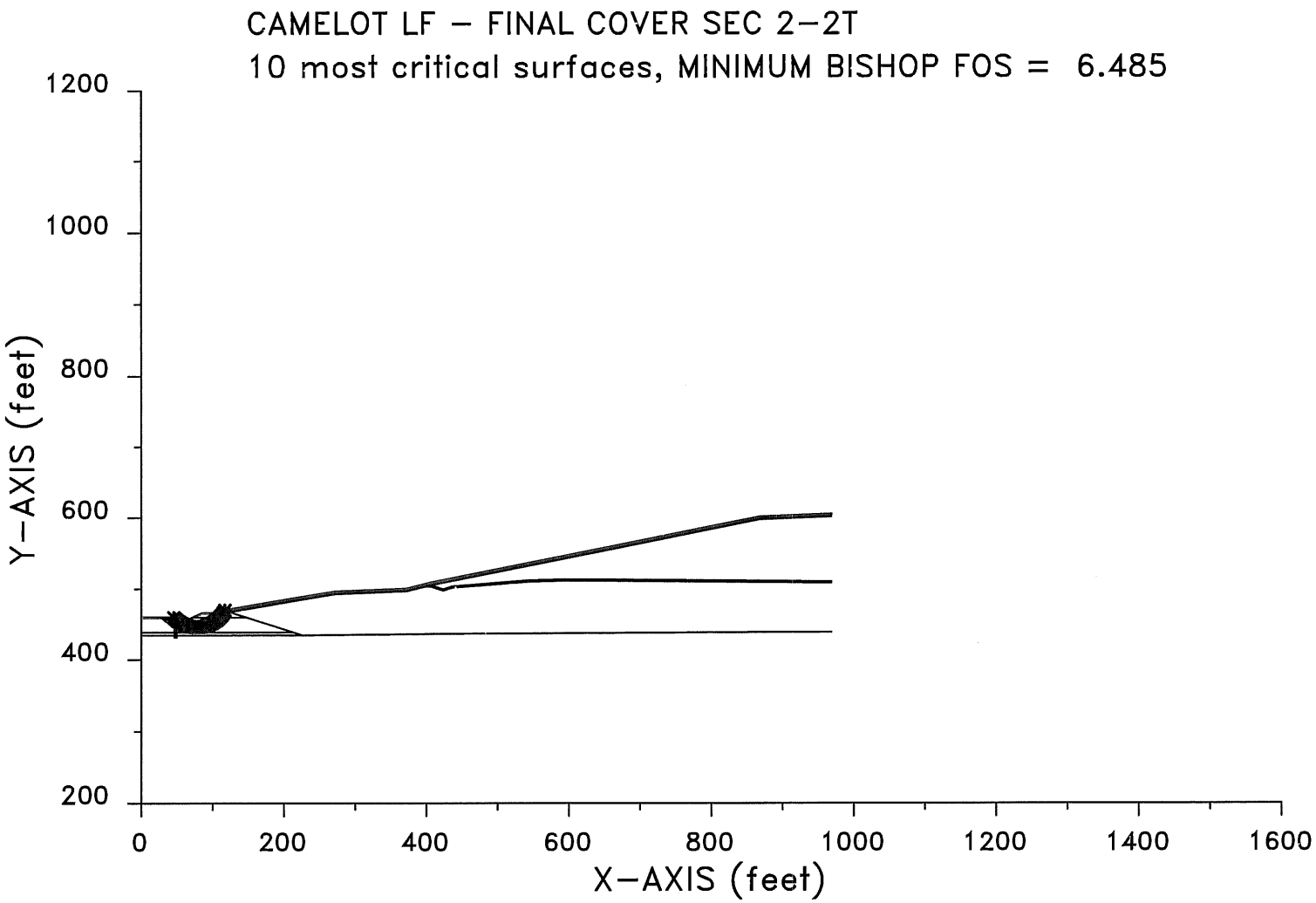
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 2-2E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	6.859	77.74	491.56	45.07	45.56	117.35	4.042E+06
2.	6.872	76.12	493.60	48.53	41.11	118.67	4.801E+06
3.	6.902	77.58	492.60	45.70	45.56	117.34	4.050E+06
4.	7.442	73.92	492.91	46.47	41.11	113.99	4.202E+06
5.	7.685	69.52	503.19	60.06	27.78	119.93	7.102E+06
6.	7.743	78.56	507.42	55.36	50.00	119.76	4.334E+06
7.	7.771	78.54	508.15	55.97	50.00	119.94	4.378E+06
8.	8.080	70.02	508.43	61.43	32.22	118.09	6.223E+06
9.	8.103	73.79	515.67	64.55	41.11	119.88	5.496E+06
10.	8.158	69.97	511.04	63.49	32.22	118.66	6.377E+06

* * * END OF FILE * * *

2-2T 2-16-16 17:09



XSTABL File: 2-2T 2-16-16 17:09

```
*****************************************
*              X S T A B L              *
*                                       *
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*               using the               *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 2-2T

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 10.0 ft
and x = 50.0 ft

Each surface terminates between x = 80.0 ft
and x = 120.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

2.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

```
**********************************************************
**     Factor of safety calculation for surface #     2    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  33.2997    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 33.2997) is defined by: xcenter =     46.33
ycenter =    540.86   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


**********************************************************
**     Factor of safety calculation for surface #     3    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  27.2355    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 27.2355) is defined by: xcenter =     47.83
ycenter =    613.39   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


**********************************************************
**     Factor of safety calculation for surface #     5    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  74.9605    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 74.9605) is defined by: xcenter =     43.24
ycenter =    567.01   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


**********************************************************
**     Factor of safety calculation for surface #     7    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  44.6759    **
**    This will be ignored for final summary of results    **
**********************************************************


Circular surface (FOS= 44.6759) is defined by: xcenter =     44.64
ycenter =    593.05   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------
```

```
    ************************************************************
    **     Factor of safety calculation for surface #     8    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  30.3803    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 30.3803) is defined by: xcenter =     47.05
ycenter =    501.46   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    10    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  41.5721    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 41.5721) is defined by: xcenter =     45.46
ycenter =    535.02   Init. Pt. =     10.00   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    11    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  35.6930    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 35.6930) is defined by: xcenter =     48.33
ycenter =    500.38   Init. Pt. =     14.44   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    13    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  38.1466    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 38.1466) is defined by: xcenter =     48.35
ycenter =    493.56   Init. Pt. =     14.44   Seg. Length =   2.00
-------------------------------------------------------------------
```

```
**************************************************************
**     Factor of safety calculation for surface #    14     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was 167.7292     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS=167.7292) is defined by: xcenter =     46.73
ycenter =    490.87   Init. Pt. =     14.44   Seg. Length =   2.00
-------------------------------------------------------------------


**************************************************************
**     Factor of safety calculation for surface #    18     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  26.7691     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS= 26.7691) is defined by: xcenter =     48.95
ycenter =    647.03   Init. Pt. =     14.44   Seg. Length =   2.00
-------------------------------------------------------------------


**************************************************************
**     Factor of safety calculation for surface #    20     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  20.4750     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS= 20.4750) is defined by: xcenter =     50.81
ycenter =    516.89   Init. Pt. =     14.44   Seg. Length =   2.00
-------------------------------------------------------------------


**************************************************************
**     Factor of safety calculation for surface #    23     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  27.0134     **
**    This will be ignored for final summary of results     **
**************************************************************


Circular surface (FOS= 27.0134) is defined by: xcenter =     51.49
ycenter =    601.21   Init. Pt. =     18.89   Seg. Length =   2.00
-------------------------------------------------------------------
```

```
    ************************************************************
    **     Factor of safety calculation for surface #    24    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  23.8125    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 23.8125) is defined by: xcenter =     51.70
ycenter =    531.25   Init. Pt. =     18.89   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    30    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  21.8844    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 21.8844) is defined by: xcenter =     52.67
ycenter =    626.47   Init. Pt. =     18.89   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    42    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  27.2767    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 27.2767) is defined by: xcenter =     54.39
ycenter =    515.58   Init. Pt. =     27.78   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    45    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  33.4564    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 33.4564) is defined by: xcenter =     54.26
ycenter =    486.45   Init. Pt. =     27.78   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
```

```
**     Factor of safety calculation for surface #    47    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  26.5453    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 26.5453) is defined by: xcenter =     55.09
ycenter =    590.82   Init. Pt. =     27.78   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    51    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was 162.1087    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS=162.1087) is defined by: xcenter =     53.96
ycenter =    503.48   Init. Pt. =     32.22   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    54    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  49.2928    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 49.2928) is defined by: xcenter =     55.54
ycenter =    482.06   Init. Pt. =     32.22   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    68    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  24.4385    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 24.4385) is defined by: xcenter =     58.58
ycenter =    484.12   Init. Pt. =     36.67   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    70    **
```

```
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  52.1822    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 52.1822) is defined by: xcenter =     57.35
ycenter =    480.52   Init. Pt. =     36.67   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    74    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  39.7231    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 39.7231) is defined by: xcenter =     59.60
ycenter =    477.58   Init. Pt. =     41.11   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    77    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  21.1692    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 21.1692) is defined by: xcenter =     60.62
ycenter =    493.16   Init. Pt. =     41.11   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    84    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was 253.0871    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS=253.0871) is defined by: xcenter =     60.10
ycenter =    488.94   Init. Pt. =     45.56   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    90    **
    **     failed to converge within FIFTY iterations          **
```

```
**                                                          **
**    The last calculated value of the FOS was  36.0055     **
**    This will be ignored for final summary of results     **
*************************************************************

Circular surface (FOS= 36.0055) is defined by: xcenter =     61.58
ycenter =    483.81   Init. Pt. =     45.56   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    98     **
**     failed to converge within FIFTY iterations           **
**                                                          **
**    The last calculated value of the FOS was  72.6477     **
**    This will be ignored for final summary of results     **
*************************************************************

Circular surface (FOS= 72.6477) is defined by: xcenter =     62.56
ycenter =    487.62   Init. Pt. =     50.00   Seg. Length =   2.00
-------------------------------------------------------------------

Factors of safety have been calculated by the :

* * * * *   SIMPLIFIED BISHOP METHOD   * * * * *

  The most critical circular failure surface
  is specified by 44 coordinate points

       Point      x-surf      y-surf
        No.        (ft)        (ft)

         1         45.56      460.00
         2         46.99      458.60
         3         48.48      457.27
         4         50.03      456.01
         5         51.63      454.81
         6         53.29      453.69
         7         54.99      452.64
         8         56.74      451.67
         9         58.53      450.78
        10         60.36      449.97
        11         62.22      449.24
        12         64.11      448.59
        13         66.03      448.03
        14         67.98      447.55
        15         69.94      447.16
        16         71.91      446.86
        17         73.90      446.65
        18         75.90      446.52
        19         77.90      446.49
```

20	79.90	446.54
21	81.89	446.68
22	83.88	446.91
23	85.86	447.22
24	87.81	447.63
25	89.75	448.12
26	91.67	448.69
27	93.56	449.35
28	95.41	450.10
29	97.23	450.92
30	99.02	451.82
31	100.76	452.81
32	102.46	453.87
33	104.10	455.00
34	105.70	456.21
35	107.24	457.48
36	108.72	458.82
37	110.14	460.23
38	111.50	461.70
39	112.79	463.23
40	114.02	464.81
41	115.17	466.45
42	116.24	468.13
43	117.25	469.86
44	117.35	470.06

**** Simplified BISHOP FOS = 6.485 ****

```
*******************************************************************
**                                                               **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**       26 surfaces were found to have MISLEADING FOS values.    **
**                                                               **
*******************************************************************
```

The following is a summary of the TEN most critical surfaces

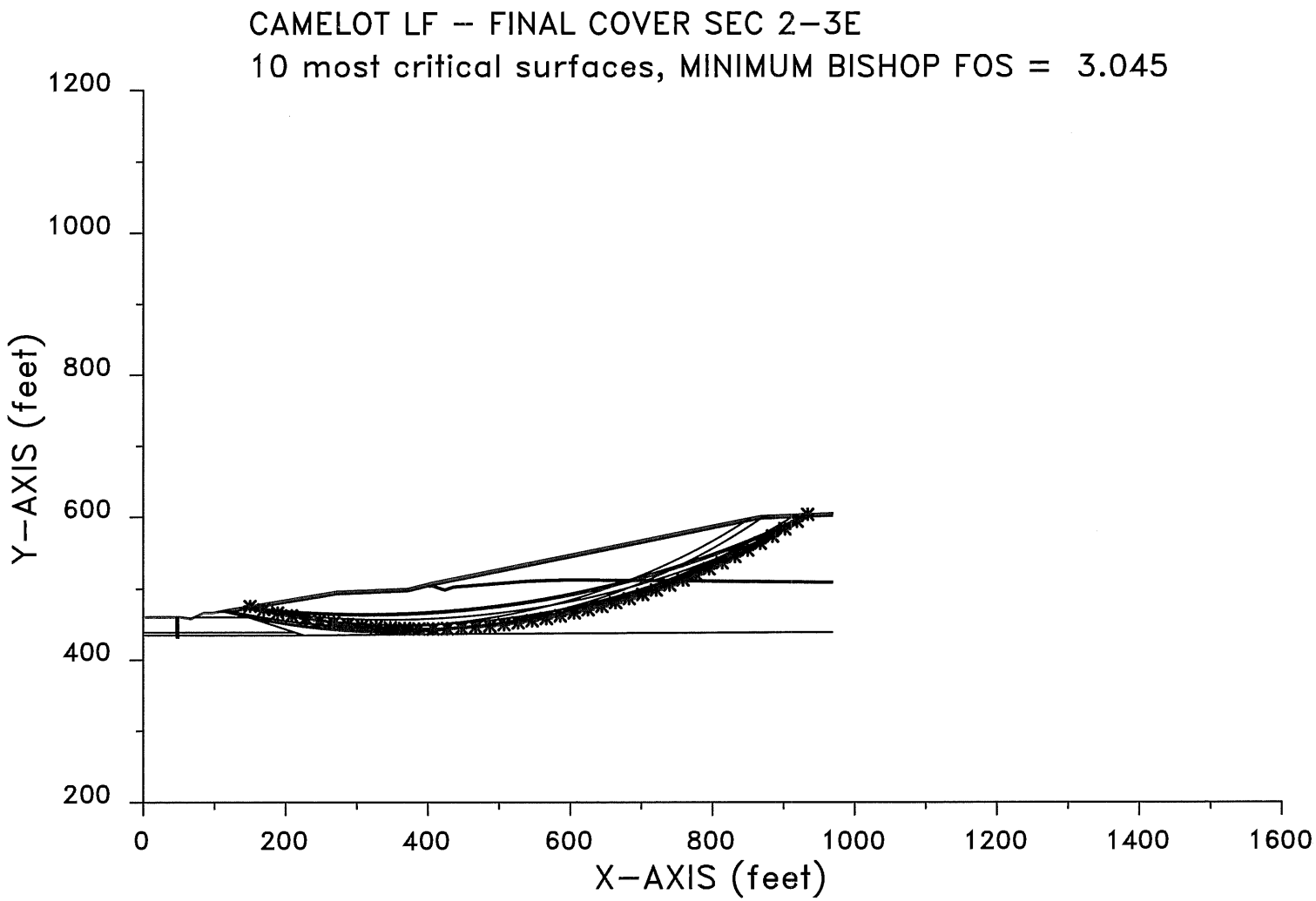
Problem Description : CAMELOT LF - FINAL COVER SEC 2-2T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	6.485	77.74	491.56	45.07	45.56	117.35	3.821E+06
2.	6.512	76.12	493.60	48.53	41.11	118.67	4.550E+06
3.	6.517	77.58	492.60	45.70	45.56	117.34	3.824E+06
4.	7.016	73.92	492.91	46.47	41.11	113.99	3.961E+06
5.	7.184	78.56	507.42	55.36	50.00	119.76	4.021E+06
6.	7.207	78.54	508.15	55.97	50.00	119.94	4.060E+06
7.	7.290	69.52	503.19	60.06	27.78	119.93	6.737E+06

8.	7.532	73.79	515.67	64.55	41.11	119.88	5.108E+06
9.	7.594	70.02	508.43	61.43	32.22	118.09	5.848E+06
10.	7.656	69.97	511.04	63.49	32.22	118.66	5.984E+06

* * * END OF FILE * * *

2-3E 2-16-16 10:58



XSTABL File: 2-3E 2-16-16 10:58

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 2-3E

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 90.0 ft
and x = 150.0 ft

Each surface terminates between x = 842.0 ft
and x = 942.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 42 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	150.00	475.59
2	169.40	470.73
3	188.89	466.26
4	208.48	462.19
5	228.14	458.52
6	247.87	455.26
7	267.66	452.40
8	287.51	449.94
9	307.41	447.89
10	327.34	446.25
11	347.30	445.01
12	367.28	444.19
13	387.28	443.77
14	407.28	443.76
15	427.27	444.16
16	447.26	444.96
17	467.22	446.18
18	487.16	447.80
19	507.05	449.84
20	526.90	452.27
21	546.70	455.11
22	566.43	458.36
23	586.10	462.01
24	605.68	466.06
25	625.18	470.51
26	644.59	475.35
27	663.89	480.60
28	683.08	486.23
29	702.15	492.26
30	721.09	498.67
31	739.90	505.47
32	758.57	512.66
33	777.08	520.22
34	795.44	528.16
35	813.63	536.48
36	831.64	545.16
37	849.48	554.21
38	867.12	563.62
39	884.57	573.39
40	901.82	583.52
41	918.86	594.00
42	933.81	603.62

**** Simplified BISHOP FOS = 3.045 ****

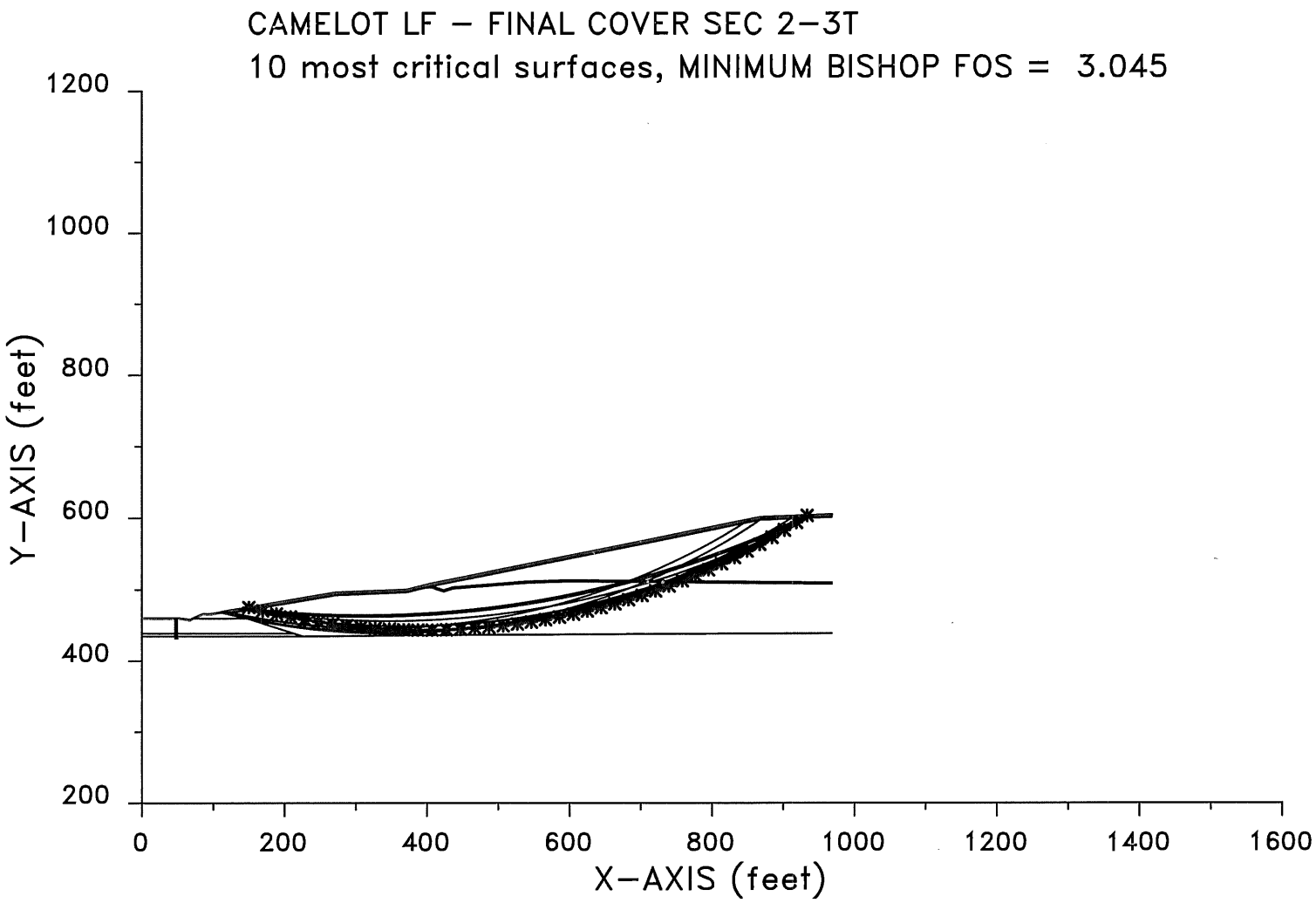
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 2-3E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.045	397.75	1422.31	978.60	150.00	933.81	1.495E+09
2.	3.060	367.49	1560.55	1111.45	136.67	932.68	1.572E+09
3.	3.061	361.02	1573.56	1130.36	116.67	941.94	1.754E+09
4.	3.061	369.49	1586.07	1136.83	136.67	941.92	1.639E+09
5.	3.088	344.41	1738.58	1282.19	136.67	941.46	1.659E+09
6.	3.110	352.82	1499.16	1058.78	110.00	916.56	1.630E+09
7.	3.130	315.71	1909.42	1447.20	136.67	940.06	1.680E+09
8.	3.144	311.29	1926.31	1461.53	143.33	932.91	1.595E+09
9.	3.153	330.24	1423.67	977.36	116.67	853.00	1.178E+09
10.	3.168	344.52	1381.59	942.63	110.00	873.16	1.338E+09

* * * END OF FILE * * *

2-3T 2-16-16 11:16



XSTABL File: 2-3T 2-16-16 11:16

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 2-3T

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 90.0 ft
and x = 150.0 ft

Each surface terminates between x = 842.0 ft
and x = 942.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 42 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	150.00	475.59
2	169.40	470.73
3	188.89	466.26
4	208.48	462.19
5	228.14	458.52
6	247.87	455.26
7	267.66	452.40
8	287.51	449.94
9	307.41	447.89
10	327.34	446.25
11	347.30	445.01
12	367.28	444.19
13	387.28	443.77
14	407.28	443.76
15	427.27	444.16
16	447.26	444.96
17	467.22	446.18
18	487.16	447.80
19	507.05	449.84
20	526.90	452.27
21	546.70	455.11
22	566.43	458.36
23	586.10	462.01
24	605.68	466.06
25	625.18	470.51
26	644.59	475.35
27	663.89	480.60
28	683.08	486.23
29	702.15	492.26
30	721.09	498.67
31	739.90	505.47
32	758.57	512.66
33	777.08	520.22
34	795.44	528.16
35	813.63	536.48
36	831.64	545.16
37	849.48	554.21
38	867.12	563.62
39	884.57	573.39
40	901.82	583.52
41	918.86	594.00
42	933.81	603.62

**** Simplified BISHOP FOS = 3.045 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 2-3T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.045	397.75	1422.31	978.60	150.00	933.81	1.495E+09
2.	3.060	367.49	1560.55	1111.45	136.67	932.68	1.572E+09
3.	3.061	361.02	1573.56	1130.36	116.67	941.94	1.754E+09
4.	3.061	369.49	1586.07	1136.83	136.67	941.92	1.639E+09
5.	3.088	344.41	1738.58	1282.19	136.67	941.46	1.659E+09
6.	3.096	352.82	1499.16	1058.78	110.00	916.56	1.623E+09
7.	3.130	315.71	1909.42	1447.20	136.67	940.06	1.680E+09
8.	3.144	311.29	1926.31	1461.53	143.33	932.91	1.595E+09
9.	3.150	344.52	1381.59	942.63	110.00	873.16	1.331E+09
10.	3.153	330.24	1423.67	977.36	116.67	853.00	1.178E+09

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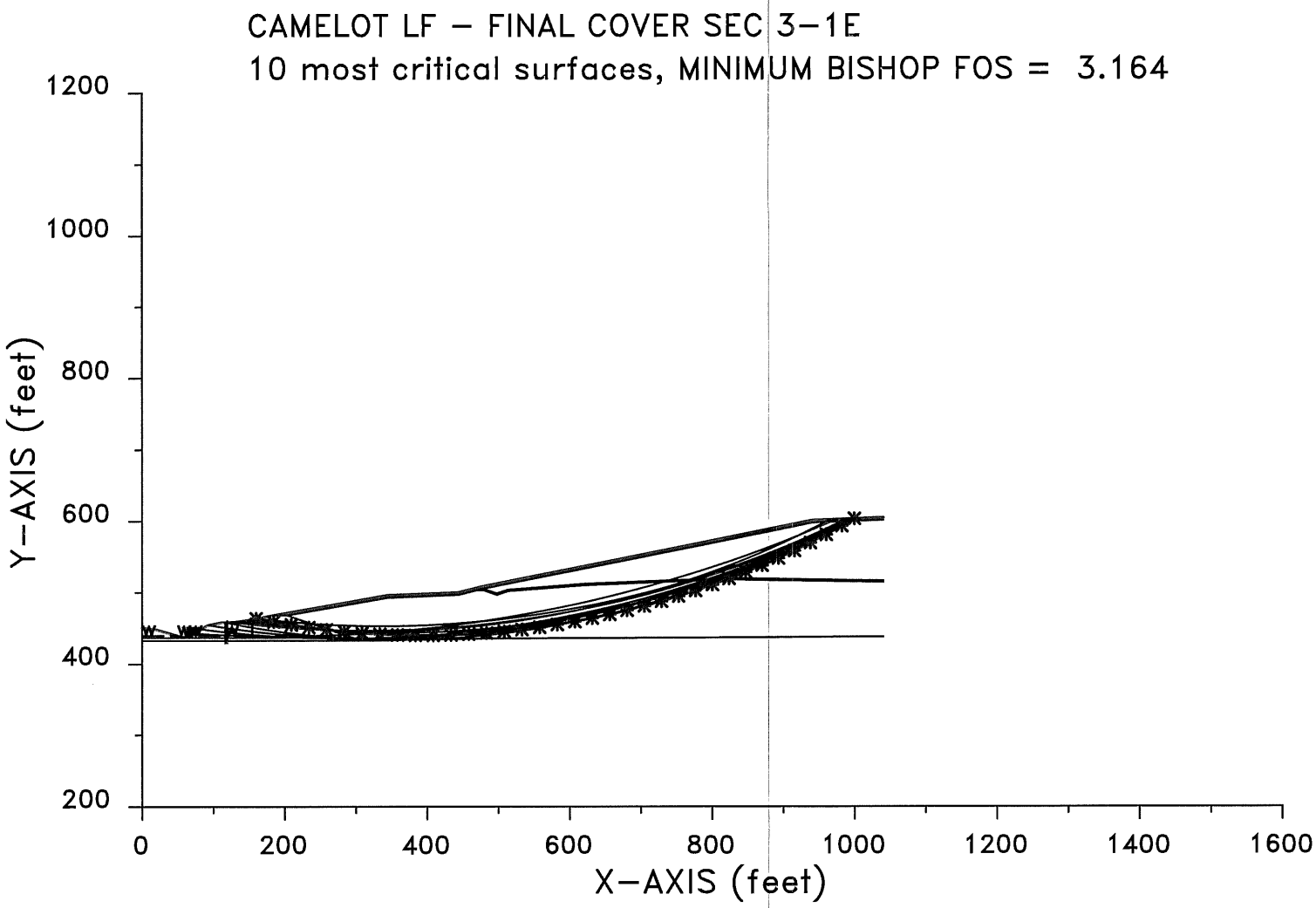

XSTABL File: 3-1E 2-16-16 18:13

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
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*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 3-1E

SEGMENT BOUNDARY COORDINATES

---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	183.6	467.7	203.5	467.7	7

2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	1

2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 60.0 ft
and x = 160.0 ft

Each surface terminates between x = 950.0 ft
and x = 1000.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

25.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 36 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	160.00	463.43
2	184.57	458.80
3	209.23	454.68
4	233.96	451.07
5	258.77	447.98
6	283.64	445.40
7	308.55	443.35
8	333.51	441.81
9	358.49	440.79
10	383.48	440.28
11	408.48	440.30
12	433.47	440.84
13	458.45	441.90
14	483.40	443.48
15	508.31	445.57
16	533.18	448.18
17	557.98	451.31
18	582.71	454.96
19	607.37	459.12
20	631.93	463.79
21	656.38	468.96
22	680.73	474.65
23	704.95	480.84
24	729.04	487.54
25	752.98	494.73
26	776.77	502.42
27	800.39	510.60
28	823.84	519.27
29	847.10	528.43
30	870.17	538.07
31	893.03	548.18

32	915.68	558.77
33	938.10	569.83
34	960.29	581.35
35	982.23	593.33
36	999.75	603.38

**** Simplified BISHOP FOS = 3.164 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 3-1E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.164	395.08	1642.60	1202.37	160.00	999.75	1.900E+09
2.	3.198	364.29	1785.20	1341.18	148.89	998.25	1.989E+09
3.	3.235	359.69	1694.58	1260.35	115.56	989.60	2.075E+09
4.	3.252	337.00	1944.44	1491.55	160.00	988.95	1.886E+09
5.	3.260	317.12	1987.61	1541.01	126.67	993.74	2.133E+09
6.	3.268	331.45	1809.93	1364.10	137.78	965.20	1.802E+09
7.	3.270	325.08	1877.02	1441.41	93.33	999.90	2.359E+09
8.	3.276	321.93	1869.15	1433.13	93.33	993.48	2.300E+09
9.	3.281	286.43	2037.25	1601.44	82.22	999.52	2.556E+09
10.	3.324	195.68	2377.25	1938.30	71.11	974.64	2.607E+09

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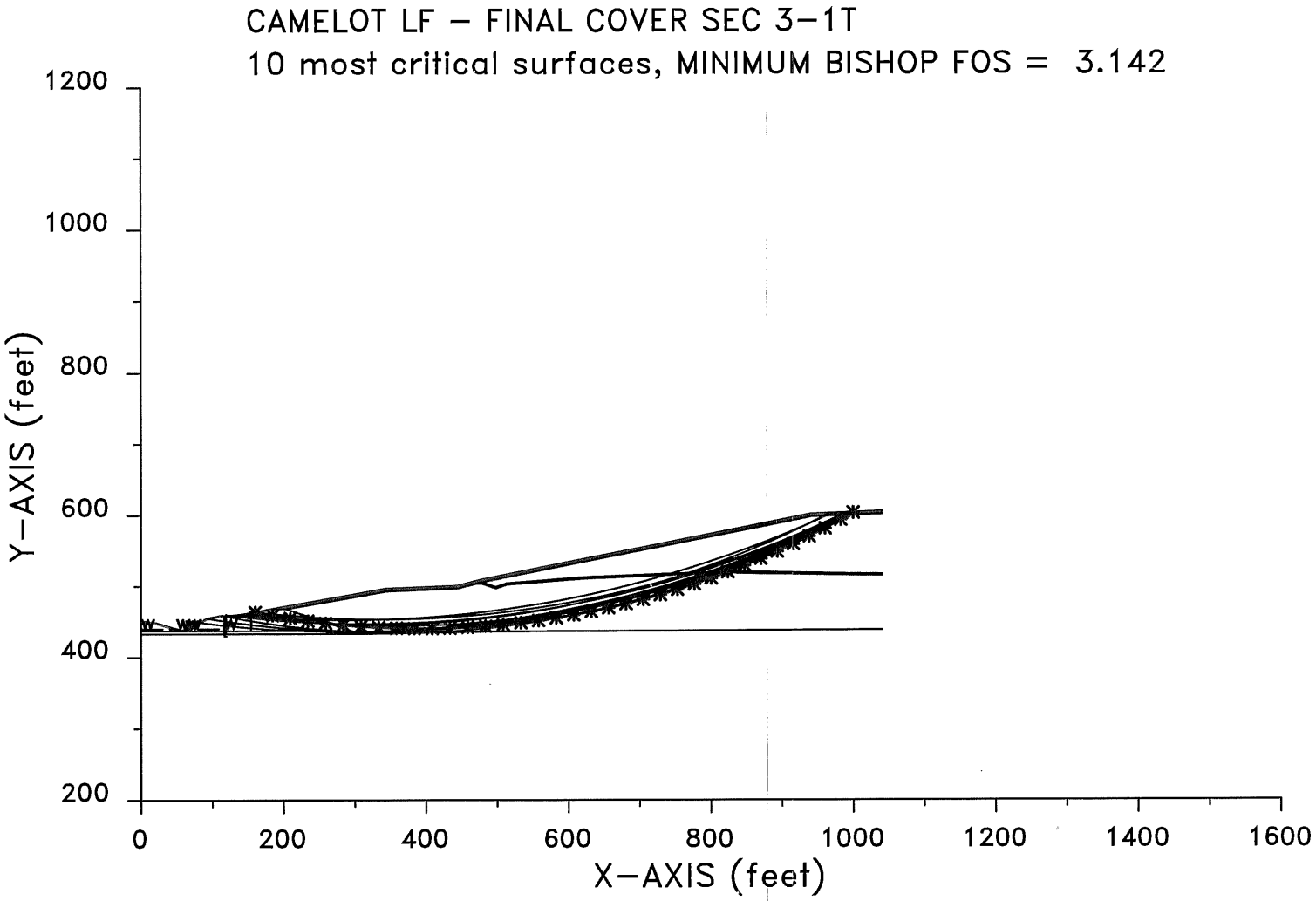

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*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
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*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 3-1T

SEGMENT BOUNDARY COORDINATES

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	183.6	467.7	203.5	467.7	7

2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	1

2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 60.0 ft
and x = 160.0 ft

Each surface terminates between x = 950.0 ft
and x = 1000.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

25.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 36 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	160.00	463.43
2	184.57	458.80
3	209.23	454.68
4	233.96	451.07
5	258.77	447.98
6	283.64	445.40
7	308.55	443.35
8	333.51	441.81
9	358.49	440.79
10	383.48	440.28
11	408.48	440.30
12	433.47	440.84
13	458.45	441.90
14	483.40	443.48
15	508.31	445.57
16	533.18	448.18
17	557.98	451.31
18	582.71	454.96
19	607.37	459.12

20	631.93	463.79
21	656.38	468.96
22	680.73	474.65
23	704.95	480.84
24	729.04	487.54
25	752.98	494.73
26	776.77	502.42
27	800.39	510.60
28	823.84	519.27
29	847.10	528.43
30	870.17	538.07
31	893.03	548.18
32	915.68	558.77
33	938.10	569.83
34	960.29	581.35
35	982.23	593.33
36	999.75	603.38

**** Simplified BISHOP FOS = 3.142 ****

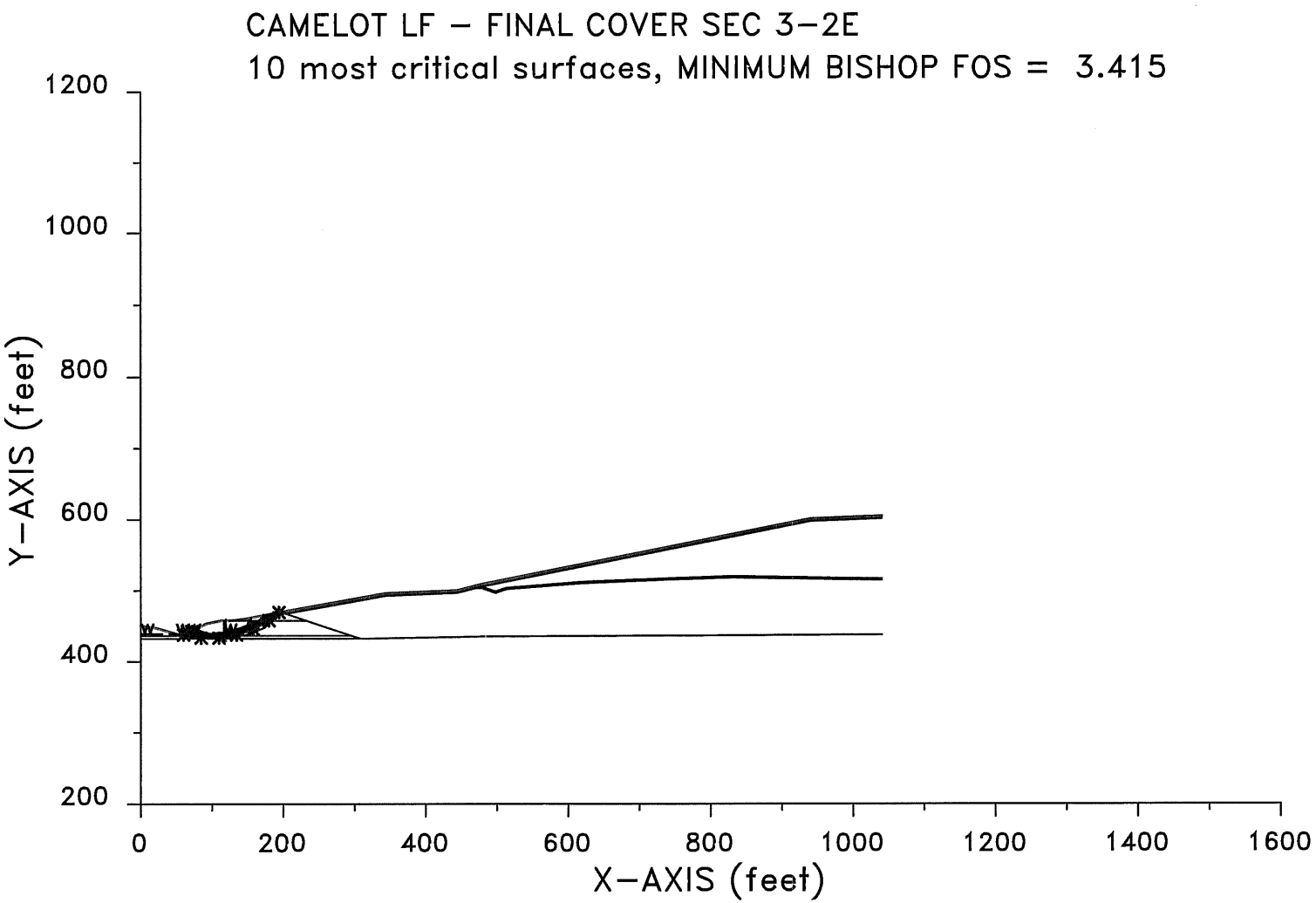
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 3-1T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.142	395.08	1642.60	1202.37	160.00	999.75	1.886E+09
2.	3.175	286.43	2037.25	1601.44	82.22	999.52	2.474E+09
3.	3.175	364.29	1785.20	1341.18	148.89	998.25	1.975E+09
4.	3.193	359.69	1694.58	1260.35	115.56	989.60	2.048E+09
5.	3.211	325.08	1877.02	1441.41	93.33	999.90	2.317E+09
6.	3.220	337.00	1944.44	1491.55	160.00	988.95	1.867E+09
7.	3.225	321.93	1869.15	1433.13	93.33	993.48	2.264E+09
8.	3.240	317.12	1987.61	1541.01	126.67	993.74	2.120E+09
9.	3.245	331.45	1809.93	1364.10	137.78	965.20	1.789E+09
10.	3.301	292.39	2057.87	1605.69	137.78	969.96	1.877E+09

* * * END OF FILE * * *

3-2E 2-16-16 18:17



XSTABL File: 3-2E 2-16-16 18:17

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 3-2E

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	183.6	467.7	203.5	467.7	7

2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	1

2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 60.0 ft
and x = 100.0 ft

Each surface terminates between x = 170.0 ft
and x = 200.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

25.0 ft line segments define each trial failure surface.

```
---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees


*********************************************************************
     --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

*********************************************************************
  Negative effective stresses were calculated at the base of a slice.
  This warning is usually reported for cases where slices have low self
  weight and a relatively high "c" shear strength parameter.  In such
  cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

     ------------------------------------------------------------
     USER SELECTED option to maintain strength greater than zero
     ------------------------------------------------------------


     ************************************************************
     **     Factor of safety calculation for surface #    69    **
     **     failed to converge within FIFTY iterations          **
     **                                                         **
     **    The last calculated value of the FOS was  35.7889    **
     **    This will be ignored for final summary of results    **
     ************************************************************


  Circular surface (FOS= 35.7889) is defined by: xcenter =    -55.73
  ycenter =   1624.18   Init. Pt. =     86.67   Seg. Length =  25.00
  ---------------------------------------------------------------------


     ************************************************************
     **     Factor of safety calculation for surface #    72    **
     **     failed to converge within FIFTY iterations          **
     **                                                         **
     **    The last calculated value of the FOS was  21.5831    **
     **    This will be ignored for final summary of results    **
     ************************************************************


  Circular surface (FOS= 21.5831) is defined by: xcenter =     98.38
  ycenter =    754.04   Init. Pt. =     91.11   Seg. Length =  25.00
  ---------------------------------------------------------------------
```

```
    ************************************************************
    **     Factor of safety calculation for surface #    73    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  40.3628    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 40.3628) is defined by: xcenter =     58.61
ycenter =   1018.84   Init. Pt. =     91.11   Seg. Length =  25.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    75    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  21.0746    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 21.0746) is defined by: xcenter =     96.81
ycenter =    774.63   Init. Pt. =     91.11   Seg. Length =  25.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    97    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  50.5046    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 50.5046) is defined by: xcenter =     99.09
ycenter =    767.16   Init. Pt. =    100.00   Seg. Length =  25.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    98    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  39.2359    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 39.2359) is defined by: xcenter =    111.59
ycenter =    647.43   Init. Pt. =    100.00   Seg. Length =  25.00
-------------------------------------------------------------------
```

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 7 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	60.00	438.10
2	84.65	433.91
3	109.65	433.90
4	134.30	438.07
5	157.90	446.30
6	179.80	458.37
7	193.83	469.52

**** Simplified BISHOP FOS = 3.415 ****

```
*******************************************************************
**                                                               **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**        6 surfaces were found to have MISLEADING FOS values.   **
**                                                               **
*******************************************************************
```

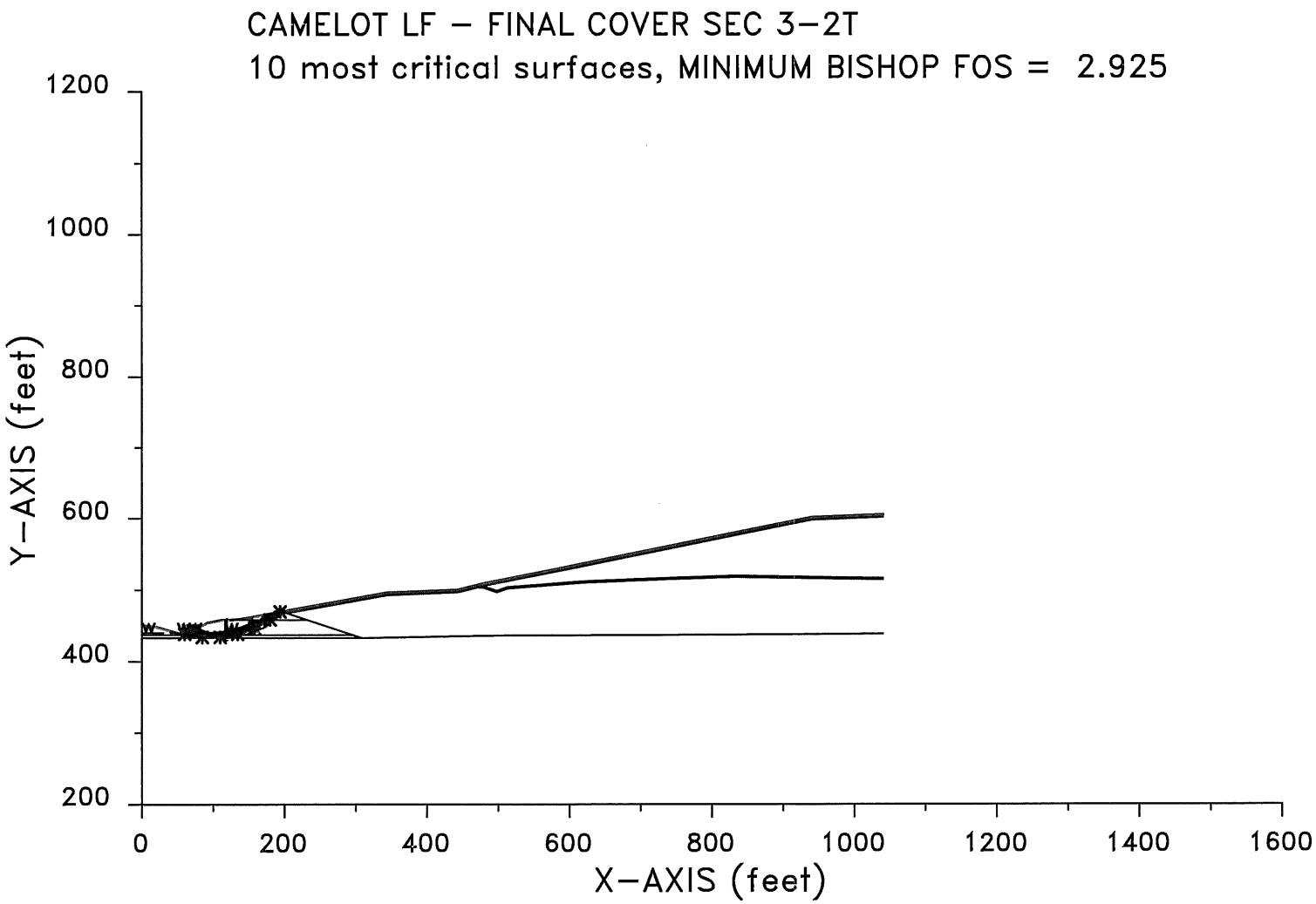
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 3-2E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.415	97.21	582.36	148.98	60.00	193.83	2.329E+07
2.	3.503	92.38	557.81	124.01	60.00	176.01	1.650E+07
3.	4.380	104.77	569.77	132.93	68.89	190.86	1.997E+07
4.	4.512	101.35	606.51	167.90	68.89	198.91	2.581E+07
5.	4.570	101.35	563.22	125.71	68.89	182.24	1.735E+07
6.	4.687	79.11	670.09	231.15	64.44	193.19	3.357E+07
7.	4.730	124.05	531.90	97.12	77.78	198.22	1.544E+07
8.	4.781	79.21	640.74	201.87	64.44	182.77	2.721E+07
9.	4.889	94.70	581.29	141.88	68.89	177.24	1.792E+07
10.	5.118	107.26	572.56	132.82	73.33	190.03	1.842E+07

* * * END OF FILE * * *

3-2T 2-16-16 18:21



XSTABL File: 3-2T 2-16-16 18:21

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 3-2T

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	183.6	467.7	203.5	467.7	7

2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	1

2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 60.0 ft
and x = 100.0 ft

```
Each surface terminates between   x =    170.0 ft
                              and   x =    200.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft


   25.0 ft line segments define each trial failure surface.



---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees



**********************************************************************
     --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

**********************************************************************
     Negative effective stresses were calculated at the base of a slice.
     This warning is usually reported for cases where slices have low self
     weight and a relatively high "c" shear strength parameter.  In such
     cases, this effect can only be eliminated by reducing the "c" value.

**********************************************************************

     ------------------------------------------------------------
     USER SELECTED option to maintain strength greater than zero
     ------------------------------------------------------------


     ************************************************************
     **     Factor of safety calculation for surface #    69    **
     **     failed to converge within FIFTY iterations          **
     **                                                         **
     **    The last calculated value of the FOS was  30.4017    **
     **    This will be ignored for final summary of results    **
     ************************************************************


     Circular surface (FOS= 30.4017) is defined by: xcenter =    -55.73
     ycenter =   1624.18   Init. Pt. =     86.67   Seg. Length =  25.00
     ---------------------------------------------------------------------


     ************************************************************
```

```
**     Factor of safety calculation for surface #    73    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  34.2276    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 34.2276) is defined by: xcenter =     58.61
ycenter =   1018.84   Init. Pt. =     91.11   Seg. Length =  25.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    97    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  42.3876    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 42.3876) is defined by: xcenter =     99.09
ycenter =    767.16   Init. Pt. =    100.00   Seg. Length =  25.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    98    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  33.7360    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 33.7360) is defined by: xcenter =    111.59
ycenter =    647.43   Init. Pt. =    100.00   Seg. Length =  25.00
-------------------------------------------------------------------


Factors of safety have been calculated by the :

* * * * *   SIMPLIFIED BISHOP METHOD   * * * * *


  The most critical circular failure surface
  is specified by  7 coordinate points

       Point      x-surf      y-surf
        No.        (ft)        (ft)

         1         60.00      438.10
         2         84.65      433.91
         3        109.65      433.90
```

4	134.30	438.07
5	157.90	446.30
6	179.80	458.37
7	193.83	469.52

**** Simplified BISHOP FOS = 2.925 ****

```
*****************************************************************
**                                                             **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**        4 surfaces were found to have MISLEADING FOS values.   **
**                                                             **
*****************************************************************
```

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 3-2T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.925	97.21	582.36	148.98	60.00	193.83	1.995E+07
2.	3.020	92.38	557.81	124.01	60.00	176.01	1.422E+07
3.	4.167	124.05	531.90	97.12	77.78	198.22	1.361E+07
4.	4.170	104.77	569.77	132.93	68.89	190.86	1.901E+07
5.	4.282	101.35	606.51	167.90	68.89	198.91	2.449E+07
6.	4.337	101.35	563.22	125.71	68.89	182.24	1.647E+07
7.	4.404	79.11	670.09	231.15	64.44	193.19	3.154E+07
8.	4.484	79.21	640.74	201.87	64.44	182.77	2.551E+07
9.	4.617	94.70	581.29	141.88	68.89	177.24	1.693E+07
10.	4.839	107.26	572.56	132.82	73.33	190.03	1.742E+07

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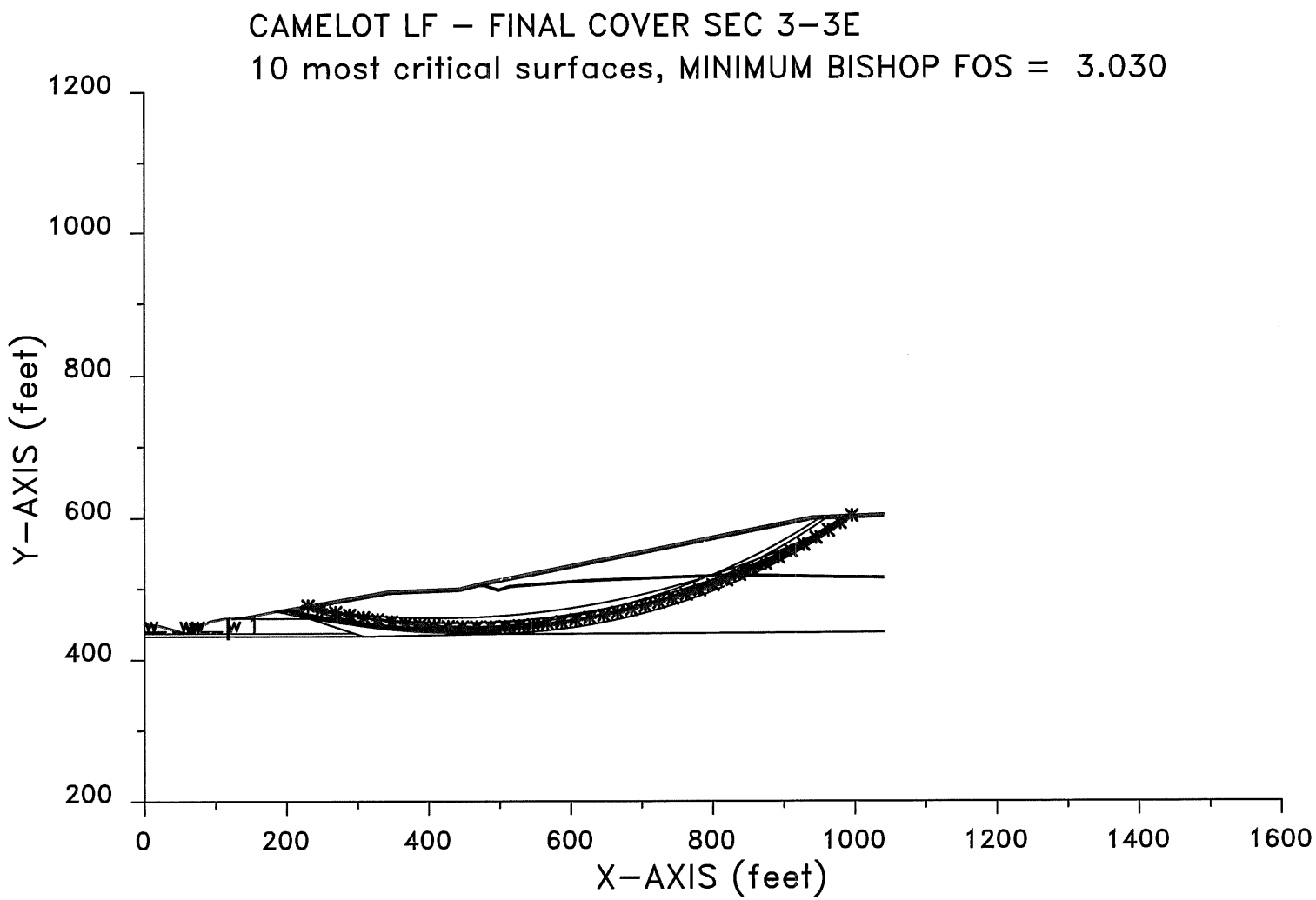
3-3E 2-16-16 18:05



XSTABL File: 3-3E 2-16-16 18:05

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
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*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 3-3E

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	183.6	467.7	203.5	467.7	7

2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	1

2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 180.0 ft
and x = 230.0 ft

Each surface terminates between x = 950.0 ft
and x = 1000.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 41 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	230.00	475.93
2	249.42	471.15
3	268.94	466.78
4	288.54	462.82
5	308.22	459.26
6	327.97	456.12
7	347.79	453.38
8	367.65	451.07
9	387.56	449.16
10	407.50	447.67
11	427.48	446.60
12	447.46	445.94
13	467.46	445.70
14	487.46	445.88
15	507.45	446.47
16	527.43	447.48
17	547.38	448.90
18	567.29	450.74
19	587.17	453.00
20	606.99	455.67
21	626.75	458.75
22	646.44	462.24
23	666.06	466.14
24	685.59	470.45
25	705.02	475.16
26	724.36	480.28
27	743.58	485.80
28	762.68	491.72
29	781.66	498.04
30	800.50	504.75
31	819.20	511.85

32	837.74	519.34
33	856.13	527.21
34	874.35	535.46
35	892.39	544.10
36	910.24	553.10
37	927.91	562.48
38	945.38	572.22
39	962.64	582.33
40	979.68	592.79
41	995.91	603.22

**** Simplified BISHOP FOS = 3.030 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 3-3E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.030	469.01	1405.67	959.97	230.00	995.91	1.398E+09
2.	3.035	476.62	1339.82	903.40	218.89	999.86	1.481E+09
3.	3.037	443.41	1487.74	1044.94	202.22	999.91	1.582E+09
4.	3.039	440.04	1439.57	999.62	196.67	986.95	1.521E+09
5.	3.043	440.22	1541.36	1090.10	218.89	995.26	1.464E+09
6.	3.044	440.49	1558.51	1106.96	218.89	999.92	1.497E+09
7.	3.054	438.49	1360.49	922.71	196.67	963.80	1.367E+09
8.	3.069	426.81	1410.32	965.78	202.22	954.61	1.282E+09
9.	3.073	415.28	1709.50	1251.05	218.89	999.71	1.516E+09
10.	3.108	424.20	1518.14	1076.87	185.56	991.88	1.656E+09

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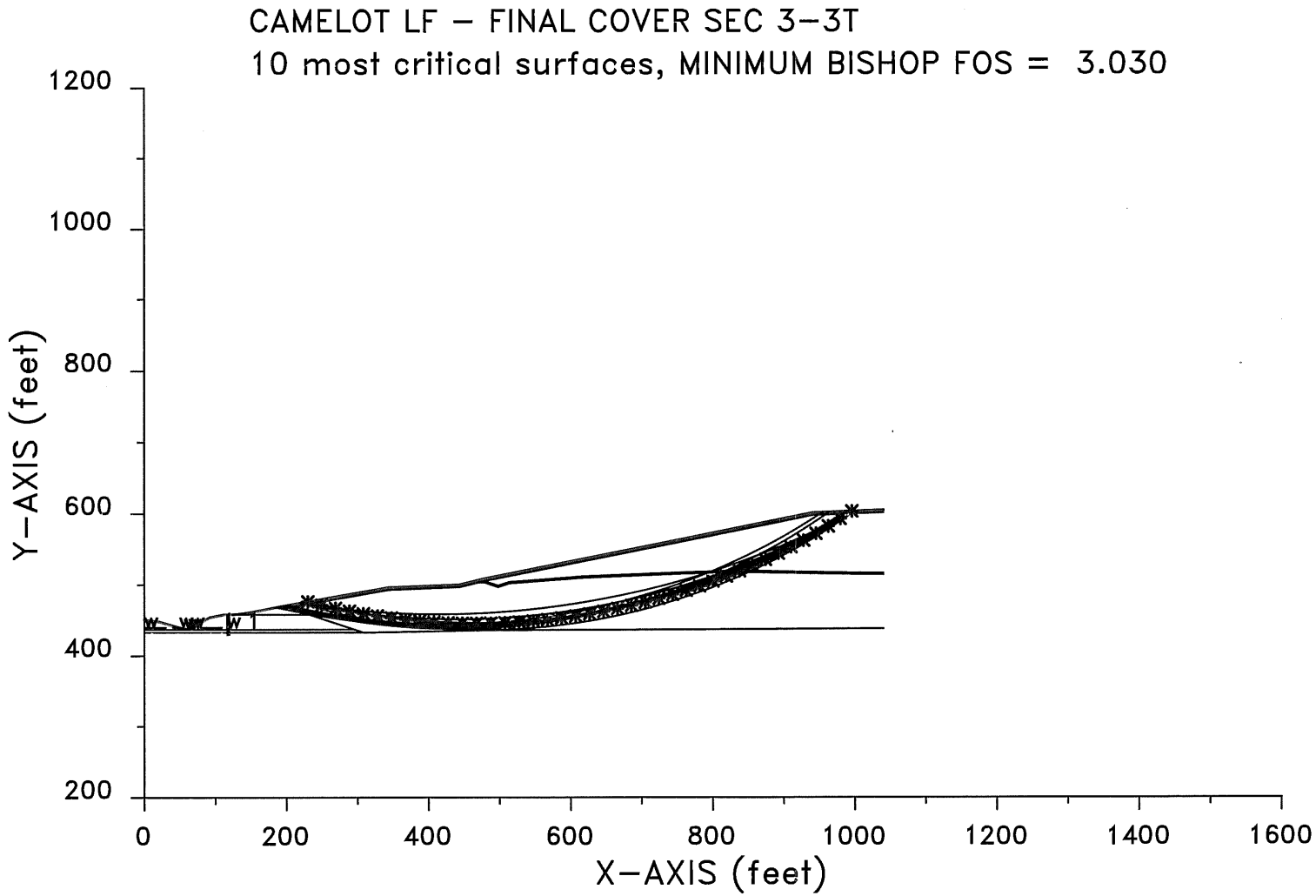

XSTABL File: 3-3T 2-16-16 18:23

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
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*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 3-3T

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	183.6	467.7	203.5	467.7	7

2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	1

2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 180.0 ft
and x = 230.0 ft

Each surface terminates between x = 950.0 ft
and x = 1000.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 41 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	230.00	475.93
2	249.42	471.15
3	268.94	466.78
4	288.54	462.82
5	308.22	459.26
6	327.97	456.12
7	347.79	453.38
8	367.65	451.07
9	387.56	449.16
10	407.50	447.67
11	427.48	446.60
12	447.46	445.94
13	467.46	445.70
14	487.46	445.88
15	507.45	446.47
16	527.43	447.48
17	547.38	448.90
18	567.29	450.74
19	587.17	453.00

20	606.99	455.67
21	626.75	458.75
22	646.44	462.24
23	666.06	466.14
24	685.59	470.45
25	705.02	475.16
26	724.36	480.28
27	743.58	485.80
28	762.68	491.72
29	781.66	498.04
30	800.50	504.75
31	819.20	511.85
32	837.74	519.34
33	856.13	527.21
34	874.35	535.46
35	892.39	544.10
36	910.24	553.10
37	927.91	562.48
38	945.38	572.22
39	962.64	582.33
40	979.68	592.79
41	995.91	603.22

**** Simplified BISHOP FOS = 3.030 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 3-3T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.030	469.01	1405.67	959.97	230.00	995.91	1.398E+09
2.	3.035	476.62	1339.82	903.40	218.89	999.86	1.481E+09
3.	3.037	443.41	1487.74	1044.94	202.22	999.91	1.582E+09
4.	3.039	440.04	1439.57	999.62	196.67	986.95	1.521E+09
5.	3.043	440.22	1541.36	1090.10	218.89	995.26	1.464E+09
6.	3.044	440.49	1558.51	1106.96	218.89	999.92	1.497E+09
7.	3.054	438.49	1360.49	922.71	196.67	963.80	1.367E+09
8.	3.069	426.81	1410.32	965.78	202.22	954.61	1.282E+09
9.	3.073	415.28	1709.50	1251.05	218.89	999.71	1.516E+09
10.	3.089	424.20	1518.14	1076.87	185.56	991.88	1.646E+09

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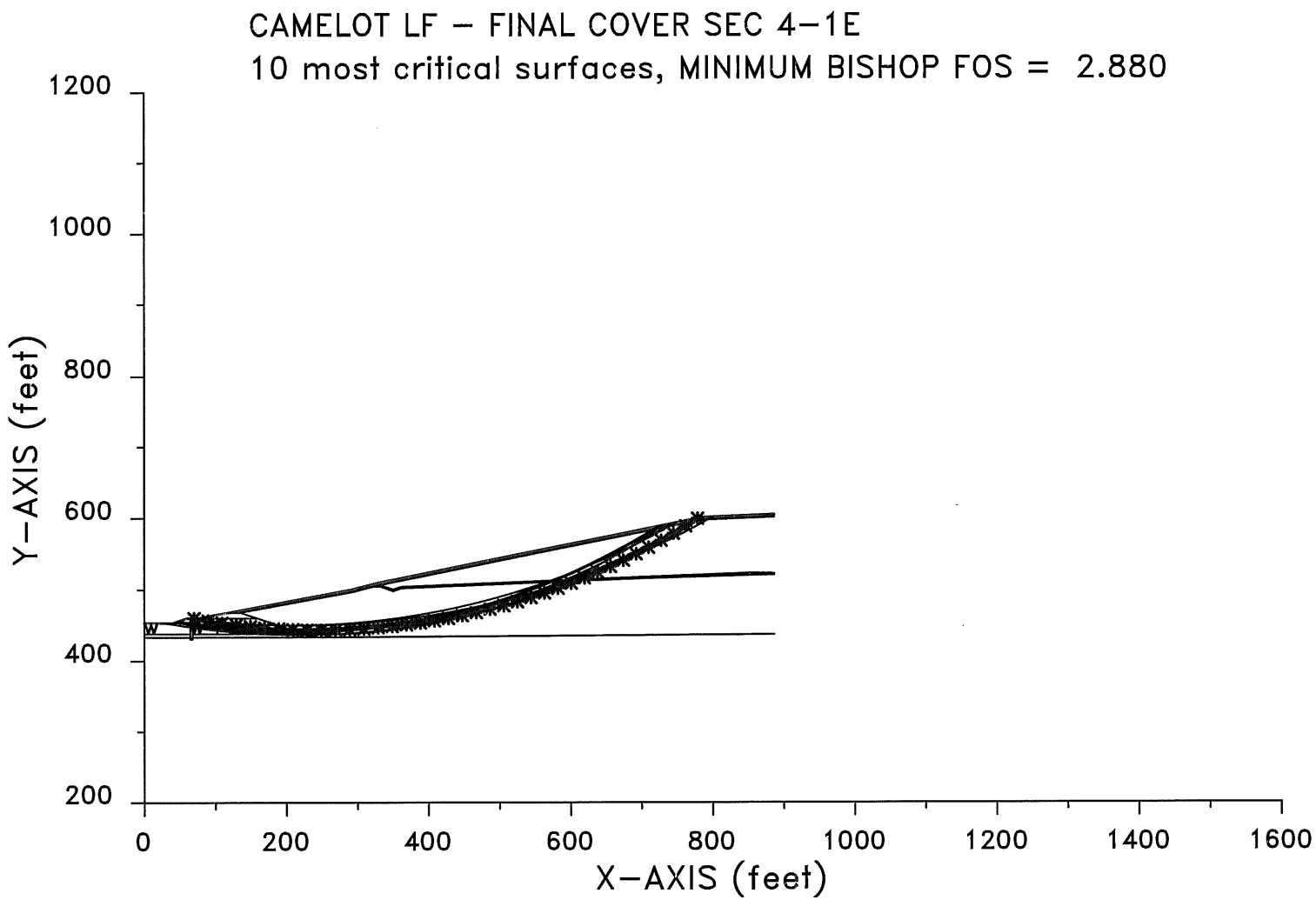

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*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 4-1E

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 30.0 ft
and x = 70.0 ft

Each surface terminates between x = 700.0 ft
and x = 800.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

```
---------------------
ANGULAR RESTRICTIONS
---------------------
```

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

****

-- WARNING -- WARNING -- WARNING -- WARNING -- (# 48)

****

Negative effective stresses were calculated at the base of a slice. This warning is usually reported for cases where slices have low self weight and a relatively high "c" shear strength parameter. In such cases, this effect can only be eliminated by reducing the "c" value.

****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 38 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	70.00	460.00
2	89.70	456.53
3	109.46	453.45
4	129.28	450.79
5	149.15	448.53
6	169.07	446.68
7	189.01	445.24
8	208.99	444.21
9	228.98	443.58
10	248.98	443.37
11	268.98	443.57
12	288.97	444.18
13	308.94	445.19
14	328.89	446.62
15	348.81	448.45
16	368.68	450.69
17	388.50	453.34
18	408.27	456.40
19	427.97	459.86
20	447.59	463.72
21	467.13	467.98
22	486.58	472.64
23	505.93	477.71
24	525.17	483.16
25	544.30	489.01
26	563.30	495.25
27	582.17	501.88
28	600.90	508.89
29	619.48	516.29

30	637.91	524.07
31	656.17	532.22
32	674.26	540.74
33	692.18	549.63
34	709.90	558.89
35	727.44	568.51
36	744.77	578.49
37	761.90	588.82
38	778.72	599.44

**** Simplified BISHOP FOS = 2.880 ****

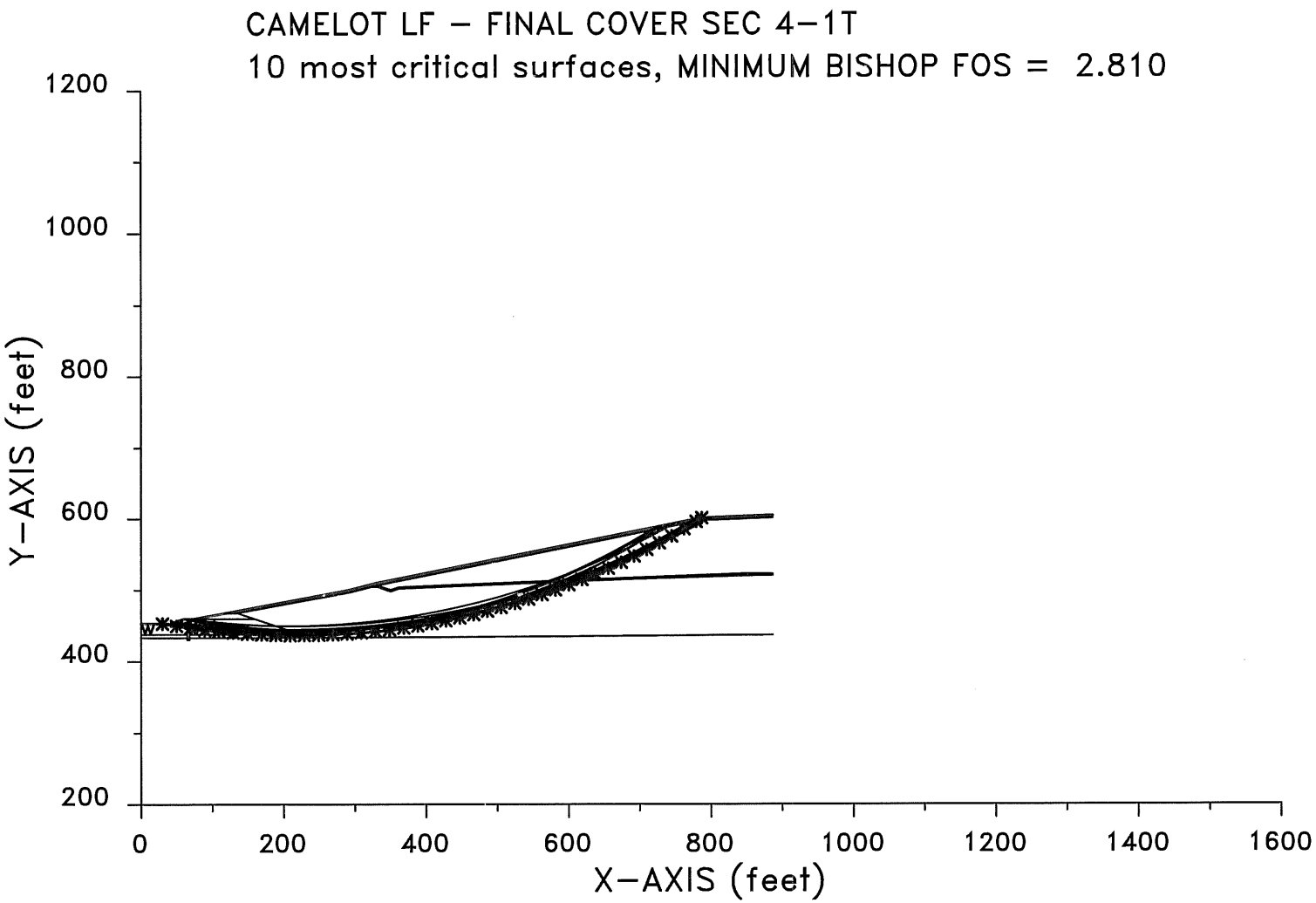
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 4-1E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.880	249.37	1419.11	975.74	70.00	778.72	1.184E+09
2.	2.888	220.27	1633.54	1183.70	65.56	800.00	1.351E+09
3.	2.899	208.98	1638.80	1193.82	47.78	799.99	1.453E+09
4.	2.914	218.42	1501.85	1065.35	30.00	787.10	1.421E+09
5.	2.918	209.14	1544.95	1103.06	43.33	776.46	1.328E+09
6.	2.931	238.55	1361.27	918.57	61.11	739.97	1.035E+09
7.	2.942	252.58	1262.56	825.09	61.11	730.08	9.826E+08
8.	2.954	208.14	1540.20	1090.16	61.11	748.39	1.097E+09
9.	2.967	210.75	1408.59	968.74	43.33	727.42	1.089E+09
10.	2.988	200.11	1425.04	986.52	30.00	722.50	1.116E+09

* * * END OF FILE * * *

4-1T 2-16-16 19:04



XSTABL File: 4-1T 2-16-16 19:04

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 4-1T

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress

have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 30.0 ft
and x = 70.0 ft

Each surface terminates between x = 700.0 ft
and x = 800.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 48)

****
Negative effective stresses were calculated at the base of a slice. This warning is usually reported for cases where slices have low self weight and a relatively high "c" shear strength parameter. In such cases, this effect can only be eliminated by reducing the "c" value.

****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 41 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	30.00	453.30
2	49.72	449.95
3	69.49	446.97
4	89.32	444.36
5	109.20	442.12
6	129.11	440.26
7	149.05	438.77
8	169.02	437.65
9	189.01	436.91
10	209.01	436.55
11	229.01	436.56
12	249.00	436.94
13	268.99	437.70
14	288.96	438.84
15	308.90	440.35
16	328.81	442.24
17	348.68	444.50

18	368.51	447.13
19	388.28	450.13
20	407.99	453.51
21	427.64	457.25
22	447.21	461.36
23	466.71	465.84
24	486.11	470.68
25	505.42	475.89
26	524.63	481.46
27	543.73	487.38
28	562.72	493.67
29	581.58	500.31
30	600.32	507.30
31	618.92	514.65
32	637.39	522.34
33	655.70	530.38
34	673.86	538.76
35	691.86	547.47
36	709.69	556.53
37	727.35	565.92
38	744.83	575.64
39	762.13	585.68
40	779.23	596.05
41	787.10	601.02

**** Simplified BISHOP FOS = 2.810 ****

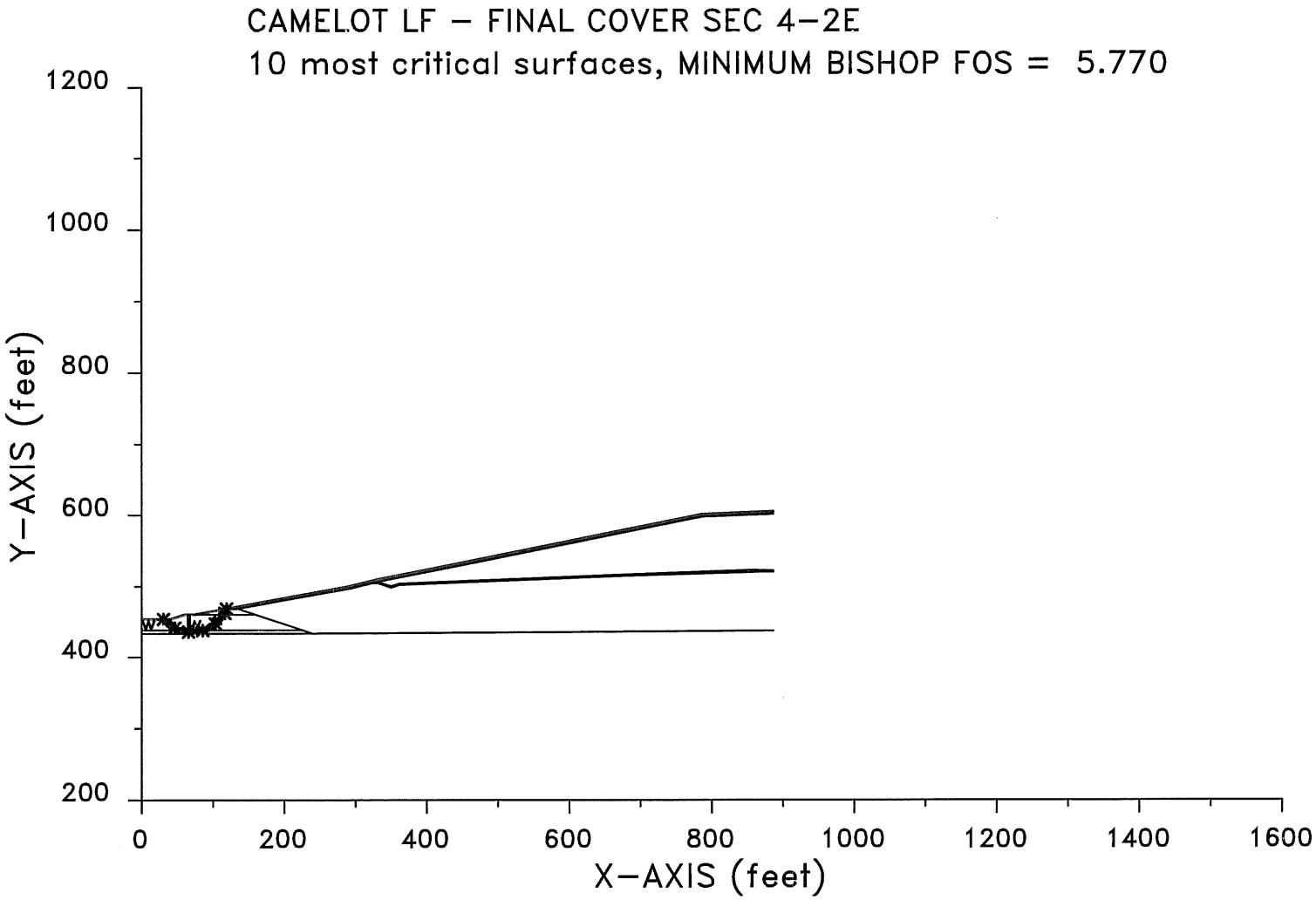
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 4-1T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.810	218.42	1501.85	1065.35	30.00	787.10	1.371E+09
2.	2.860	249.37	1419.11	975.74	70.00	778.72	1.176E+09
3.	2.870	220.27	1633.54	1183.70	65.56	800.00	1.343E+09
4.	2.879	208.98	1638.80	1193.82	47.78	799.99	1.443E+09
5.	2.897	209.14	1544.95	1103.06	43.33	776.46	1.318E+09
6.	2.909	238.55	1361.27	918.57	61.11	739.97	1.028E+09
7.	2.919	252.58	1262.56	825.09	61.11	730.08	9.747E+08
8.	2.933	208.14	1540.20	1090.16	61.11	748.39	1.089E+09
9.	2.944	210.75	1408.59	968.74	43.33	727.42	1.081E+09
10.	2.963	200.11	1425.04	986.52	30.00	722.50	1.107E+09

* * * END OF FILE * * *

4-2E 2-16-16 19:02



XSTABL File: 4-2E 2-16-16 19:02

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 4-2E

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 25.0 ft
and x = 50.0 ft

Each surface terminates between x = 100.0 ft
and x = 120.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

****

```
        -- WARNING -- WARNING -- WARNING -- WARNING -- (# 48)

*********************************************************************
     Negative effective stresses were calculated at the base of a slice.
     This warning is usually reported for cases where slices have low self
     weight and a relatively high "c" shear strength parameter.  In such
     cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

        ------------------------------------------------------------
        USER SELECTED option to maintain strength greater than zero
        ------------------------------------------------------------


        ************************************************************
        **     Factor of safety calculation for surface #    61    **
        **     failed to converge within FIFTY iterations          **
        **                                                         **
        **    The last calculated value of the FOS was  35.0080    **
        **    This will be ignored for final summary of results    **
        ************************************************************


     Circular surface (FOS= 35.0080) is defined by: xcenter =    -30.55
     ycenter =   1009.94   Init. Pt. =     41.67   Seg. Length =  20.00
     ---------------------------------------------------------------------


        ************************************************************
        **     Factor of safety calculation for surface #    67    **
        **     failed to converge within FIFTY iterations          **
        **                                                         **
        **    The last calculated value of the FOS was  48.8560    **
        **    This will be ignored for final summary of results    **
        ************************************************************


     Circular surface (FOS= 48.8560) is defined by: xcenter =   -812.01
     ycenter =   5190.66   Init. Pt. =     41.67   Seg. Length =  20.00
     ---------------------------------------------------------------------


        ************************************************************
        **     Factor of safety calculation for surface #    69    **
        **     failed to converge within FIFTY iterations          **
        **                                                         **
        **    The last calculated value of the FOS was  23.8979    **
        **    This will be ignored for final summary of results    **
        ************************************************************


     Circular surface (FOS= 23.8979) is defined by: xcenter =     26.21
     ycenter =    717.33   Init. Pt. =     41.67   Seg. Length =  20.00
     ---------------------------------------------------------------------
```

```
*************************************************************
**     Factor of safety calculation for surface #    89    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  45.7670    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 45.7670) is defined by: xcenter =      9.81
ycenter =    871.86   Init. Pt. =     47.22   Seg. Length =  20.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    91    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was 106.3432    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS=106.3432) is defined by: xcenter =    -34.48
ycenter =   1161.57   Init. Pt. =     50.00   Seg. Length =  20.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    92    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  74.7418    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 74.7418) is defined by: xcenter =     14.81
ycenter =    841.32   Init. Pt. =     50.00   Seg. Length =  20.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    98    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  50.5467    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 50.5467) is defined by: xcenter =     38.09
ycenter =    709.89   Init. Pt. =     50.00   Seg. Length =  20.00
-------------------------------------------------------------------
```

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 7 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	30.56	453.30
2	46.50	441.23
3	65.75	435.81
4	85.65	437.79
5	103.46	446.89
6	116.72	461.87
7	119.01	468.13

**** Simplified BISHOP FOS = 5.770 ****

```
*****************************************************************
**                                                             **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**        7 surfaces were found to have MISLEADING FOS values.   **
**                                                             **
*****************************************************************
```

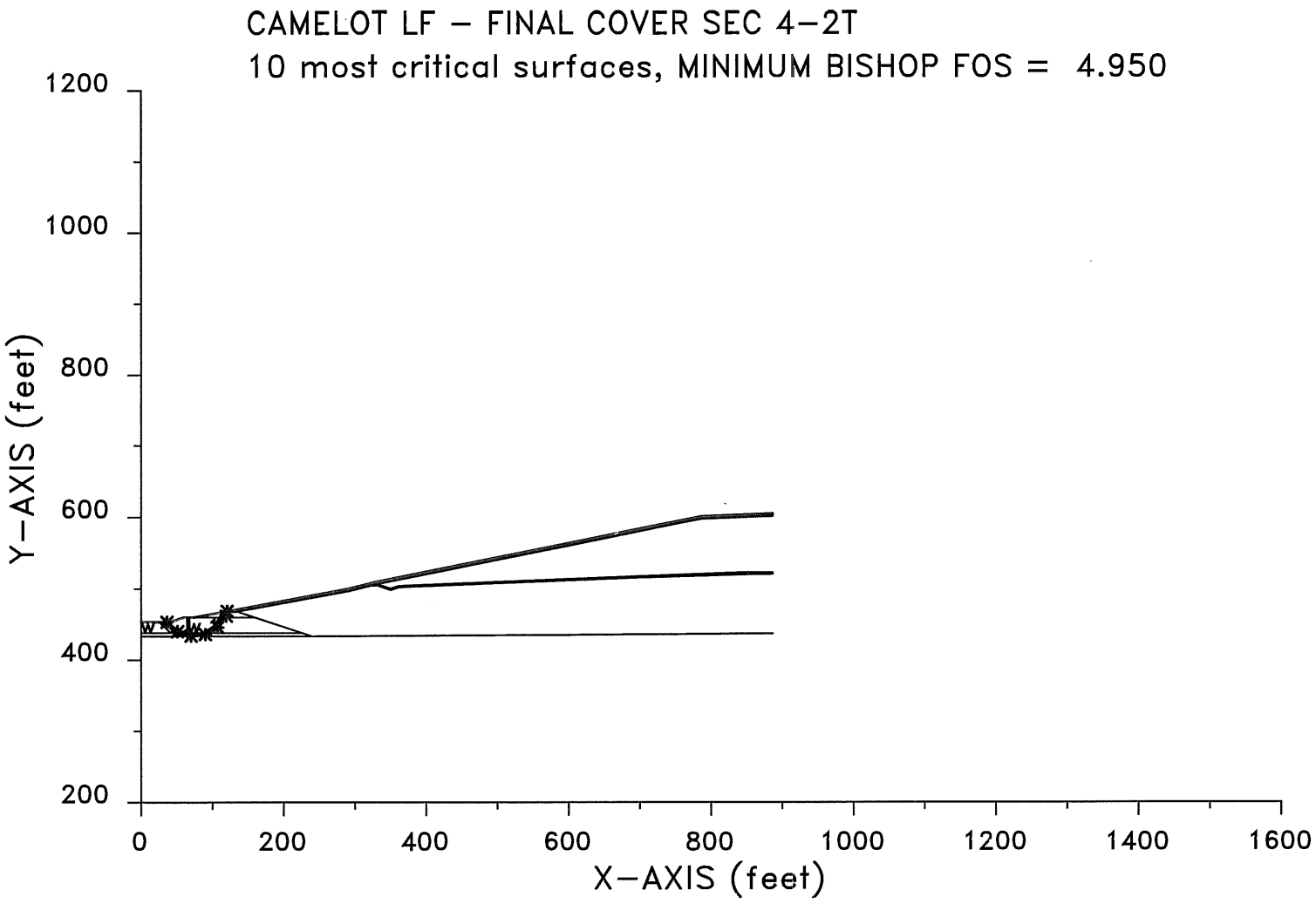
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 4-2E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	5.770	70.47	489.45	53.85	30.56	119.01	6.841E+06
2.	5.783	71.45	493.85	55.66	33.33	120.54	6.680E+06
3.	5.812	74.42	485.51	50.05	36.11	120.79	6.261E+06
4.	5.842	75.11	482.00	48.42	36.11	120.62	6.343E+06
5.	5.862	74.44	483.25	48.64	36.11	119.97	6.164E+06
6.	5.954	66.34	484.33	51.69	25.00	114.09	6.952E+06
7.	5.995	73.39	483.78	48.15	36.11	118.60	5.866E+06
8.	6.099	69.51	489.61	51.26	33.33	115.15	5.793E+06
9.	6.129	76.93	479.35	46.10	38.89	120.86	6.009E+06
10.	6.138	69.99	479.28	44.93	33.33	113.17	5.400E+06

* * * END OF FILE * * *

4-2T 2-16-16 19:05



XSTABL File: 4-2T 2-16-16 19:05

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 4-2T

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress

have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 25.0 ft
and x = 50.0 ft

Each surface terminates between x = 100.0 ft
and x = 120.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

```
The first segment of each failure surface will be inclined
within the angular range defined by :

        Lower angular limit :=   -45.0 degrees
        Upper angular limit :=  (slope angle - 5.0) degrees


*********************************************************************
     --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

*********************************************************************
   Negative effective stresses were calculated at the base of a slice.
   This warning is usually reported for cases where slices have low self
   weight and a relatively high "c" shear strength parameter.  In such
   cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

      ------------------------------------------------------------
      USER SELECTED option to maintain strength greater than zero
      ------------------------------------------------------------


      ************************************************************
      **     Factor of safety calculation for surface #    61    **
      **     failed to converge within FIFTY iterations          **
      **                                                         **
      **    The last calculated value of the FOS was  30.2545    **
      **    This will be ignored for final summary of results    **
      ************************************************************


   Circular surface (FOS= 30.2545) is defined by: xcenter =    -30.55
   ycenter =   1009.94   Init. Pt. =     41.67   Seg. Length =  20.00
   -------------------------------------------------------------------


      ************************************************************
      **     Factor of safety calculation for surface #    67    **
      **     failed to converge within FIFTY iterations          **
      **                                                         **
      **    The last calculated value of the FOS was  41.7461    **
      **    This will be ignored for final summary of results    **
      ************************************************************


   Circular surface (FOS= 41.7461) is defined by: xcenter =   -812.01
   ycenter =   5190.66   Init. Pt. =     41.67   Seg. Length =  20.00
   -------------------------------------------------------------------


      ************************************************************
      **     Factor of safety calculation for surface #    69    **
```

```
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  20.9498    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 20.9498) is defined by: xcenter =     26.21
ycenter =    717.33   Init. Pt. =     41.67   Seg. Length =  20.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    89    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  38.7291    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 38.7291) is defined by: xcenter =      9.81
ycenter =    871.86   Init. Pt. =     47.22   Seg. Length =  20.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    91    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  87.9184    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 87.9184) is defined by: xcenter =    -34.48
ycenter =   1161.57   Init. Pt. =     50.00   Seg. Length =  20.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    92    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  63.0455    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 63.0455) is defined by: xcenter =     14.81
ycenter =    841.32   Init. Pt. =     50.00   Seg. Length =  20.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    98    **
**     failed to converge within FIFTY iterations          **
```

```
**                                                          **
**    The last calculated value of the FOS was  42.9347     **
**    This will be ignored for final summary of results     **
*************************************************************
```

Circular surface (FOS= 42.9347) is defined by: xcenter = 38.09
ycenter = 709.89 Init. Pt. = 50.00 Seg. Length = 20.00

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 7 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	36.11	453.30
2	51.04	439.99
3	70.07	433.84
4	89.96	435.92
5	107.32	445.85
6	119.18	461.96
7	120.62	468.42

**** Simplified BISHOP FOS = 4.950 ****

```
*******************************************************************
**                                                               **
**  Out of the    100 surfaces generated and analyzed by XSTABL, **
**        7 surfaces were found to have MISLEADING FOS values.   **
**                                                               **
*******************************************************************
```

The following is a summary of the TEN most critical surfaces

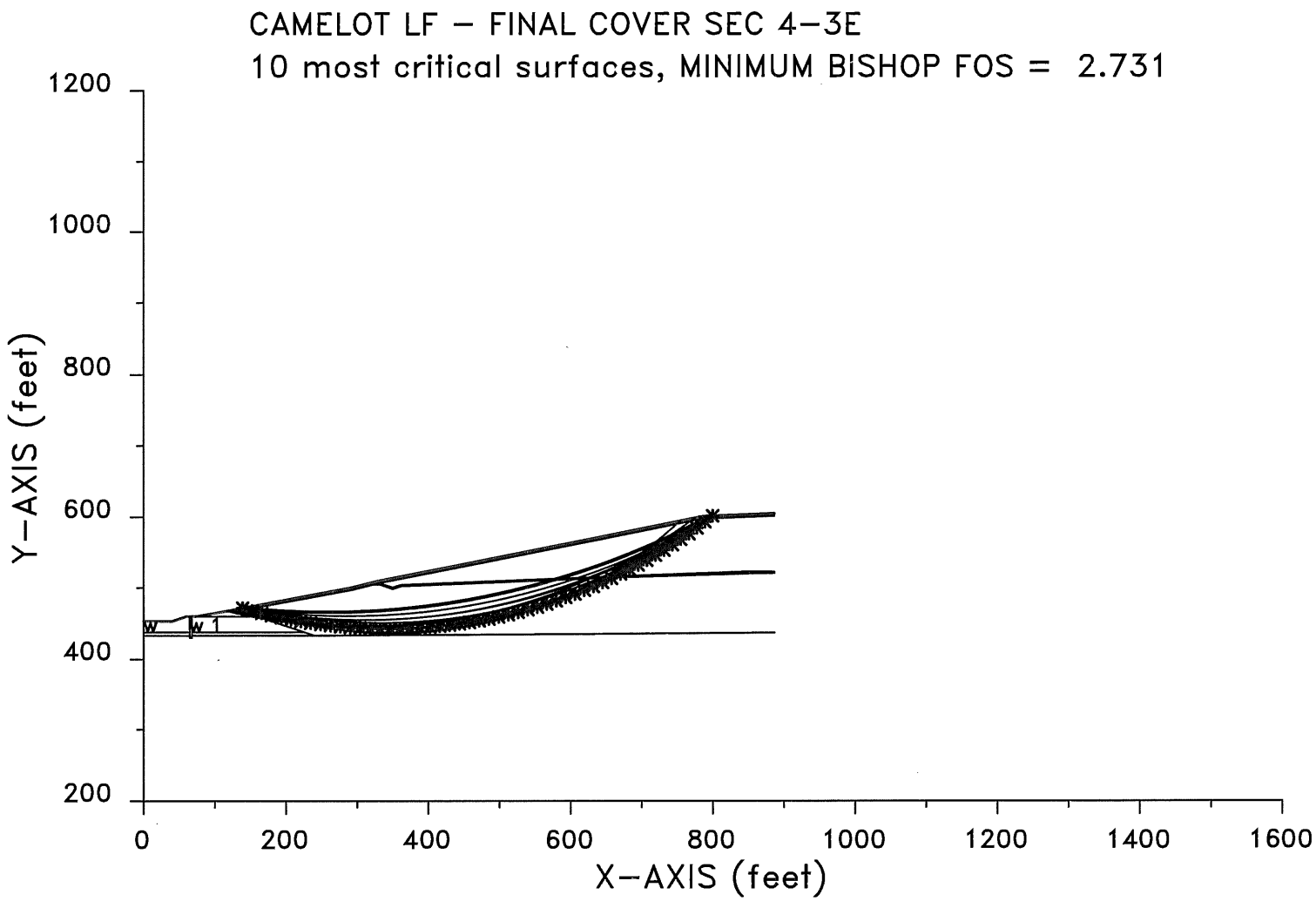
Problem Description : CAMELOT LF - FINAL COVER SEC 4-2T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	4.950	75.11	482.00	48.42	36.11	120.62	5.375E+06

2.	4.974	66.34	484.33	51.69	25.00	114.09	5.808E+06
3.	5.050	74.44	483.25	48.64	36.11	119.97	5.310E+06
4.	5.059	70.47	489.45	53.85	30.56	119.01	5.998E+06
5.	5.113	74.42	485.51	50.05	36.11	120.79	5.508E+06
6.	5.167	76.93	479.35	46.10	38.89	120.86	5.066E+06
7.	5.244	69.99	479.28	44.93	33.33	113.17	4.613E+06
8.	5.336	73.39	483.78	48.15	36.11	118.60	5.221E+06
9.	5.365	68.74	481.79	47.65	30.56	113.46	5.040E+06
10.	5.441	73.34	477.31	44.30	36.11	115.96	4.936E+06

* * * END OF FILE * * *

4-3E 2-16-16 18:56



XSTABL File: 4-3E 2-16-16 18:56

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 4-3E

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 100.0 ft
and x = 150.0 ft

Each surface terminates between x = 700.0 ft
and x = 800.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

14.0 ft line segments define each trial failure surface.

```
---------------------
ANGULAR RESTRICTIONS
---------------------
```

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 51 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	138.89	471.76
2	152.37	467.98
3	165.92	464.46
4	179.53	461.19
5	193.21	458.19
6	206.94	455.45
7	220.71	452.97
8	234.54	450.75
9	248.40	448.80
10	262.30	447.12
11	276.23	445.69
12	290.18	444.54
13	304.15	443.65
14	318.14	443.03
15	332.13	442.67
16	346.13	442.59
17	360.13	442.77
18	374.12	443.21
19	388.11	443.93
20	402.07	444.91
21	416.02	446.15
22	429.93	447.67
23	443.82	449.44
24	457.67	451.49
25	471.48	453.79
26	485.24	456.36
27	498.95	459.19
28	512.61	462.29
29	526.20	465.64
30	539.73	469.25
31	553.18	473.12
32	566.56	477.25
33	579.86	481.63
34	593.07	486.26
35	606.19	491.14
36	619.21	496.28
37	632.14	501.66
38	644.96	507.28
39	657.67	513.15
40	670.26	519.27
41	682.74	525.62
42	695.09	532.21
43	707.32	539.03

44	719.41	546.08
45	731.36	553.37
46	743.18	560.88
47	754.85	568.61
48	766.37	576.57
49	777.73	584.74
50	788.94	593.13
51	799.72	601.53

**** Simplified BISHOP FOS = 2.731 ****

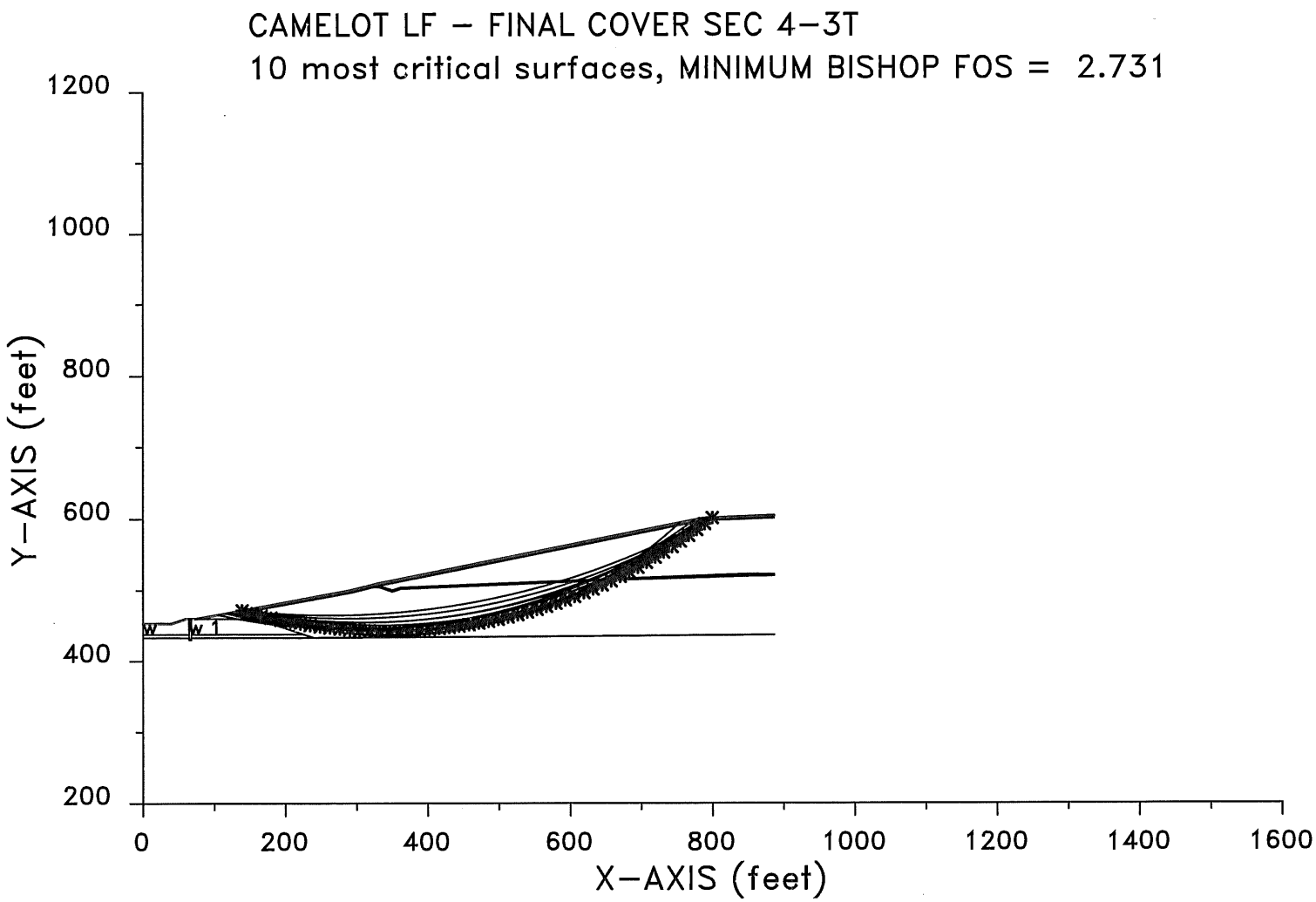
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 4-3E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.731	343.74	1176.23	733.65	138.89	799.72	9.556E+08
2.	2.731	310.96	1343.95	889.00	138.89	799.94	9.696E+08
3.	2.735	336.39	1218.79	767.93	150.00	792.79	8.818E+08
4.	2.735	309.53	1323.38	868.54	138.89	792.04	9.276E+08
5.	2.751	288.47	1457.14	996.66	138.89	799.61	9.834E+08
6.	2.755	313.76	1286.77	840.18	122.22	799.96	1.042E+09
7.	2.784	350.14	1030.38	594.32	144.44	754.08	7.549E+08
8.	2.785	263.10	1582.17	1117.34	138.89	798.44	9.983E+08
9.	2.803	306.61	1233.41	788.91	116.67	775.11	9.548E+08
10.	2.803	259.47	1592.26	1125.36	144.44	792.70	9.491E+08

* * * END OF FILE * * *

4-3T 2-16-16 19:06



XSTABL File: 4-3T 2-16-16 19:06

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 4-3T

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	834.0	16.00	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress

have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
7.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 100.0 ft
and x = 150.0 ft

Each surface terminates between x = 700.0 ft
and x = 800.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

14.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 51 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	138.89	471.76
2	152.37	467.98
3	165.92	464.46
4	179.53	461.19
5	193.21	458.19
6	206.94	455.45
7	220.71	452.97
8	234.54	450.75
9	248.40	448.80
10	262.30	447.12
11	276.23	445.69
12	290.18	444.54
13	304.15	443.65
14	318.14	443.03
15	332.13	442.67
16	346.13	442.59
17	360.13	442.77
18	374.12	443.21
19	388.11	443.93
20	402.07	444.91
21	416.02	446.15
22	429.93	447.67
23	443.82	449.44
24	457.67	451.49
25	471.48	453.79
26	485.24	456.36
27	498.95	459.19
28	512.61	462.29
29	526.20	465.64
30	539.73	469.25
31	553.18	473.12

32	566.56	477.25
33	579.86	481.63
34	593.07	486.26
35	606.19	491.14
36	619.21	496.28
37	632.14	501.66
38	644.96	507.28
39	657.67	513.15
40	670.26	519.27
41	682.74	525.62
42	695.09	532.21
43	707.32	539.03
44	719.41	546.08
45	731.36	553.37
46	743.18	560.88
47	754.85	568.61
48	766.37	576.57
49	777.73	584.74
50	788.94	593.13
51	799.72	601.53

**** Simplified BISHOP FOS = 2.731 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 4-3T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.731	343.74	1176.23	733.65	138.89	799.72	9.556E+08
2.	2.731	310.96	1343.95	889.00	138.89	799.94	9.696E+08
3.	2.735	336.39	1218.79	767.93	150.00	792.79	8.818E+08
4.	2.735	309.53	1323.38	868.54	138.89	792.04	9.276E+08
5.	2.743	313.76	1286.77	840.18	122.22	799.96	1.038E+09
6.	2.751	288.47	1457.14	996.66	138.89	799.61	9.834E+08
7.	2.783	306.61	1233.41	788.91	116.67	775.11	9.481E+08
8.	2.784	350.14	1030.38	594.32	144.44	754.08	7.549E+08
9.	2.785	263.10	1582.17	1117.34	138.89	798.44	9.983E+08
10.	2.796	293.97	1297.87	853.20	105.56	786.11	1.045E+09

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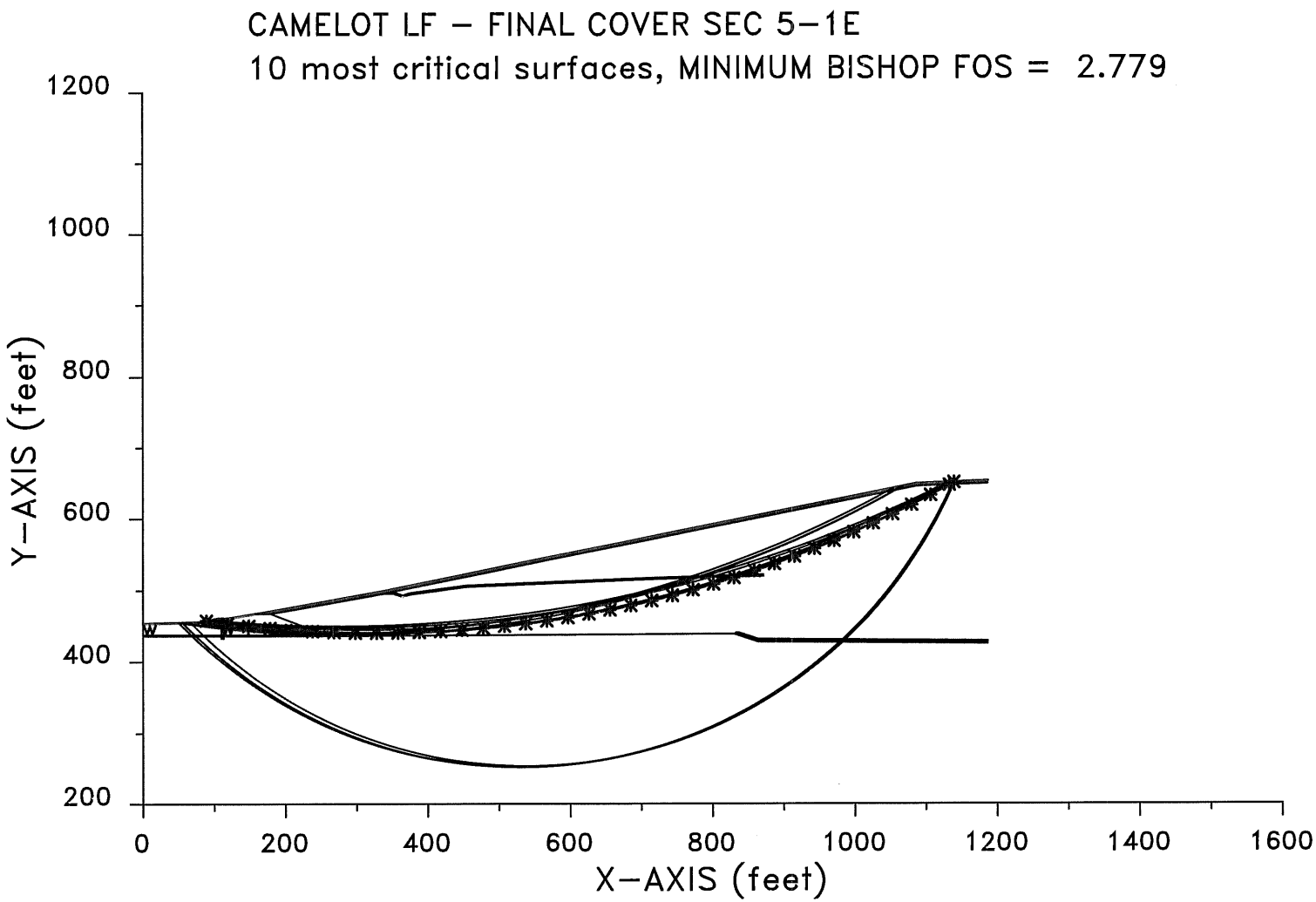

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 5-1E

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4

7	347.5	497.6	352.4	497.6	9
8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	100.0	16.00	.000	.0	0
10	115.0	120.0	1074.0	13.10	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 50.0 ft
and x = 100.0 ft

Each surface terminates between x = 1040.0 ft
and x = 1140.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

30.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 38 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	88.89	457.98
2	118.61	453.91
3	148.40	450.38
4	178.25	447.38
5	208.15	444.92
6	238.09	443.00
7	268.06	441.63
8	298.05	440.79
9	328.05	440.49
10	358.04	440.74
11	388.03	441.52
12	418.00	442.85
13	447.95	444.72
14	477.85	447.13
15	507.71	450.07
16	537.50	453.55
17	567.23	457.58
18	596.88	462.13
19	626.45	467.22
20	655.92	472.84
21	685.28	479.00
22	714.53	485.68
23	743.65	492.88
24	772.63	500.62
25	801.48	508.87
26	830.17	517.64
27	858.69	526.93
28	887.05	536.73
29	915.22	547.04
30	943.20	557.86
31	970.98	569.18
32	998.56	581.00
33	1025.91	593.31
34	1053.04	606.12

35	1079.94	619.41
36	1106.59	633.18
37	1132.98	647.44
38	1139.50	651.11

**** Simplified BISHOP FOS = 2.779 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 5-1E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.779	329.45	2103.94	1663.45	88.89	1139.50	3.690E+09
2.	2.793	313.71	2113.95	1674.68	77.78	1128.05	3.657E+09
3.	2.805	286.61	2331.85	1884.27	88.89	1138.30	3.746E+09
4.	2.812	278.14	2368.19	1917.94	94.44	1131.85	3.620E+09
5.	2.818	313.40	1962.27	1517.20	100.00	1065.69	2.763E+09
6.	2.870	285.56	2013.16	1575.60	50.00	1067.03	3.118E+09
7.	2.883	274.75	2042.87	1602.52	55.56	1053.49	2.985E+09
8.	2.963	528.53	917.22	665.12	50.00	1137.89	3.871E+09
9.	2.964	532.04	911.44	659.54	55.56	1137.82	3.825E+09
10.	2.965	539.09	907.01	653.36	66.67	1140.23	3.759E+09

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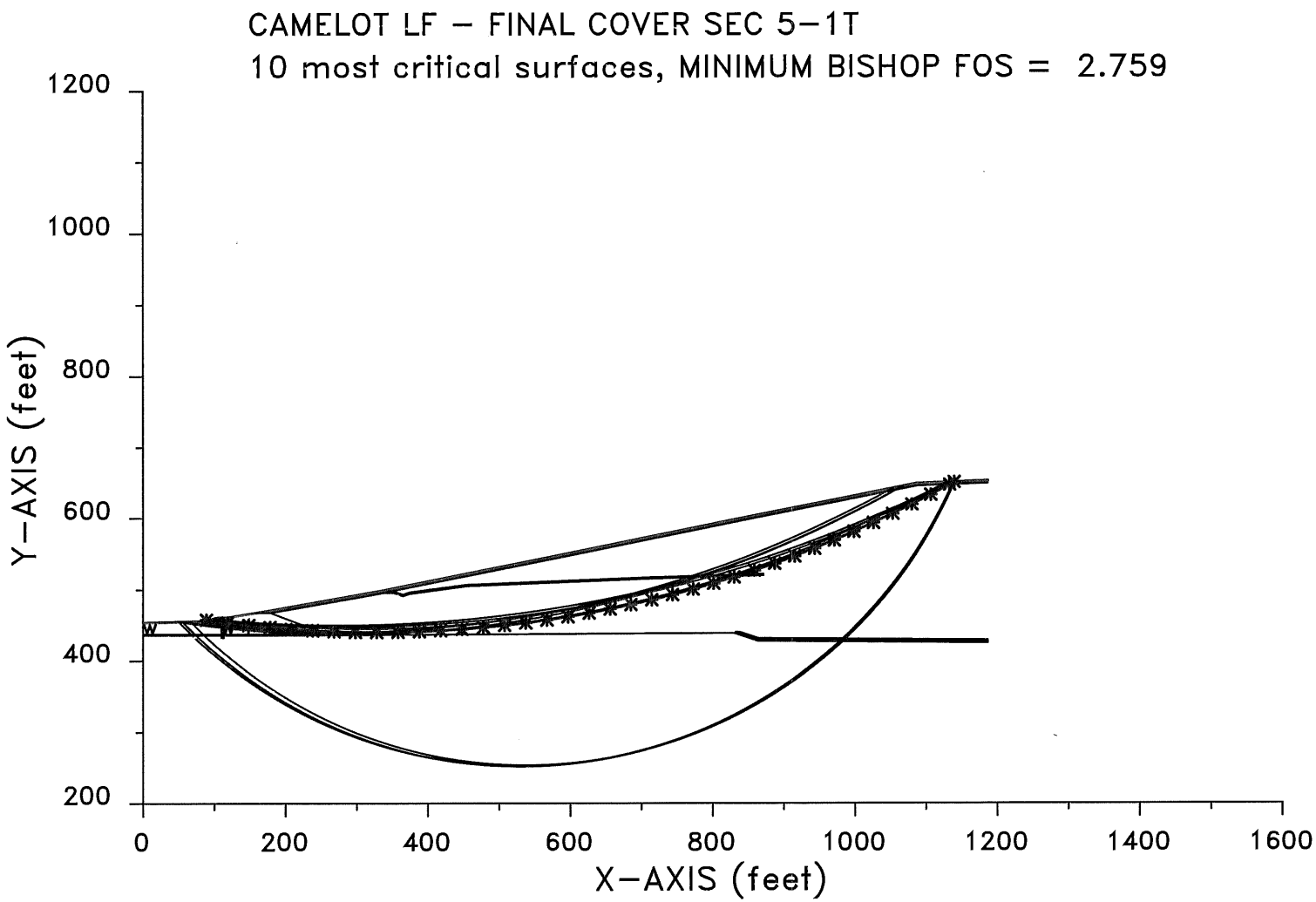
5-1T 2-17-16 9:24



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*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 5-1T

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4

7	347.5	497.6	352.4	497.6	9
8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	100.0	16.00	.000	.0	0
10	115.0	120.0	834.0	16.00	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
10.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 50.0 ft
and x = 100.0 ft

Each surface terminates between x = 1040.0 ft
and x = 1140.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

30.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 38 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	88.89	457.98
2	118.61	453.91
3	148.40	450.38
4	178.25	447.38
5	208.15	444.92
6	238.09	443.00
7	268.06	441.63
8	298.05	440.79
9	328.05	440.49
10	358.04	440.74
11	388.03	441.52
12	418.00	442.85
13	447.95	444.72
14	477.85	447.13
15	507.71	450.07
16	537.50	453.55
17	567.23	457.58
18	596.88	462.13
19	626.45	467.22
20	655.92	472.84
21	685.28	479.00
22	714.53	485.68

23	743.65	492.88
24	772.63	500.62
25	801.48	508.87
26	830.17	517.64
27	858.69	526.93
28	887.05	536.73
29	915.22	547.04
30	943.20	557.86
31	970.98	569.18
32	998.56	581.00
33	1025.91	593.31
34	1053.04	606.12
35	1079.94	619.41
36	1106.59	633.18
37	1132.98	647.44
38	1139.50	651.11

**** Simplified BISHOP FOS = 2.759 ****

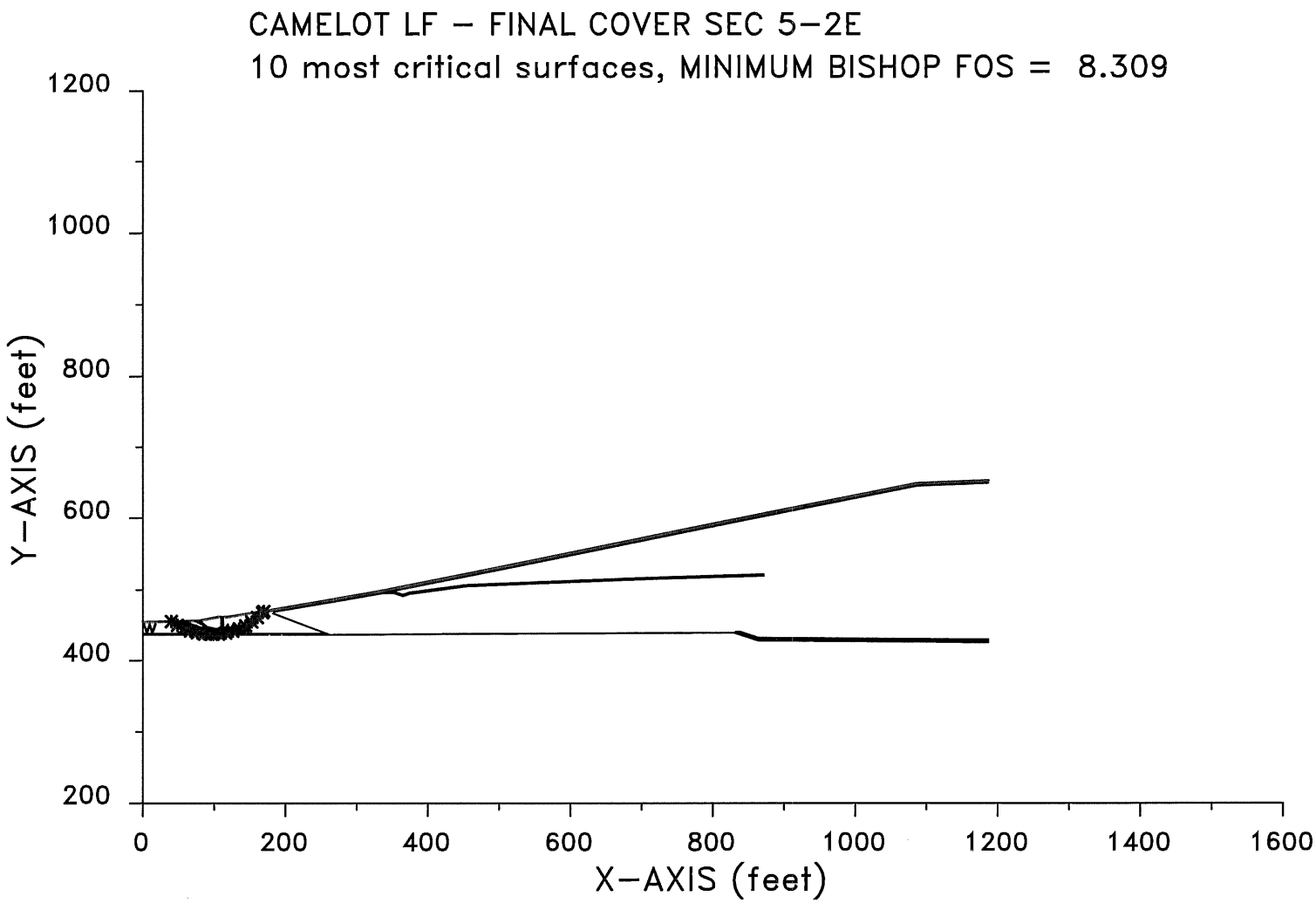
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 5-1T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.759	329.45	2103.94	1663.45	88.89	1139.50	3.663E+09
2.	2.774	313.71	2113.95	1674.68	77.78	1128.05	3.632E+09
3.	2.782	286.61	2331.85	1884.27	88.89	1138.30	3.716E+09
4.	2.787	278.14	2368.19	1917.94	94.44	1131.85	3.589E+09
5.	2.793	313.40	1962.27	1517.20	100.00	1065.69	2.738E+09
6.	2.843	285.56	2013.16	1575.60	50.00	1067.03	3.088E+09
7.	2.860	274.75	2042.87	1602.52	55.56	1053.49	2.960E+09
8.	2.961	528.53	917.22	665.12	50.00	1137.89	3.868E+09
9.	2.962	532.04	911.44	659.54	55.56	1137.82	3.822E+09
10.	2.963	539.09	907.01	653.36	66.67	1140.23	3.756E+09

* * * END OF FILE * * *

5-2E 2-17-16 9:09



XSTABL File: 5-2E 2-17-16 9:09

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 5-2E

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4

7	347.5	497.6	352.4	497.6	9
8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	100.0	16.00	.000	.0	0
10	115.0	120.0	1074.0	13.10	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 20.0 ft
and x = 80.0 ft

Each surface terminates between x = 140.0 ft
and x = 170.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

10.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

```
The first segment of each failure surface will be inclined
within the angular range defined by :

        Lower angular limit :=   -45.0 degrees
        Upper angular limit :=  (slope angle - 5.0) degrees


    ************************************************************
    **     Factor of safety calculation for surface #     3    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  25.5085    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 25.5085) is defined by: xcenter =     61.06
ycenter =    709.03   Init. Pt. =     20.00   Seg. Length =  10.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #     5    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  20.7405    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 20.7405) is defined by: xcenter =     84.84
ycenter =    519.42   Init. Pt. =     20.00   Seg. Length =  10.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    16    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  27.2561    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 27.2561) is defined by: xcenter =     63.20
ycenter =    699.67   Init. Pt. =     26.67   Seg. Length =  10.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    19    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  23.7419    **
```

```
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 23.7419) is defined by: xcenter =     80.37
ycenter =    502.08   Init. Pt. =     26.67   Seg. Length =  10.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    21    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  21.1103    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 21.1103) is defined by: xcenter =     84.42
ycenter =    501.62   Init. Pt. =     33.33   Seg. Length =  10.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    63    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  21.3544    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 21.3544) is defined by: xcenter =     84.54
ycenter =    609.53   Init. Pt. =     60.00   Seg. Length =  10.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    71    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  22.0979    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 22.0979) is defined by: xcenter =     86.62
ycenter =    663.58   Init. Pt. =     66.67   Seg. Length =  10.00
-------------------------------------------------------------------

*********************************************************************
      --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

*********************************************************************
      Negative effective stresses were calculated at the base of a slice.
```

This warning is usually reported for cases where slices have low self weight and a relatively high "c" shear strength parameter. In such cases, this effect can only be eliminated by reducing the "c" value.

****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	40.00	455.02
2	48.44	449.65
3	57.38	445.17
4	66.73	441.63
5	76.40	439.06
6	86.27	437.48
7	96.25	436.92
8	106.24	437.37
9	116.14	438.84
10	125.83	441.31
11	135.21	444.76
12	144.20	449.14
13	152.70	454.41
14	160.62	460.52
15	167.87	467.40
16	169.66	469.48

**** Simplified BISHOP FOS = 8.309 ****

```
*****************************************************************
**                                                             **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**        7 surfaces were found to have MISLEADING FOS values.   **
**                                                             **
*****************************************************************
```

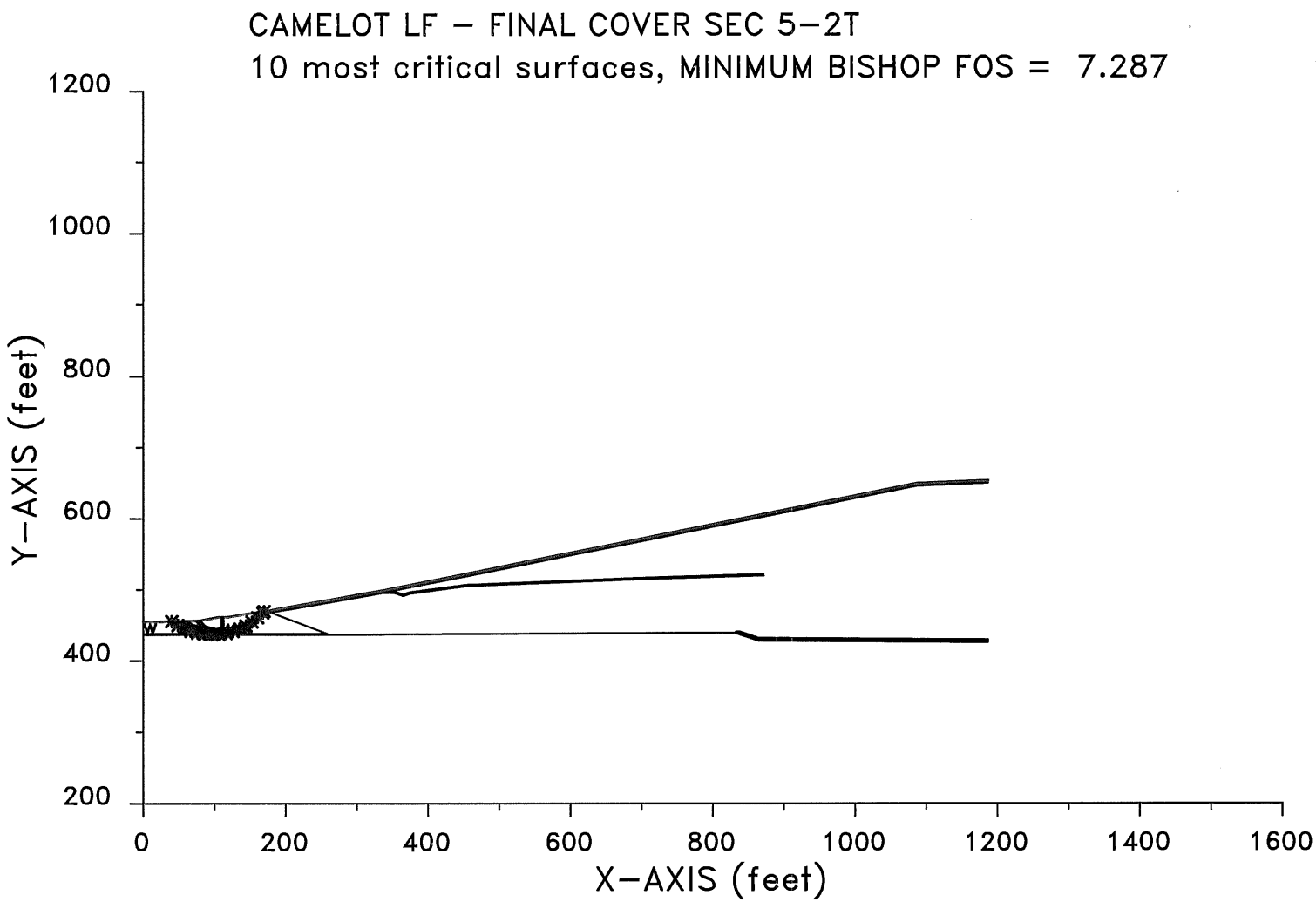
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 5-2E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	8.309	96.78	535.03	98.12	40.00	169.66	1.764E+07
2.	8.516	102.83	529.78	89.38	53.33	168.47	1.396E+07
3.	8.599	121.03	490.44	53.42	80.00	170.12	7.631E+06
4.	8.660	113.81	518.68	74.73	73.33	169.89	9.679E+06
5.	8.726	105.76	501.89	65.15	60.00	161.32	9.879E+06
6.	8.741	105.69	506.63	68.55	60.00	162.35	1.029E+07
7.	8.807	98.03	543.27	101.97	46.67	168.08	1.615E+07
8.	8.845	105.22	539.06	94.99	60.00	169.80	1.329E+07
9.	8.915	93.78	527.97	90.63	40.00	161.75	1.521E+07
10.	8.989	120.10	492.26	53.91	80.00	168.64	7.621E+06

* * * END OF FILE * * *

5-2T 2-17-16 9:25



XSTABL File: 5-2T 2-17-16 9:25

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 5-2T

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4

7	347.5	497.6	352.4	497.6	9
8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	100.0	16.00	.000	.0	0
10	115.0	120.0	834.0	16.00	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
10.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 20.0 ft
and x = 80.0 ft

Each surface terminates between x = 140.0 ft
and x = 170.0 ft

```
Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft


   10.0 ft line segments define each trial failure surface.


---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees



************************************************************
**     Factor of safety calculation for surface #     3    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  22.9608    **
**    This will be ignored for final summary of results    **
************************************************************


Circular surface (FOS= 22.9608) is defined by: xcenter =     61.06
ycenter =    709.03   Init. Pt. =     20.00   Seg. Length =  10.00
-------------------------------------------------------------------


************************************************************
**     Factor of safety calculation for surface #    16    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  24.5169    **
**    This will be ignored for final summary of results    **
************************************************************


Circular surface (FOS= 24.5169) is defined by: xcenter =     63.20
ycenter =    699.67   Init. Pt. =     26.67   Seg. Length =  10.00
-------------------------------------------------------------------


************************************************************
**     Factor of safety calculation for surface #    19    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  23.1662    **
**    This will be ignored for final summary of results    **
************************************************************
```

```
Circular surface (FOS= 23.1662) is defined by: xcenter =     80.37
ycenter =    502.08   Init. Pt. =     26.67   Seg. Length =  10.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    21    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  20.4320    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 20.4320) is defined by: xcenter =     84.42
ycenter =    501.62   Init. Pt. =     33.33   Seg. Length =  10.00
-------------------------------------------------------------------



*********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

*********************************************************************
      Negative effective stresses were calculated at the base of a slice.
      This warning is usually reported for cases where slices have low self
      weight and a relatively high "c" shear strength parameter.  In such
      cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

          ------------------------------------------------------------
          USER SELECTED option to maintain strength greater than zero
          ------------------------------------------------------------



          Factors of safety have been calculated by the :

          * * * * *   SIMPLIFIED BISHOP METHOD   * * * * *


            The most critical circular failure surface
            is specified by 16 coordinate points

                 Point      x-surf      y-surf
                  No.        (ft)        (ft)

                   1         40.00      455.02
                   2         48.44      449.65
                   3         57.38      445.17
                   4         66.73      441.63
                   5         76.40      439.06
                   6         86.27      437.48
```

7	96.25	436.92
8	106.24	437.37
9	116.14	438.84
10	125.83	441.31
11	135.21	444.76
12	144.20	449.14
13	152.70	454.41
14	160.62	460.52
15	167.87	467.40
16	169.66	469.48

**** Simplified BISHOP FOS = 7.287 ****

```
*******************************************************************
**                                                               **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**        4 surfaces were found to have MISLEADING FOS values.   **
**                                                               **
*******************************************************************
```

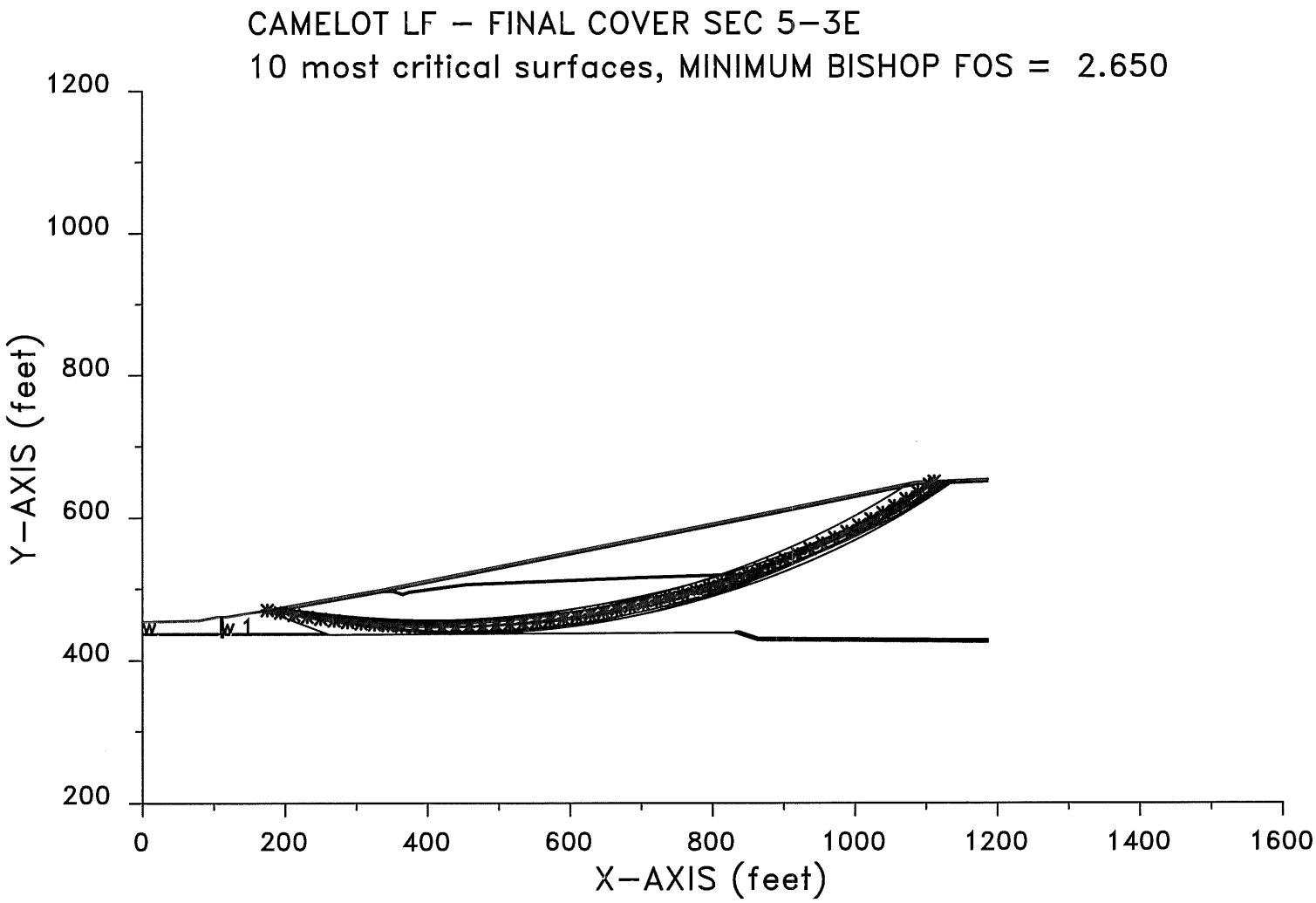
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 5-2T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	7.287	96.78	535.03	98.12	40.00	169.66	1.547E+07
2.	7.660	105.76	501.89	65.15	60.00	161.32	8.673E+06
3.	7.679	121.03	490.44	53.42	80.00	170.12	6.815E+06
4.	7.896	102.83	529.78	89.38	53.33	168.47	1.295E+07
5.	7.910	93.78	527.97	90.63	40.00	161.75	1.350E+07
6.	7.942	113.81	518.68	74.73	73.33	169.89	8.877E+0
7.	8.104	105.22	539.06	94.99	60.00	169.80	1.218E+07
8.	8.138	98.03	543.27	101.97	46.67	168.08	1.492E+07
9.	8.155	105.69	506.63	68.55	60.00	162.35	9.601E+06
10.	8.299	113.76	489.68	52.71	73.33	161.66	6.545E+06

* * * END OF FILE * * *

5-3E 2-17-16 8:39



XSTABL File: 5-3E 2-17-16 8:39

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 5-3E

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4

7	347.5	497.6	352.4	497.6	9
8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	100.0	16.00	.000	.0	0
10	115.0	120.0	1074.0	13.10	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 175.0 ft
and x = 200.0 ft

Each surface terminates between x = 1040.0 ft
and x = 1140.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

19.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 53 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	175.00	470.37
2	193.68	466.90
3	212.41	463.70
4	231.18	460.78
5	250.00	458.14
6	268.85	455.77
7	287.74	453.69
8	306.65	451.89
9	325.59	450.36
10	344.55	449.12
11	363.52	448.16
12	382.51	447.48
13	401.51	447.08
14	420.51	446.96
15	439.51	447.12
16	458.50	447.56
17	477.49	448.29
18	496.46	449.30
19	515.42	450.58
20	534.35	452.15
21	553.26	454.00
22	572.14	456.13
23	590.99	458.53
24	609.80	461.22
25	628.57	464.18
26	647.29	467.43
27	665.96	470.94
28	684.58	474.74
29	703.14	478.81
30	721.63	483.15
31	740.06	487.77

32	758.42	492.66
33	776.71	497.82
34	794.91	503.25
35	813.04	508.95
36	831.08	514.92
37	849.03	521.16
38	866.88	527.66
39	884.63	534.42
40	902.29	541.45
41	919.84	548.73
42	937.27	556.28
43	954.60	564.08
44	971.80	572.14
45	988.89	580.45
46	1005.85	589.01
47	1022.68	597.83
48	1039.38	606.89
49	1055.94	616.20
50	1072.37	625.75
51	1088.65	635.55
52	1104.78	645.58
53	1111.65	650.00

**** Simplified BISHOP FOS = 2.650 ****

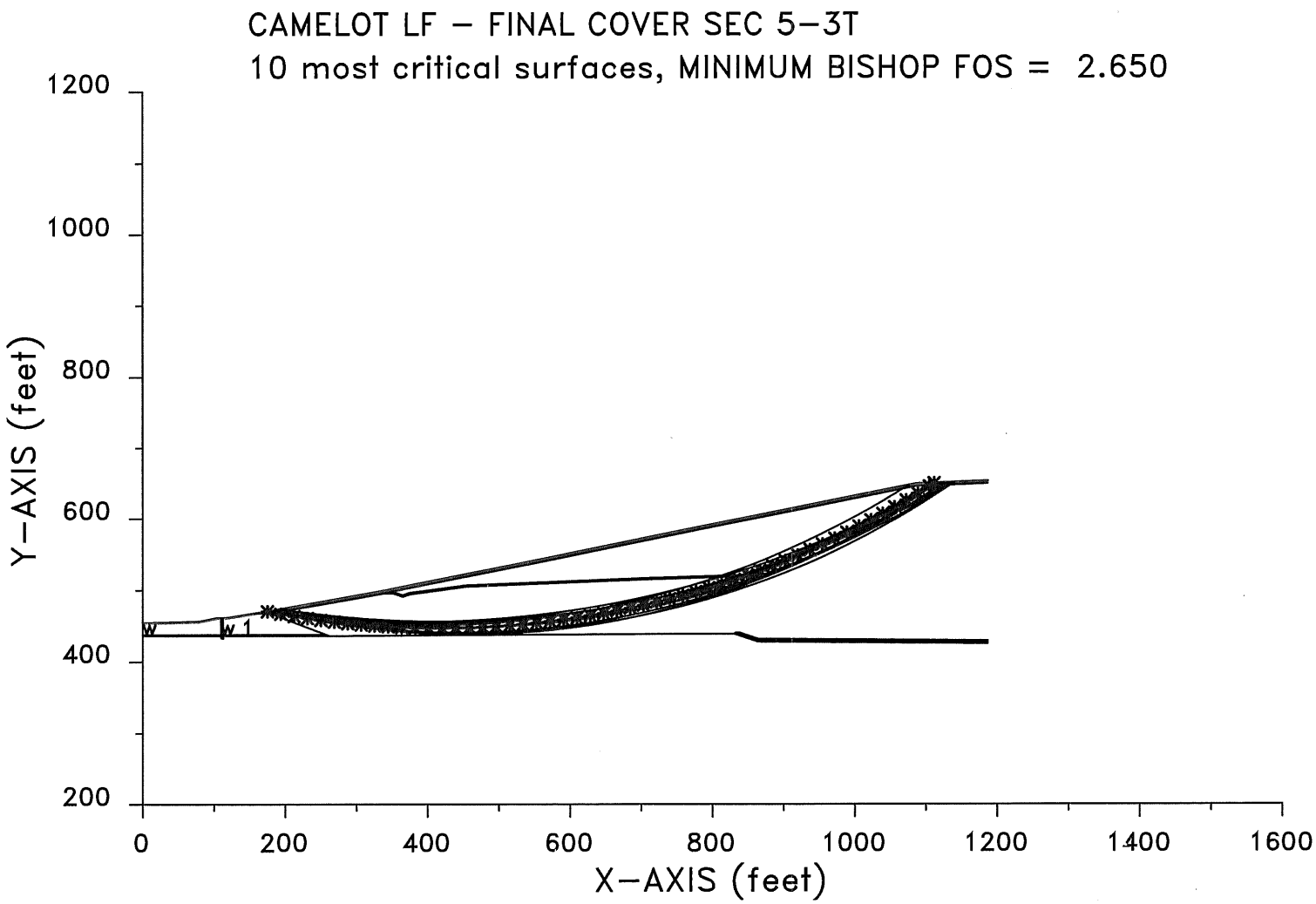
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 5-3E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.650	419.00	1730.06	1283.10	175.00	1111.65	2.555E+09
2.	2.655	447.50	1702.86	1254.83	194.44	1131.36	2.605E+09
3.	2.658	398.84	1928.68	1475.39	175.00	1136.60	2.845E+09
4.	2.658	445.03	1649.03	1208.10	177.78	1125.04	2.665E+09
5.	2.662	417.92	1890.23	1433.94	194.44	1139.53	2.721E+09
6.	2.662	387.34	1932.90	1476.98	177.78	1119.72	2.650E+09
7.	2.663	457.02	1568.68	1130.47	183.33	1115.99	2.529E+09
8.	2.663	448.75	1727.35	1279.08	194.44	1139.97	2.699E+09
9.	2.665	461.10	1639.06	1198.69	186.11	1139.92	2.749E+09
10.	2.667	397.79	1721.46	1270.77	175.00	1076.03	2.238E+09

* * * END OF FILE * * *

5-3T 2-17-16 9:26



XSTABL File: 5-3T 2-17-16 9:26

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 5-3T

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4
7	347.5	497.6	352.4	497.6	9

8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	477.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0

5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	100.0	16.00	.000	.0	0
10	115.0	120.0	834.0	16.00	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	477.0	11.50
2.	470.0	8.30
10.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 175.0 ft
and x = 200.0 ft

Each surface terminates between x = 1040.0 ft
and x = 1140.0 ft

Unless further limitations were imposed, the minimum elevation

at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

19.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 53 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	175.00	470.37
2	193.68	466.90
3	212.41	463.70
4	231.18	460.78
5	250.00	458.14
6	268.85	455.77
7	287.74	453.69
8	306.65	451.89
9	325.59	450.36
10	344.55	449.12
11	363.52	448.16
12	382.51	447.48
13	401.51	447.08
14	420.51	446.96
15	439.51	447.12
16	458.50	447.56
17	477.49	448.29
18	496.46	449.30
19	515.42	450.58
20	534.35	452.15
21	553.26	454.00
22	572.14	456.13
23	590.99	458.53
24	609.80	461.22

25	628.57	464.18
26	647.29	467.43
27	665.96	470.94
28	684.58	474.74
29	703.14	478.81
30	721.63	483.15
31	740.06	487.77
32	758.42	492.66
33	776.71	497.82
34	794.91	503.25
35	813.04	508.95
36	831.08	514.92
37	849.03	521.16
38	866.88	527.66
39	884.63	534.42
40	902.29	541.45
41	919.84	548.73
42	937.27	556.28
43	954.60	564.08
44	971.80	572.14
45	988.89	580.45
46	1005.85	589.01
47	1022.68	597.83
48	1039.38	606.89
49	1055.94	616.20
50	1072.37	625.75
51	1088.65	635.55
52	1104.78	645.58
53	1111.65	650.00

**** Simplified BISHOP FOS = 2.650 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 5-3T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.650	419.00	1730.06	1283.10	175.00	1111.65	2.555E+09
2.	2.655	447.50	1702.86	1254.83	194.44	1131.36	2.605E+09
3.	2.658	398.84	1928.68	1475.39	175.00	1136.60	2.845E+09
4.	2.658	445.03	1649.03	1208.10	177.78	1125.04	2.665E+09
5.	2.662	417.92	1890.23	1433.94	194.44	1139.53	2.721E+09
6.	2.662	387.34	1932.90	1476.98	177.78	1119.72	2.650E+09
7.	2.663	457.02	1568.68	1130.47	183.33	1115.99	2.529E+09
8.	2.663	448.75	1727.35	1279.08	194.44	1139.97	2.699E+09
9.	2.665	461.10	1639.06	1198.69	186.11	1139.92	2.749E+09
10.	2.667	397.79	1721.46	1270.77	175.00	1076.03	2.238E+09

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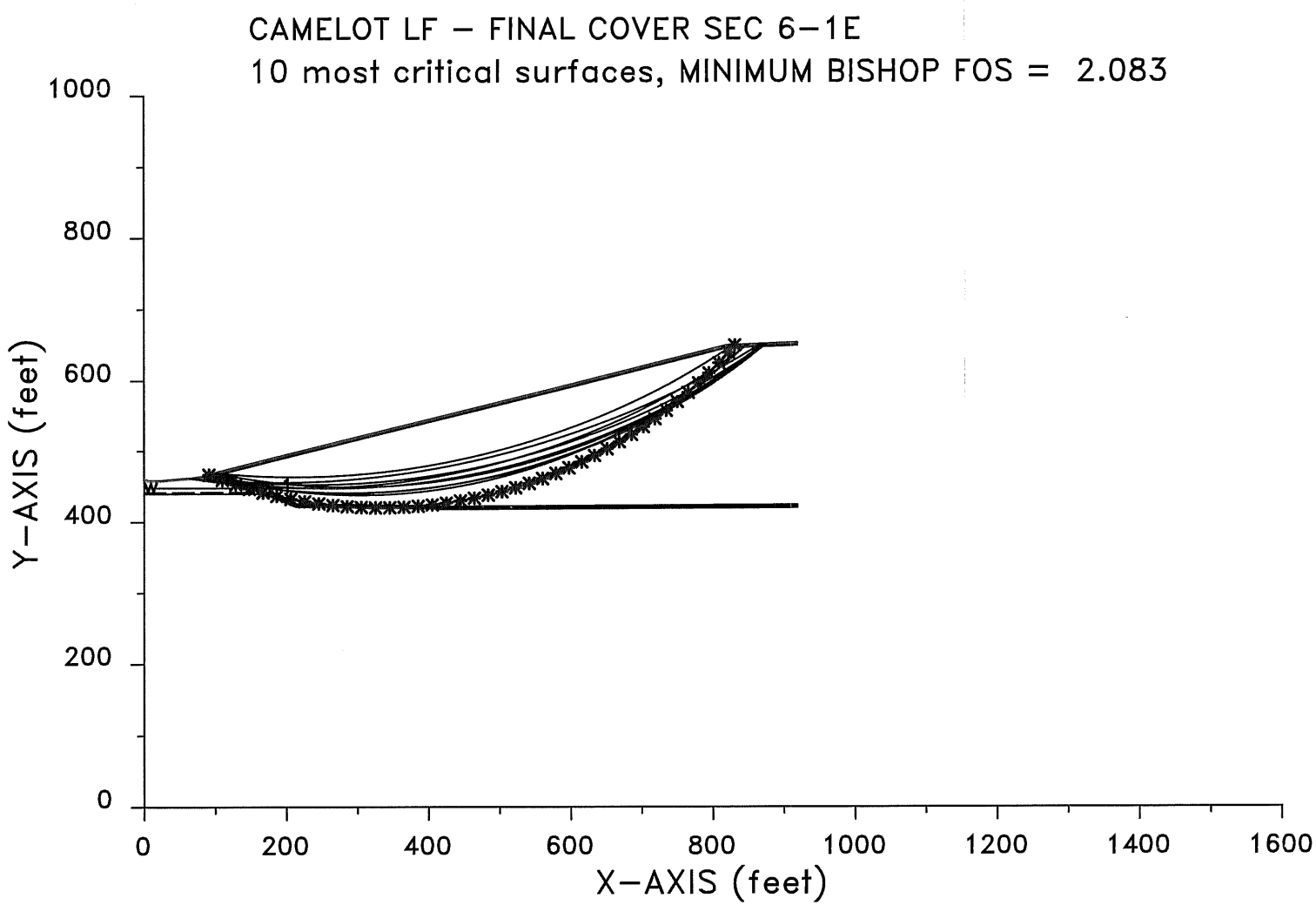
6-1E 2-17-16 9:59



XSTABL File: 6-1E 2-17-16 9:59

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*              X S T A B L              *
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*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*                                       *
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*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 6-1E

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.1	468.0	7
3	104.1	468.0	109.1	468.0	6
4	109.1	468.0	819.5	645.5	4
5	819.5	645.5	919.1	649.5	4
6	109.1	468.0	213.2	425.9	6
7	213.2	425.9	408.8	422.9	6
8	408.8	422.9	416.4	422.0	6
9	416.4	422.0	919.1	424.3	6
10	104.1	468.0	213.2	423.9	7
11	213.2	423.9	408.8	420.9	8
12	408.8	420.9	416.4	420.0	8
13	416.4	420.0	919.1	422.3	8

14	99.2	468.0	108.1	464.4	9
15	108.1	464.4	148.8	448.0	8
16	148.8	448.0	168.5	440.0	2
17	168.5	440.0	213.2	421.9	3
18	213.2	421.9	408.8	418.9	3
19	408.8	418.9	416.4	418.0	3
20	416.4	418.0	919.1	420.3	3
21	85.5	464.4	108.1	464.4	9
22	.0	448.0	148.8	448.0	2
23	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	1074.0	13.10	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	442.00
2	163.60	442.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced
along the ground surface between x = 20.0 ft
and x = 100.0 ft

Each surface terminates between x = 815.0 ft
and x = 875.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 42 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	91.11	466.50
2	109.81	459.42
3	128.72	452.90
4	147.82	446.97
5	167.09	441.62
6	186.52	436.86
7	206.08	432.69
8	225.76	429.13
9	245.54	426.16
10	265.40	423.80
11	285.32	422.04
12	305.29	420.89
13	325.28	420.36
14	345.28	420.43
15	365.27	421.11

16	385.23	422.39
17	405.14	424.29
18	424.98	426.79
19	444.74	429.90
20	464.39	433.61
21	483.92	437.91
22	503.31	442.81
23	522.55	448.29
24	541.60	454.36
25	560.47	461.01
26	579.12	468.23
27	597.54	476.01
28	615.72	484.35
29	633.63	493.24
30	651.27	502.68
31	668.61	512.64
32	685.64	523.13
33	702.34	534.14
34	718.70	545.65
35	734.69	557.65
36	750.32	570.13
37	765.56	583.08
38	780.40	596.50
39	794.82	610.35
40	808.81	624.64
41	822.36	639.36
42	831.13	649.48

**** Simplified BISHOP FOS = 2.083 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-1E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.083	332.97	1076.55	656.24	91.11	831.13	1.256E+09
2.	2.181	292.11	1377.34	928.21	100.00	870.08	1.568E+09
3.	2.188	264.18	1464.26	1016.76	82.22	874.71	1.738E+09
4.	2.190	239.79	1564.63	1111.93	82.22	873.79	1.757E+09
5.	2.191	286.32	1354.78	913.94	82.22	869.41	1.677E+09
6.	2.191	231.93	1494.17	1046.02	64.44	849.85	1.636E+09
7.	2.193	286.88	1369.02	927.95	82.22	874.97	1.720E+09
8.	2.193	213.77	1573.28	1109.91	100.00	828.79	1.315E+09
9.	2.198	303.04	1245.05	806.87	91.11	848.09	1.463E+09
10.	2.212	188.14	1733.41	1277.77	64.44	867.00	1.831E+09

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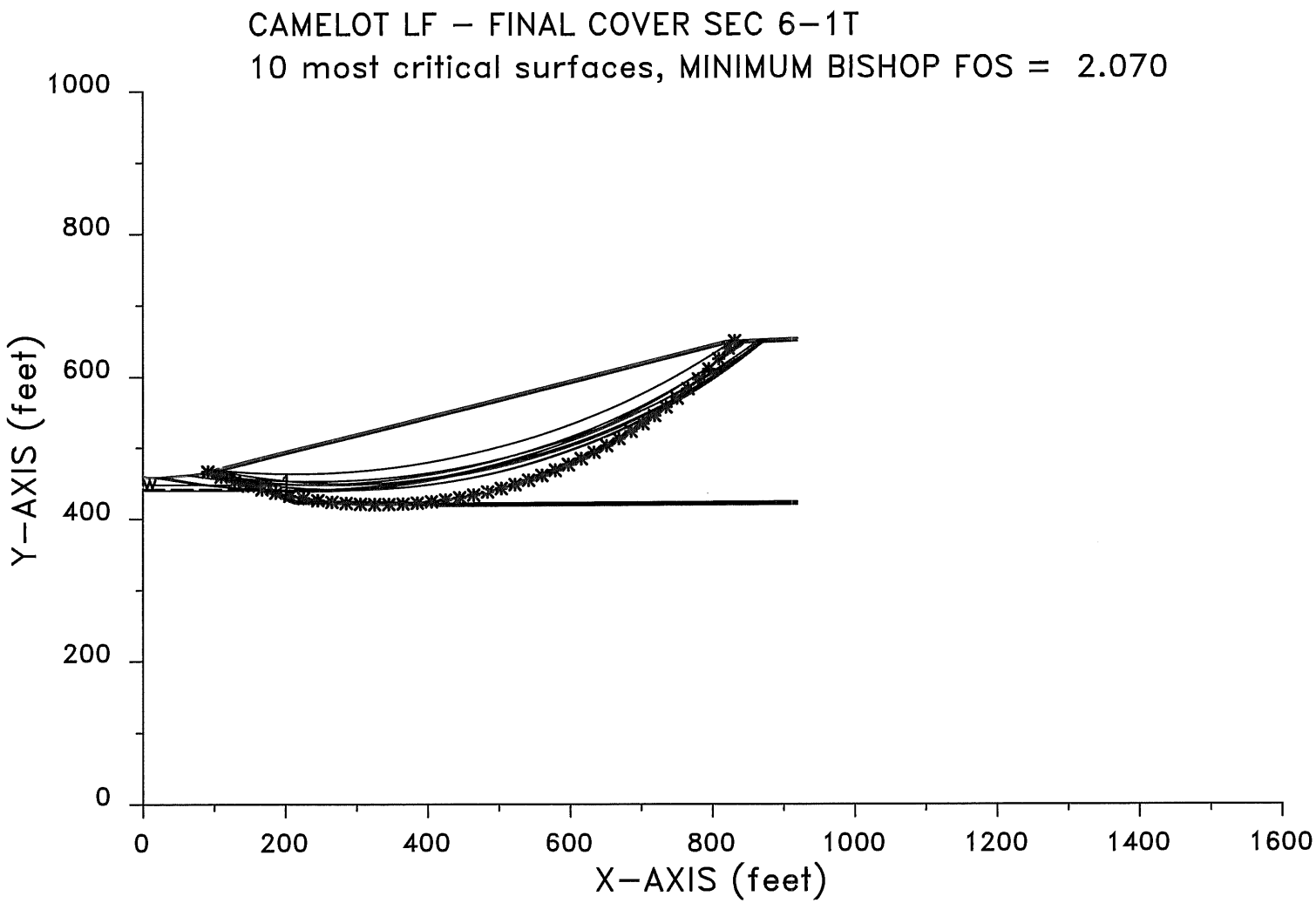
6-1T 2-17-16 10:35



XSTABL File: 6-1T 2-17-16 10:35

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*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 6-1T

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.1	468.0	7
3	104.1	468.0	109.1	468.0	6
4	109.1	468.0	819.5	645.5	4
5	819.5	645.5	919.1	649.5	4
6	109.1	468.0	213.2	425.9	6
7	213.2	425.9	408.8	422.9	6
8	408.8	422.9	416.4	422.0	6
9	416.4	422.0	919.1	424.3	6

10	104.1	468.0	213.2	423.9	7
11	213.2	423.9	408.8	420.9	8
12	408.8	420.9	416.4	420.0	8
13	416.4	420.0	919.1	422.3	8
14	99.2	468.0	108.1	464.4	9
15	108.1	464.4	148.8	448.0	8
16	148.8	448.0	168.5	440.0	2
17	168.5	440.0	213.2	421.9	3
18	213.2	421.9	408.8	418.9	3
19	408.8	418.9	416.4	418.0	3
20	416.4	418.0	919.1	420.3	3
21	85.5	464.4	108.1	464.4	9
22	.0	448.0	148.8	448.0	2
23	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	834.0	16.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
9.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	442.00
2	163.60	442.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 20.0 ft
and x = 100.0 ft

Each surface terminates between x = 815.0 ft
and x = 875.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

20.0 ft line segments define each trial failure surface.

```
---------------------
ANGULAR RESTRICTIONS
---------------------
```

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 42 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	91.11	466.50
2	109.81	459.42
3	128.72	452.90
4	147.82	446.97
5	167.09	441.62
6	186.52	436.86
7	206.08	432.69
8	225.76	429.13
9	245.54	426.16
10	265.40	423.80
11	285.32	422.04
12	305.29	420.89
13	325.28	420.36
14	345.28	420.43
15	365.27	421.11
16	385.23	422.39
17	405.14	424.29
18	424.98	426.79
19	444.74	429.90
20	464.39	433.61
21	483.92	437.91
22	503.31	442.81
23	522.55	448.29
24	541.60	454.36
25	560.47	461.01
26	579.12	468.23
27	597.54	476.01
28	615.72	484.35
29	633.63	493.24
30	651.27	502.68
31	668.61	512.64
32	685.64	523.13
33	702.34	534.14
34	718.70	545.65
35	734.69	557.65
36	750.32	570.13
37	765.56	583.08
38	780.40	596.50
39	794.82	610.35
40	808.81	624.64
41	822.36	639.36
42	831.13	649.48

**** Simplified BISHOP FOS = 2.070 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-1T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.070	332.97	1076.55	656.24	91.11	831.13	1.248E+09
2.	2.180	264.18	1464.26	1016.76	82.22	874.71	1.732E+09
3.	2.181	292.11	1377.34	928.21	100.00	870.08	1.568E+09
4.	2.182	239.79	1564.63	1111.93	82.22	873.79	1.751E+09
5.	2.183	231.93	1494.17	1046.02	64.44	849.85	1.630E+09
6.	2.184	286.32	1354.78	913.94	82.22	869.41	1.672E+09
7.	2.186	286.88	1369.02	927.95	82.22	874.97	1.715E+09
8.	2.188	228.27	1443.96	1005.30	28.89	844.90	1.706E+09
9.	2.193	215.79	1549.88	1109.29	20.00	865.55	1.922E+09
10.	2.193	213.77	1573.28	1109.91	100.00	828.79	1.315E+09

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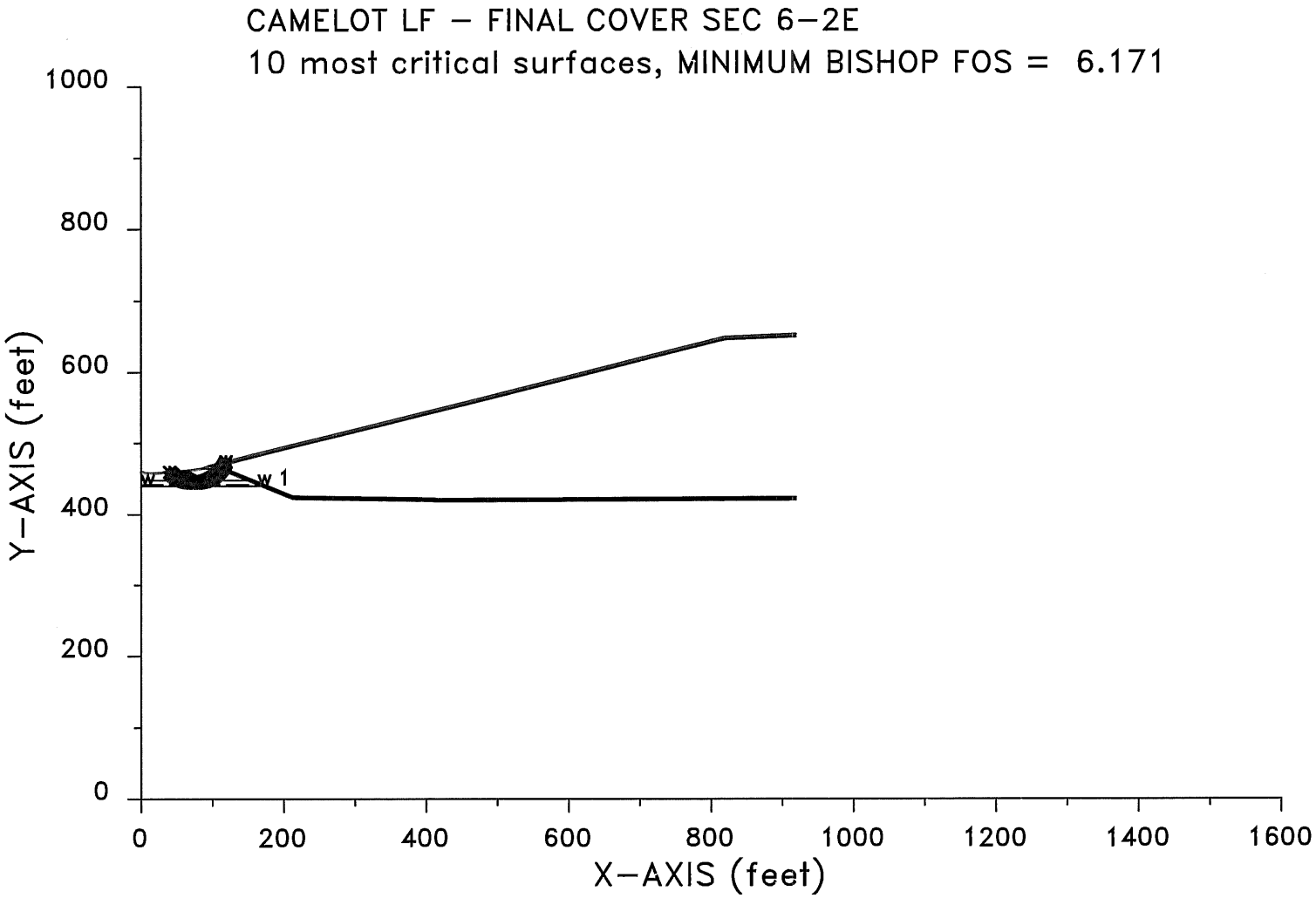
6-2E 2-17-16 10:30



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*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 6-2E

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.1	468.0	7
3	104.1	468.0	109.1	468.0	6
4	109.1	468.0	819.5	645.5	4
5	819.5	645.5	919.1	649.5	4
6	109.1	468.0	213.2	425.9	6
7	213.2	425.9	408.8	422.9	6
8	408.8	422.9	416.4	422.0	6
9	416.4	422.0	919.1	424.3	6

10	104.1	468.0	213.2	423.9	7
11	213.2	423.9	408.8	420.9	8
12	408.8	420.9	416.4	420.0	8
13	416.4	420.0	919.1	422.3	8
14	99.2	468.0	108.1	464.4	9
15	108.1	464.4	148.8	448.0	8
16	148.8	448.0	168.5	440.0	2
17	168.5	440.0	213.2	421.9	3
18	213.2	421.9	408.8	418.9	3
19	408.8	418.9	416.4	418.0	3
20	416.4	418.0	919.1	420.3	3
21	85.5	464.4	108.1	464.4	9
22	.0	448.0	148.8	448.0	2
23	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	1074.0	13.10	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	442.00
2	163.60	442.00

```
A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.

  100 trial surfaces will be generated and analyzed.

  10 Surfaces initiate from each of  10 points equally spaced
along the ground surface between  x =     40.0 ft
                              and  x =     80.0 ft

Each surface terminates between   x =     90.0 ft
                            and   x =    120.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft


* * * * *  DEFAULT SEGMENT LENGTH SELECTED BY XSTABL  * * * * *

    2.0 ft line segments define each trial failure surface.


---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees



************************************************************
**     Factor of safety calculation for surface #     3    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  52.4531    **
**    This will be ignored for final summary of results    **
************************************************************


Circular surface (FOS= 52.4531) is defined by: xcenter =     51.10
ycenter =    582.34   Init. Pt. =     40.00   Seg. Length =   2.00
-------------------------------------------------------------------


************************************************************
**     Factor of safety calculation for surface #     4    **
```

```
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  20.4977    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 20.4977) is defined by: xcenter =     53.55
ycenter =    601.78   Init. Pt. =     40.00   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #     6    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  22.8243    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 22.8243) is defined by: xcenter =     58.45
ycenter =    534.73   Init. Pt. =     40.00   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #     8    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  28.3241    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS= 28.3241) is defined by: xcenter =     56.57
ycenter =    546.43   Init. Pt. =     40.00   Seg. Length =   2.00
-------------------------------------------------------------------


*********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)

*********************************************************************
      This warning is usually reported for cases where slices near the toe
      of the slide mass have steep, negative base angles.  Generally, this
      error condition can be avoided by "raising" the lower angular limit
      boundary to prevent generation of such deep failure surfaces.

*********************************************************************


          Surface No:    16        Slice No:  1        m_alpha =  -.018388
          Alpha =   -3.91 deg      Phi =  11.00 deg        FOS =   .013
```

```
    ************************************************************
    **     Factor of safety calculation for surface #    16    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  50.1856    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 50.1856) is defined by: xcenter =     53.23
ycenter =    573.98   Init. Pt. =     44.44   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    20    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  20.4446    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 20.4446) is defined by: xcenter =     61.13
ycenter =    541.64   Init. Pt. =     44.44   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    35    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  37.3210    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 37.3210) is defined by: xcenter =     63.88
ycenter =    532.52   Init. Pt. =     53.33   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    40    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  20.7897    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 20.7897) is defined by: xcenter =     68.35
ycenter =    503.48   Init. Pt. =     53.33   Seg. Length =   2.00
-------------------------------------------------------------------
```

```
*********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

*********************************************************************
      Negative effective stresses were calculated at the base of a slice.
      This warning is usually reported for cases where slices have low self
      weight and a relatively high "c" shear strength parameter.  In such
      cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

          ------------------------------------------------------------
          USER SELECTED option to maintain strength greater than zero
          ------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #    45    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  29.2749    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 29.2749) is defined by: xcenter =     69.51
      ycenter =    497.00   Init. Pt. =     57.78   Seg. Length =   2.00
      ---------------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #    63    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  35.0692    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 35.0692) is defined by: xcenter =     71.43
      ycenter =    507.43   Init. Pt. =     66.67   Seg. Length =   2.00
      ---------------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #    65    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  20.7360    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 20.7360) is defined by: xcenter =     76.71
      ycenter =    473.03   Init. Pt. =     66.67   Seg. Length =   2.00
      ---------------------------------------------------------------------
```

```
    ************************************************************
    **     Factor of safety calculation for surface #    70    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  21.5594    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 21.5594) is defined by: xcenter =     76.47
ycenter =    476.19   Init. Pt. =     66.67   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    71    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  30.6563    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 30.6563) is defined by: xcenter =     67.53
ycenter =    556.94   Init. Pt. =     71.11   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    72    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  20.5823    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 20.5823) is defined by: xcenter =     80.02
ycenter =    471.30   Init. Pt. =     71.11   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    81    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  26.5386    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 26.5386) is defined by: xcenter =     82.21
ycenter =    468.62   Init. Pt. =     75.56   Seg. Length =   2.00
-------------------------------------------------------------------
```

```
*************************************************************
**     Factor of safety calculation for surface #    85    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  26.6519    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 26.6519) is defined by: xcenter =     82.23
ycenter =    468.40   Init. Pt. =     75.56   Seg. Length =   2.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #    88    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  23.5631    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 23.5631) is defined by: xcenter =     82.22
ycenter =    474.53   Init. Pt. =     75.56   Seg. Length =   2.00
-------------------------------------------------------------------


*********************************************************************
        --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)

*********************************************************************
      This warning is usually reported for cases where slices near the toe
      of the slide mass have steep, negative base angles.  Generally, this
      error condition can be avoided by "raising" the lower angular limit
      boundary to prevent generation of such deep failure surfaces.

*********************************************************************


      Surface No:    95        Slice No:  1        m_alpha =  -.134770
      Alpha =  -20.69 deg      Phi =  11.00 deg       FOS =   .064


*************************************************************
**     Factor of safety calculation for surface #    95    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  37.2636    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 37.2636) is defined by: xcenter =     83.69
```

```
ycenter =    470.52   Init. Pt. =     80.00   Seg. Length =   2.00
-----------------------------------------------------------------


*********************************************************************
        --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)

*********************************************************************
      This warning is usually reported for cases where slices near the toe
      of the slide mass have steep, negative base angles.  Generally, this
      error condition can be avoided by "raising" the lower angular limit
      boundary to prevent generation of such deep failure surfaces.

*********************************************************************


          Surface No:    96       Slice No:  1        m_alpha =  -.392578
          Alpha =   -9.48 deg     Phi =  11.00 deg        FOS =   .023


          ************************************************************
          **     Factor of safety calculation for surface #    96    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  39.7851    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 39.7851) is defined by: xcenter =     83.13
      ycenter =    476.24   Init. Pt. =     80.00   Seg. Length =   2.00
      -----------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #    97    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  23.7786    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 23.7786) is defined by: xcenter =     85.41
      ycenter =    469.58   Init. Pt. =     80.00   Seg. Length =   2.00
      -----------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #   100    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  27.7535    **
          **    This will be ignored for final summary of results    **
          ************************************************************
```

Circular surface (FOS= 27.7535) is defined by: xcenter = 85.18
ycenter = 467.60 Init. Pt. = 80.00 Seg. Length = 2.00

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 49 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	40.00	459.64
2	41.42	458.24
3	42.90	456.89
4	44.43	455.60
5	46.02	454.38
6	47.65	453.23
7	49.33	452.15
8	51.06	451.13
9	52.82	450.19
10	54.62	449.32
11	56.46	448.53
12	58.32	447.81
13	60.22	447.17
14	62.14	446.61
15	64.08	446.13
16	66.04	445.73
17	68.02	445.41
18	70.00	445.18
19	72.00	445.02
20	73.99	444.95
21	75.99	444.96
22	77.99	445.05
23	79.98	445.23
24	81.97	445.49
25	83.94	445.83
26	85.89	446.25
27	87.83	446.75
28	89.74	447.33
29	91.63	447.99
30	93.49	448.73
31	95.32	449.54
32	97.11	450.43
33	98.86	451.39
34	100.58	452.43
35	102.24	453.53
36	103.87	454.70
37	105.44	455.94

38	106.96	457.24
39	108.42	458.60
40	109.83	460.02
41	111.17	461.50
42	112.46	463.03
43	113.68	464.62
44	114.83	466.25
45	115.91	467.93
46	116.93	469.66
47	117.87	471.42
48	118.74	473.22
49	119.07	473.99

**** Simplified BISHOP FOS = 6.171 ****

```
*******************************************************************
**                                                               **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**       21 surfaces were found to have MISLEADING FOS values.   **
**                                                               **
*******************************************************************
```

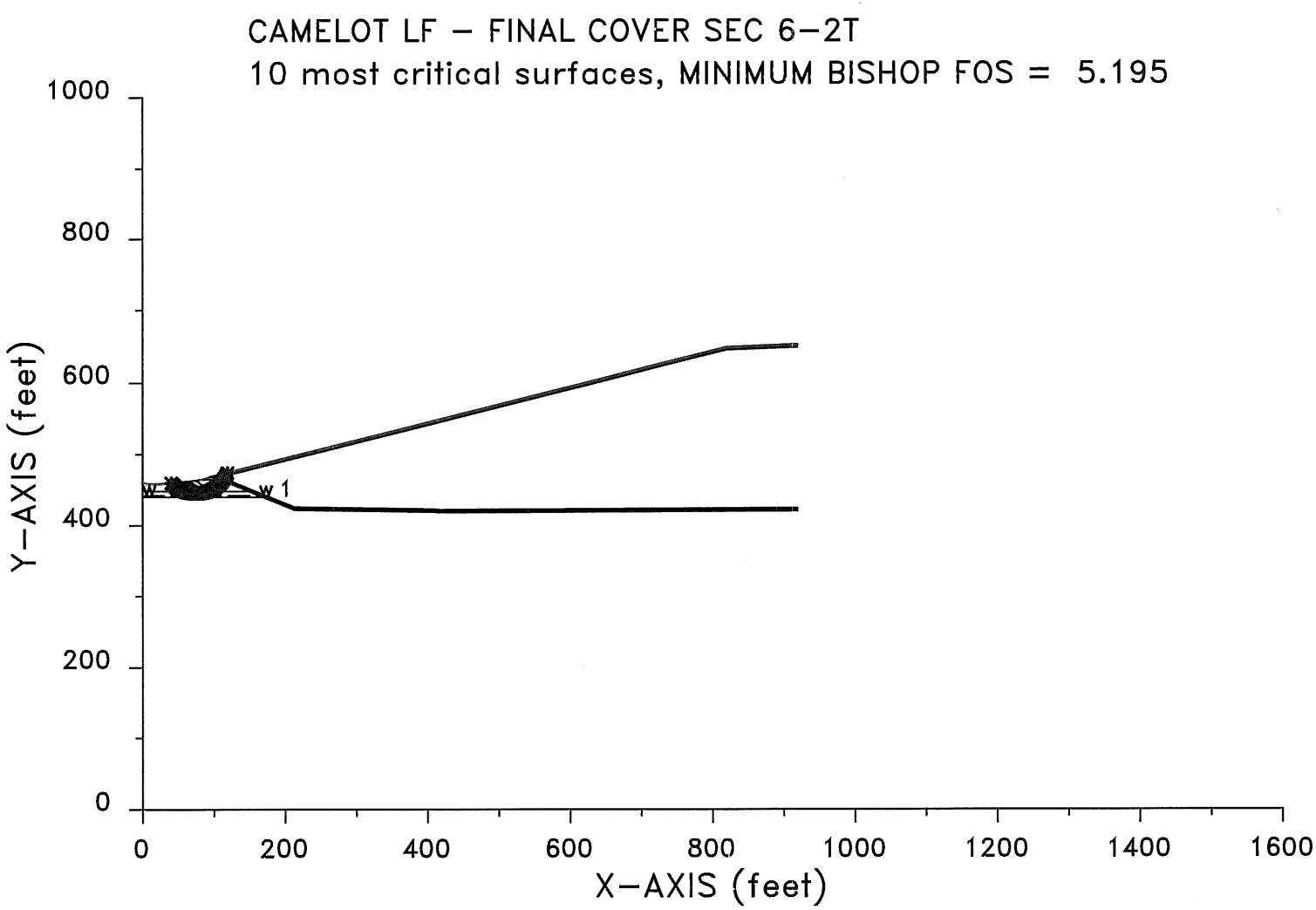
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-2E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	6.171	74.73	493.33	48.38	40.00	119.07	4.698E+06
2.	6.215	77.17	491.41	45.33	44.44	119.01	4.153E+0
3.	6.252	86.69	487.74	35.89	62.22	119.93	2.464E+06
4.	6.262	89.73	483.46	31.63	66.67	119.98	2.058E+06
5.	6.262	88.93	486.24	33.05	66.67	119.69	2.051E+06
6.	6.325	76.86	491.05	44.85	44.44	118.24	4.096E+06
7.	6.373	82.46	488.54	40.20	53.33	120.00	3.389E+06
8.	6.417	76.61	494.25	46.95	44.44	118.94	4.287E+06
9.	6.589	83.03	490.09	38.40	57.78	117.72	2.755E+06
10.	6.592	85.28	487.79	34.98	62.22	117.21	2.289E+06

* * * END OF FILE * * *

6-2T 2-17-16 10:37



XSTABL File: 6-2T 2-17-16 10:37

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 6-2T

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.1	468.0	7
3	104.1	468.0	109.1	468.0	6
4	109.1	468.0	819.5	645.5	4
5	819.5	645.5	919.1	649.5	4
6	109.1	468.0	213.2	425.9	6
7	213.2	425.9	408.8	422.9	6
8	408.8	422.9	416.4	422.0	6
9	416.4	422.0	919.1	424.3	6
10	104.1	468.0	213.2	423.9	7
11	213.2	423.9	408.8	420.9	8

12	408.8	420.9	416.4	420.0	8
13	416.4	420.0	919.1	422.3	8
14	99.2	468.0	108.1	464.4	9
15	108.1	464.4	148.8	448.0	8
16	148.8	448.0	168.5	440.0	2
17	168.5	440.0	213.2	421.9	3
18	213.2	421.9	408.8	418.9	3
19	408.8	418.9	416.4	418.0	3
20	416.4	418.0	919.1	420.3	3
21	85.5	464.4	108.1	464.4	9
22	.0	448.0	148.8	448.0	2
23	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	834.0	16.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
9.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,

```
**********************************

  Point       x-water      y-water
   No.          (ft)         (ft)

    1            .00       442.00
    2         163.60       442.00


A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.


  100 trial surfaces will be generated and analyzed.


  10 Surfaces initiate from each of  10 points equally spaced
along the ground surface between  x =     40.0 ft
                                and  x =     80.0 ft


Each surface terminates between   x =     90.0 ft
                              and  x =    120.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft


* * * * *  DEFAULT SEGMENT LENGTH SELECTED BY XSTABL  * * * * *

    2.0 ft line segments define each trial failure surface.


---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees


************************************************************
**     Factor of safety calculation for surface #     3    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  47.1792    **
**    This will be ignored for final summary of results    **
************************************************************

Circular surface (FOS= 47.1792) is defined by: xcenter =     51.10
ycenter =    582.34   Init. Pt. =     40.00   Seg. Length =   2.00
```

```
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #     6    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  20.6817    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 20.6817) is defined by: xcenter =     58.45
ycenter =    534.73   Init. Pt. =     40.00   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #     8    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  25.5954    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 25.5954) is defined by: xcenter =     56.57
ycenter =    546.43   Init. Pt. =     40.00   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    16    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  70.7101    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 70.7101) is defined by: xcenter =     53.23
ycenter =    573.98   Init. Pt. =     44.44   Seg. Length =   2.00
-----------------------------------------------------------------

    ************************************************************
    **     Factor of safety calculation for surface #    35    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  33.2909    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 33.2909) is defined by: xcenter =     63.88
ycenter =    532.52   Init. Pt. =     53.33   Seg. Length =   2.00
-----------------------------------------------------------------
```

```
*********************************************************************
          --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

*********************************************************************
      Negative effective stresses were calculated at the base of a slice.
      This warning is usually reported for cases where slices have low self
      weight and a relatively high "c" shear strength parameter.  In such
      cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

          ------------------------------------------------------------
          USER SELECTED option to maintain strength greater than zero
          ------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #    45    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  26.2343    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 26.2343) is defined by: xcenter =     69.51
      ycenter =    497.00   Init. Pt. =     57.78   Seg. Length =   2.00
      ---------------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #    63    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  49.9003    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 49.9003) is defined by: xcenter =     71.43
      ycenter =    507.43   Init. Pt. =     66.67   Seg. Length =   2.00
      ---------------------------------------------------------------------


          ************************************************************
          **     Factor of safety calculation for surface #    71    **
          **     failed to converge within FIFTY iterations          **
          **                                                         **
          **    The last calculated value of the FOS was  26.8510    **
          **    This will be ignored for final summary of results    **
          ************************************************************


      Circular surface (FOS= 26.8510) is defined by: xcenter =     67.53
      ycenter =    556.94   Init. Pt. =     71.11   Seg. Length =   2.00
      ---------------------------------------------------------------------
```

```
    ************************************************************
    **     Factor of safety calculation for surface #    81    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  23.2555    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 23.2555) is defined by: xcenter =     82.21
ycenter =    468.62   Init. Pt. =     75.56   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    85    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  23.3708    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 23.3708) is defined by: xcenter =     82.23
ycenter =    468.40   Init. Pt. =     75.56   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    95    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  36.0829    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 36.0829) is defined by: xcenter =     83.69
ycenter =    470.52   Init. Pt. =     80.00   Seg. Length =   2.00
-------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    96    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  38.8367    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS= 38.8367) is defined by: xcenter =     83.13
ycenter =    476.24   Init. Pt. =     80.00   Seg. Length =   2.00
-------------------------------------------------------------------
```

```
*************************************************************
**     Factor of safety calculation for surface #   100    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  23.7645    **
**    This will be ignored for final summary of results    **
*************************************************************
```

Circular surface (FOS= 23.7645) is defined by: xcenter = 85.18
ycenter = 467.60 Init. Pt. = 80.00 Seg. Length = 2.00

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 49 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	40.00	459.64
2	41.42	458.24
3	42.90	456.89
4	44.43	455.60
5	46.02	454.38
6	47.65	453.23
7	49.33	452.15
8	51.06	451.13
9	52.82	450.19
10	54.62	449.32
11	56.46	448.53
12	58.32	447.81
13	60.22	447.17
14	62.14	446.61
15	64.08	446.13
16	66.04	445.73
17	68.02	445.41
18	70.00	445.18
19	72.00	445.02
20	73.99	444.95
21	75.99	444.96
22	77.99	445.05
23	79.98	445.23
24	81.97	445.49
25	83.94	445.83
26	85.89	446.25
27	87.83	446.75
28	89.74	447.33
29	91.63	447.99
30	93.49	448.73
31	95.32	449.54

32	97.11	450.43
33	98.86	451.39
34	100.58	452.43
35	102.24	453.53
36	103.87	454.70
37	105.44	455.94
38	106.96	457.24
39	108.42	458.60
40	109.83	460.02
41	111.17	461.50
42	112.46	463.03
43	113.68	464.62
44	114.83	466.25
45	115.91	467.93
46	116.93	469.66
47	117.87	471.42
48	118.74	473.22
49	119.07	473.99

**** Simplified BISHOP FOS = 5.195 ****

```
*****************************************************************
**                                                             **
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**       13 surfaces were found to have MISLEADING FOS values.   **
**                                                             **
*****************************************************************
```

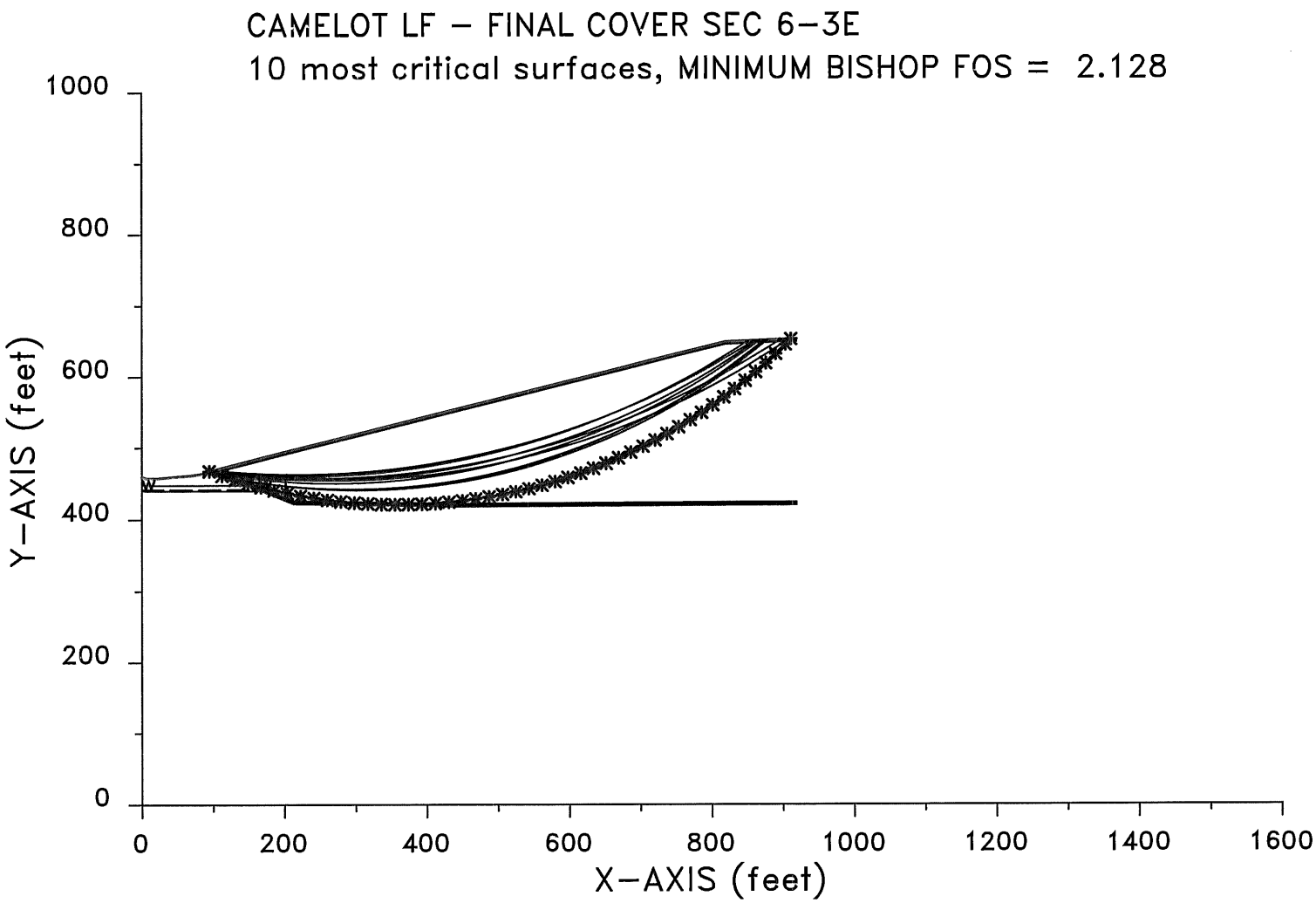
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-2T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	5.195	74.73	493.33	48.38	40.00	119.07	3.955E+06
2.	5.357	77.17	491.41	45.33	44.44	119.01	3.579E+06
3.	5.463	76.86	491.05	44.85	44.44	118.24	3.538E+06
4.	5.710	76.61	494.25	46.95	44.44	118.94	3.814E+06
5.	5.761	88.93	486.24	33.05	66.67	119.69	1.887E+06
6.	5.787	86.69	487.74	35.89	62.22	119.93	2.281E+06
7.	5.796	89.73	483.46	31.63	66.67	119.98	1.904E+06
8.	5.974	82.46	488.54	40.20	53.33	120.00	3.176E+06
9.	6.024	94.06	480.02	25.19	75.56	118.49	1.175E+06
10.	6.059	85.28	487.79	34.98	62.22	117.21	2.104E+06

* * * END OF FILE * * *

6-3E 2-17-16 9:53



XSTABL File: 6-3E 2-17-16 9:53

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 6-3E

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.1	468.0	7
3	104.1	468.0	109.1	468.0	6
4	109.1	468.0	819.5	645.5	4
5	819.5	645.5	919.1	649.5	4
6	109.1	468.0	213.2	425.9	6
7	213.2	425.9	408.8	422.9	6
8	408.8	422.9	416.4	422.0	6
9	416.4	422.0	919.1	424.3	6

10	104.1	468.0	213.2	423.9	7
11	213.2	423.9	408.8	420.9	8
12	408.8	420.9	416.4	420.0	8
13	416.4	420.0	919.1	422.3	8
14	99.2	468.0	108.1	464.4	9
15	108.1	464.4	148.8	448.0	8
16	148.8	448.0	168.5	440.0	2
17	168.5	440.0	213.2	421.9	3
18	213.2	421.9	408.8	418.9	3
19	408.8	418.9	416.4	418.0	3
20	416.4	418.0	919.1	420.3	3
21	85.5	464.4	108.1	464.4	9
22	.0	448.0	148.8	448.0	2
23	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	1074.0	13.10	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	442.00
2	163.60	442.00

```
A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.

  100 trial surfaces will be generated and analyzed.

  10 Surfaces initiate from each of  10 points equally spaced
along the ground surface between  x =     90.0 ft
                              and  x =    100.0 ft

Each surface terminates between   x =    845.0 ft
                            and   x =    915.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft


* * * * *  DEFAULT SEGMENT LENGTH SELECTED BY XSTABL  * * * * *

   19.0 ft line segments define each trial failure surface.


---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees


***********************************************************************
        --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)

***********************************************************************
     Negative effective stresses were calculated at the base of a slice.
     This warning is usually reported for cases where slices have low self
     weight and a relatively high "c" shear strength parameter.  In such
     cases, this effect can only be eliminated by reducing the "c" value.

***********************************************************************

        ------------------------------------------------------------
        USER SELECTED option to maintain strength greater than zero
        ------------------------------------------------------------
```

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 48 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	94.44	467.75
2	112.37	461.46
3	130.45	455.61
4	148.66	450.20
5	167.01	445.25
6	185.46	440.75
7	204.03	436.70
8	222.69	433.11
9	241.43	429.98
10	260.24	427.31
11	279.11	425.10
12	298.03	423.36
13	316.99	422.09
14	335.97	421.28
15	354.97	420.94
16	373.97	421.06
17	392.96	421.66
18	411.93	422.72
19	430.87	424.24
20	449.76	426.23
21	468.60	428.69
22	487.38	431.61
23	506.07	434.98
24	524.68	438.82
25	543.19	443.11
26	561.59	447.86
27	579.86	453.06
28	598.01	458.70
29	616.00	464.79
30	633.85	471.32
31	651.52	478.29
32	669.02	485.69
33	686.33	493.52
34	703.45	501.77
35	720.36	510.44
36	737.05	519.52
37	753.51	529.01
38	769.73	538.90
39	785.70	549.19
40	801.42	559.87
41	816.87	570.93
42	832.04	582.37
43	846.92	594.17

44	861.52	606.34
45	875.80	618.87
46	889.78	631.74
47	903.44	644.95
48	911.04	652.68

**** Simplified BISHOP FOS = 2.128 ****

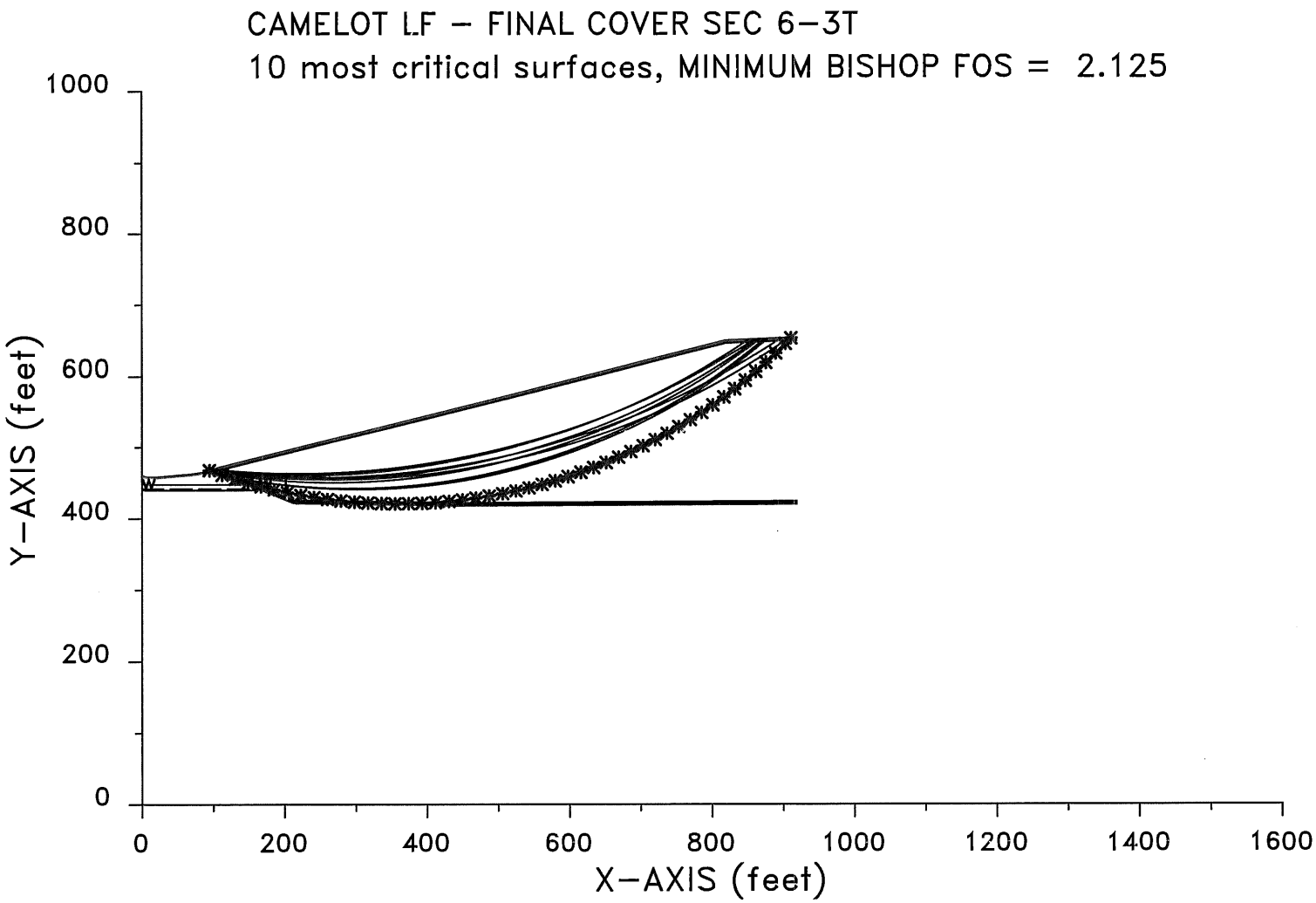
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-3E

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.128	359.35	1193.63	772.70	94.44	911.04	1.774E+09
2.	2.140	362.99	1193.39	772.36	96.67	914.59	1.792E+09
3.	2.182	252.52	1508.58	1053.34	93.33	863.82	1.592E+09
4.	2.184	223.97	1591.19	1130.88	94.44	851.28	1.509E+09
5.	2.186	270.19	1441.68	990.88	92.22	867.28	1.614E+09
6.	2.186	220.24	1647.50	1184.39	100.00	859.72	1.549E+09
7.	2.194	295.42	1347.04	904.58	90.00	873.36	1.658E+09
8.	2.199	272.61	1576.03	1121.08	97.78	908.22	1.908E+09
9.	2.199	245.31	1644.18	1186.61	93.33	896.25	1.873E+09
10.	2.200	304.32	1329.35	888.13	92.22	877.95	1.673E+09

* * * END OF FILE * * *

6-3T 2-17-16 10:38



XSTABL File: 6-3T 2-17-16 10:38

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : CAMELOT LF - FINAL COVER SEC 6-3T

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.1	468.0	7
3	104.1	468.0	109.1	468.0	6
4	109.1	468.0	819.5	645.5	4
5	819.5	645.5	919.1	649.5	4
6	109.1	468.0	213.2	425.9	6
7	213.2	425.9	408.8	422.9	6
8	408.8	422.9	416.4	422.0	6
9	416.4	422.0	919.1	424.3	6

10	104.1	468.0	213.2	423.9	7
11	213.2	423.9	408.8	420.9	8
12	408.8	420.9	416.4	420.0	8
13	416.4	420.0	919.1	422.3	8
14	99.2	468.0	108.1	464.4	9
15	108.1	464.4	148.8	448.0	8
16	148.8	448.0	168.5	440.0	2
17	168.5	440.0	213.2	421.9	3
18	213.2	421.9	408.8	418.9	3
19	408.8	418.9	416.4	418.0	3
20	416.4	418.0	919.1	420.3	3
21	85.5	464.4	108.1	464.4	9
22	.0	448.0	148.8	448.0	2
23	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	788.0	11.50	.000	.0	0
2	132.0	135.0	470.0	8.30	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	834.0	16.00	.000	.0	0

UNDRAINED STRENGTHS as a function of effective vertical stress
have been specified for 3 Soil Unit(s)

Soil Unit #	Parameter a	Parameter Psi
1.	788.0	11.50
2.	470.0	8.30
9.	834.0	16.00

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************

  Point       x-water      y-water
   No.          (ft)         (ft)

    1            .00       442.00
    2         163.60       442.00


A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.


  100 trial surfaces will be generated and analyzed.


  10 Surfaces initiate from each of  10 points equally spaced
along the ground surface between  x =     90.0 ft
                              and  x =    100.0 ft


Each surface terminates between   x =    845.0 ft
                            and   x =    915.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =       .0 ft


* * * * *  DEFAULT SEGMENT LENGTH SELECTED BY XSTABL  * * * * *

   19.0 ft line segments define each trial failure surface.


---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees


**********************************************************************
        --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)
```

```
*********************************************************************
      Negative effective stresses were calculated at the base of a slice.
      This warning is usually reported for cases where slices have low self
      weight and a relatively high "c" shear strength parameter.  In such
      cases, this effect can only be eliminated by reducing the "c" value.

*********************************************************************

          ------------------------------------------------------------
          USER SELECTED option to maintain strength greater than zero
          ------------------------------------------------------------


          Factors of safety have been calculated by the :

          * * * * *   SIMPLIFIED BISHOP METHOD   * * * * *


            The most critical circular failure surface
            is specified by 48 coordinate points
```

Point No.	x-surf (ft)	y-surf (ft)
1	94.44	467.75
2	112.37	461.46
3	130.45	455.61
4	148.66	450.20
5	167.01	445.25
6	185.46	440.75
7	204.03	436.70
8	222.69	433.11
9	241.43	429.98
10	260.24	427.31
11	279.11	425.10
12	298.03	423.36
13	316.99	422.09
14	335.97	421.28
15	354.97	420.94
16	373.97	421.06
17	392.96	421.66
18	411.93	422.72
19	430.87	424.24
20	449.76	426.23
21	468.60	428.69
22	487.38	431.61
23	506.07	434.98
24	524.68	438.82
25	543.19	443.11
26	561.59	447.86
27	579.86	453.06
28	598.01	458.70
29	616.00	464.79
30	633.85	471.32

31	651.52	478.29
32	669.02	485.69
33	686.33	493.52
34	703.45	501.77
35	720.36	510.44
36	737.05	519.52
37	753.51	529.01
38	769.73	538.90
39	785.70	549.19
40	801.42	559.87
41	816.87	570.93
42	832.04	582.37
43	846.92	594.17
44	861.52	606.34
45	875.80	618.87
46	889.78	631.74
47	903.44	644.95
48	911.04	652.68

**** Simplified BISHOP FOS = 2.125 ****

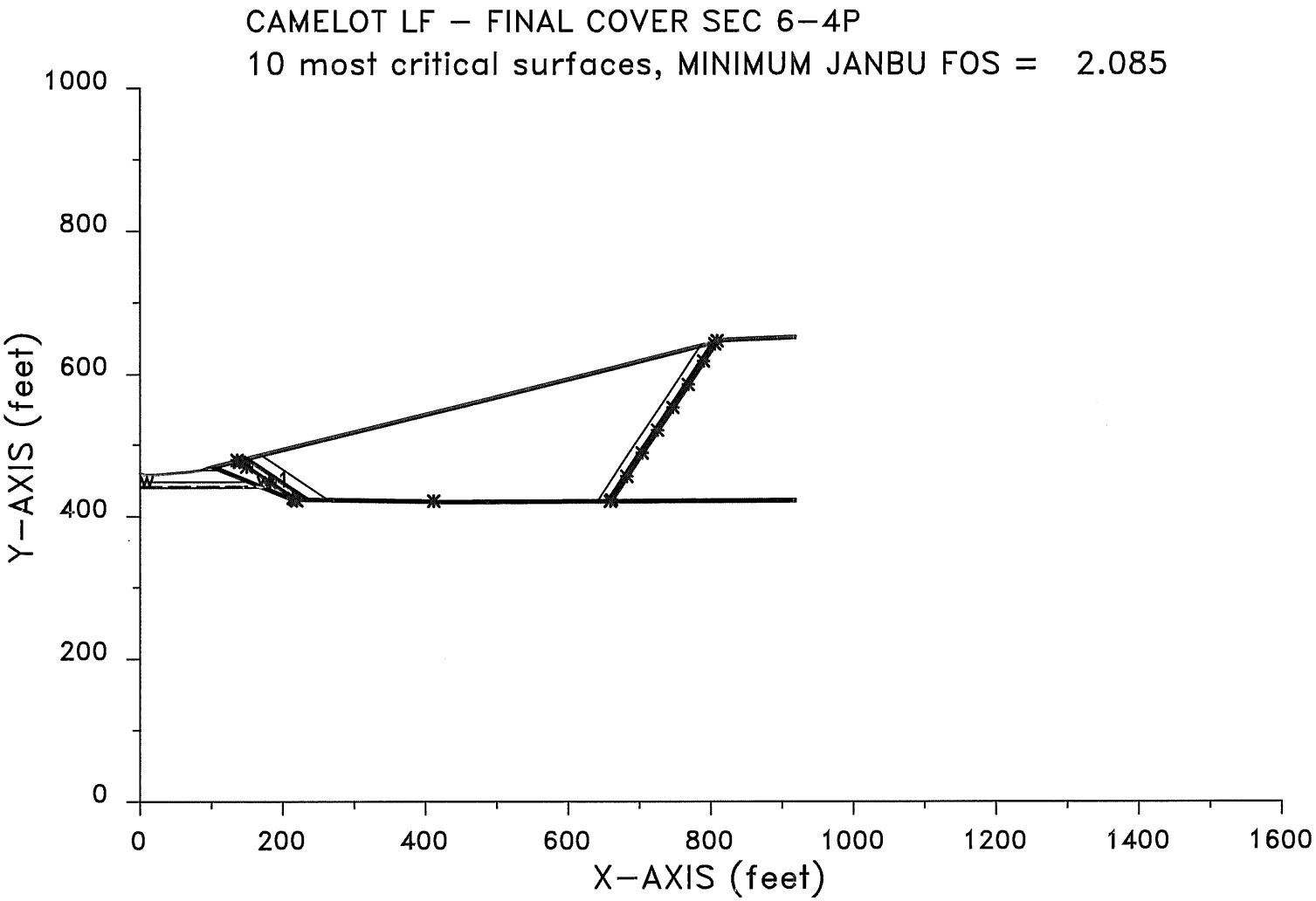
The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-3T

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.125	359.35	1193.63	772.70	94.44	911.04	1.772E+09
2.	2.137	362.99	1193.39	772.36	96.67	914.59	1.790E+09
3.	2.179	252.52	1508.58	1053.34	93.33	863.82	1.590E+09
4.	2.181	270.19	1441.68	990.88	92.22	867.28	1.611E+09
5.	2.183	223.97	1591.19	1130.88	94.44	851.28	1.507E+09
6.	2.186	220.24	1647.50	1184.39	100.00	859.72	1.549E+09
7.	2.189	295.42	1347.04	904.58	90.00	873.36	1.654E+09
8.	2.196	304.32	1329.35	888.13	92.22	877.95	1.670E+09
9.	2.196	245.31	1644.18	1186.61	93.33	896.25	1.871E+09
10.	2.199	272.61	1576.03	1121.08	97.78	908.22	1.908E+09

* * * END OF FILE * * *

6-4P 2-17-16 10:49



XSTABL File: 6-4P 2-17-16 10:49

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
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Problem Description : CAMELOT LF - FINAL COVER SEC 6-4P

SEGMENT BOUNDARY COORDINATES
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8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

28 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.0	468.0	6
3	104.0	468.0	104.2	468.0	7
4	104.2	468.0	109.1	468.0	6
5	109.1	468.0	819.5	645.5	4
6	819.5	645.5	919.1	649.5	4
7	109.1	468.0	213.2	425.9	6
8	213.2	425.9	408.8	422.9	6
9	408.8	422.9	416.4	422.0	6

10	416.4	422.0	919.1	424.3	6
11	104.2	468.0	213.2	423.9	7
12	213.2	423.9	408.8	421.0	8
13	408.8	421.0	416.4	420.1	8
14	416.4	420.1	919.1	422.4	8
15	104.0	468.0	213.2	423.9	6
16	213.2	423.9	408.8	420.9	6
17	408.8	420.9	416.4	420.0	6
18	416.4	420.0	919.1	422.3	6
19	99.2	468.0	108.1	464.4	9
20	108.1	464.4	148.8	448.0	8
21	148.8	448.0	168.5	440.0	2
22	168.5	440.0	213.2	421.9	3
23	213.2	421.9	408.8	418.9	3
24	408.8	418.9	416.4	418.0	3
25	416.4	418.0	919.1	420.3	3
26	85.5	464.4	108.1	464.4	9
27	.0	448.0	148.8	448.0	2
28	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	13.00	.000	.0	0
8	115.0	120.0	100.0	13.00	.000	.0	0
9	115.0	120.0	1074.0	13.10	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

1	.00	442.00
2	163.60	442.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 39.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	218.1	423.8	268.1	423.1	4.0
2	408.8	420.9	416.4	420.0	4.0
3	613.9	420.9	663.9	421.1	4.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 20 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	135.81	478.18
2	139.30	475.55
3	149.29	468.93
4	181.82	447.41
5	214.34	425.88
6	216.90	423.84

7	219.17	422.13
8	411.45	421.42
9	659.15	421.10
10	659.16	421.11
11	659.24	421.21
12	660.68	423.12
13	682.20	455.64
14	703.73	488.16
15	725.26	520.68
16	746.78	553.20
17	768.31	585.73
18	789.83	618.25
19	805.57	642.02
20	808.91	646.45

** Corrected JANBU FOS = 2.085 ** (Fo factor = 1.083)

Failure surface No. 2 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	147.29	481.05
2	150.79	478.42
3	165.49	468.69
4	198.01	447.16
5	230.53	425.63
6	232.22	424.36
7	414.83	420.17
8	640.54	420.90
9	640.63	421.03
10	640.71	421.13
11	642.15	423.03
12	663.67	455.55
13	685.20	488.08
14	706.72	520.60
15	728.25	553.12
16	749.77	585.64
17	771.30	618.16
18	783.43	636.49
19	786.76	640.92

** Corrected JANBU FOS = 2.088 ** (Fo factor = 1.084)

Failure surface No. 3 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	138.10	478.75
2	141.59	476.12
3	152.52	468.88
4	185.04	447.36
5	217.56	425.83
6	220.26	423.80

7	220.27	423.79
8	222.23	422.31
9	414.37	421.26
10	661.10	422.58
11	661.51	423.12
12	683.04	455.64
13	704.57	488.16
14	726.09	520.69
15	747.62	553.21
16	769.14	585.73
17	790.67	618.25
18	806.56	642.27
19	809.91	646.70

** Corrected JANBU FOS = 2.092 ** (Fo factor = 1.083)

Failure surface No. 4 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	168.41	486.33
2	171.90	483.69
3	195.27	468.23
4	227.79	446.70
5	260.31	425.18
6	262.98	423.16
7	263.02	423.14
8	263.71	422.61
9	415.84	420.08
10	655.64	421.01
11	655.70	421.09
12	655.78	421.20
13	657.22	423.10
14	678.74	455.62
15	700.27	488.14
16	721.80	520.67
17	743.32	553.19
18	764.85	585.71
19	786.37	618.23
20	801.43	640.99
21	804.77	645.42

** Corrected JANBU FOS = 2.103 ** (Fo factor = 1.085)

Failure surface No. 5 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	137.99	478.72
2	141.48	476.09
3	152.36	468.89
4	184.89	447.36
5	217.41	425.84

6	219.08	424.58
7	415.05	419.34
8	656.56	419.33
9	657.90	421.10
10	657.98	421.21
11	659.41	423.11
12	680.94	455.63
13	702.46	488.15
14	723.99	520.68
15	745.51	553.20
16	767.04	585.72
17	788.57	618.24
18	804.05	641.64
19	807.39	646.07

** Corrected JANBU FOS = 2.107 ** (Fo factor = 1.083)

Failure surface No. 6 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	146.19	480.77
2	149.68	478.14
3	163.93	468.71
4	196.46	447.18
5	228.98	425.66
6	231.67	423.63
7	231.69	423.62
8	234.18	421.74
9	414.79	420.06
10	654.72	420.67
11	655.04	421.09
12	655.12	421.19
13	656.55	423.10
14	678.08	455.62
15	699.60	488.14
16	721.13	520.66
17	742.66	553.18
18	764.18	585.71
19	785.71	618.23
20	800.64	640.79
21	803.98	645.22

** Corrected JANBU FOS = 2.109 ** (Fo factor = 1.084)

Failure surface No. 7 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	138.27	478.79
2	141.76	476.16
3	152.76	468.88
4	185.28	447.35

5	217.81	425.83
6	220.18	424.04
7	413.55	418.79
8	652.38	419.71
9	653.42	421.08
10	653.50	421.18
11	654.93	423.09
12	676.46	455.61
13	697.98	488.13
14	719.51	520.66
15	741.04	553.18
16	762.56	585.70
17	784.09	618.22
18	798.70	640.30
19	802.04	644.74

** Corrected JANBU FOS = 2.112 ** (Fo factor = 1.083)

Failure surface No. 8 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	147.88	481.19
2	151.37	478.56
3	166.31	468.67
4	198.83	447.15
5	231.35	425.62
6	234.05	423.59
7	234.06	423.58
8	235.58	422.43
9	409.07	421.67
10	661.40	420.51
11	661.87	421.12
12	661.95	421.22
13	663.38	423.13
14	684.91	455.65
15	706.43	488.17
16	727.96	520.69
17	749.48	553.22
18	771.01	585.74
19	792.54	618.26
20	808.80	642.83
21	812.14	647.26

** Corrected JANBU FOS = 2.112 ** (Fo factor = 1.084)

Failure surface No. 9 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	150.35	481.81
2	153.84	479.18
3	169.80	468.62

4	202.32	447.09
5	234.84	425.57
6	237.53	423.54
7	237.55	423.53
8	238.12	423.10
9	415.77	421.56
10	663.66	422.52
11	664.12	423.13
12	685.64	455.65
13	707.17	488.18
14	728.70	520.70
15	750.22	553.22
16	771.75	585.74
17	793.27	618.26
18	809.67	643.05
19	813.02	647.48

** Corrected JANBU FOS = 2.113 ** (Fo factor = 1.084)

Failure surface No.10 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	138.44	478.83
2	141.93	476.20
3	153.00	468.88
4	185.52	447.35
5	218.04	425.83
6	220.74	423.79
7	220.75	423.78
8	222.81	422.23
9	412.72	419.13
10	655.57	419.32
11	656.91	421.10
12	656.99	421.20
13	658.43	423.11
14	679.96	455.63
15	701.48	488.15
16	723.01	520.67
17	744.53	553.19
18	766.06	585.72
19	787.58	618.24
20	802.88	641.35
21	806.22	645.78

** Corrected JANBU FOS = 2.114 ** (Fo factor = 1.083)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-4P

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.085	1.083	135.81	808.91	1.906E+06
2.	2.088	1.084	147.29	786.76	1.770E+06
3.	2.092	1.083	138.10	809.91	1.912E+06
4.	2.103	1.085	168.41	804.77	1.813E+06
5.	2.107	1.083	137.99	807.39	1.927E+06
6.	2.109	1.084	146.19	803.98	1.887E+06
7.	2.112	1.083	138.27	802.04	1.909E+06
8.	2.112	1.084	147.88	812.14	1.916E+06
9.	2.113	1.084	150.35	813.02	1.911E+06
10.	2.114	1.083	138.44	806.22	1.934E+06

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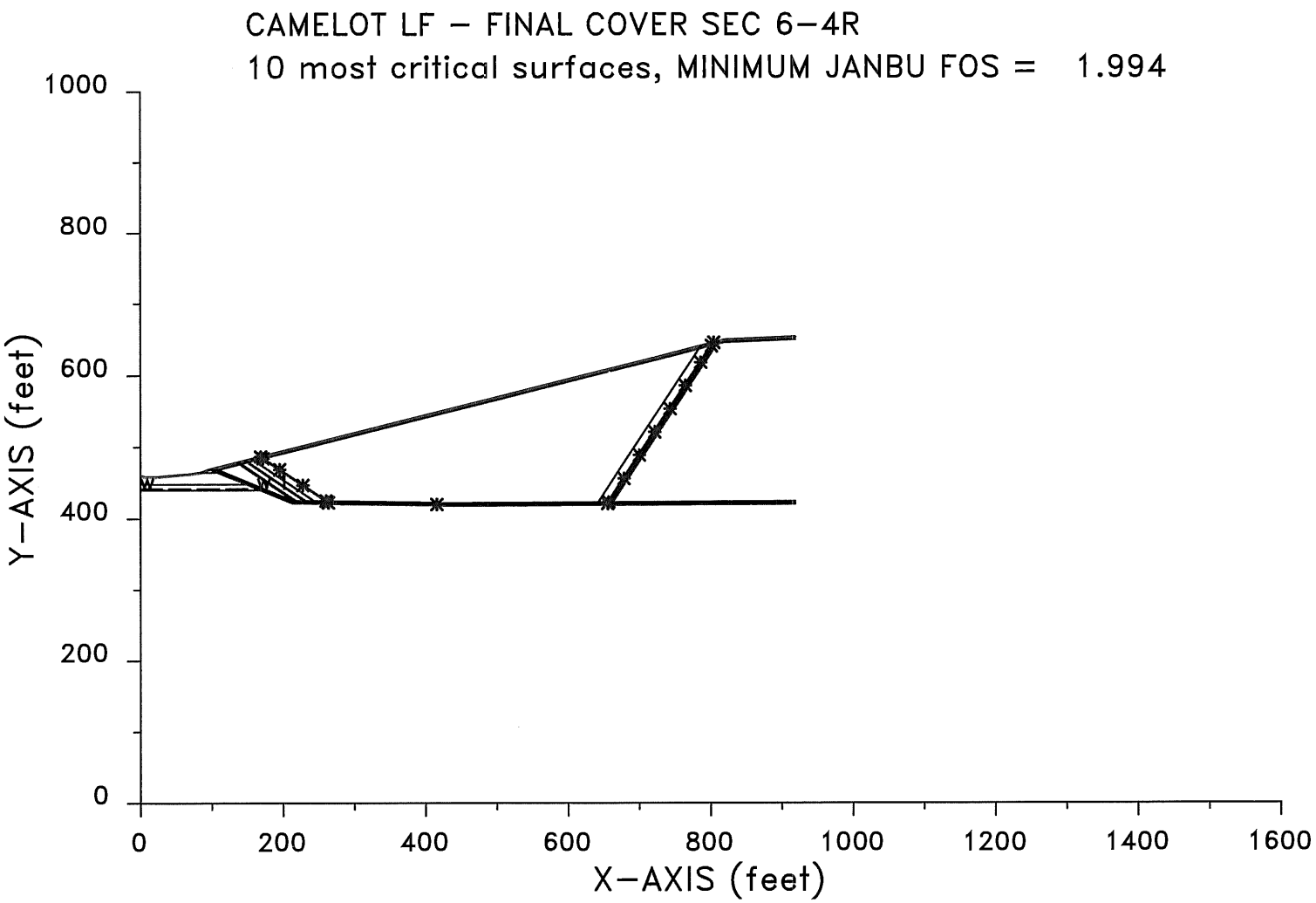

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Problem Description : CAMELOT LF - FINAL COVER SEC 6-4R

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.4	6.0	458.0	1
2	6.0	458.0	22.0	458.0	1
3	22.0	458.0	51.6	460.7	1
4	51.6	460.7	69.3	462.0	1
5	69.3	462.0	85.5	464.4	1
6	85.5	464.4	95.1	468.0	9
7	95.1	468.0	819.1	649.0	5
8	819.1	649.0	919.1	653.0	5

28 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	95.1	468.0	99.2	468.0	1
2	99.2	468.0	104.0	468.0	6
3	104.0	468.0	104.2	468.0	7
4	104.2	468.0	109.1	468.0	6
5	109.1	468.0	819.5	645.5	4
6	819.5	645.5	919.1	649.5	4
7	109.1	468.0	213.2	425.9	6
8	213.2	425.9	408.8	422.9	6
9	408.8	422.9	416.4	422.0	6

10	416.4	422.0	919.1	424.3	6
11	104.2	468.0	213.2	423.9	7
12	213.2	423.9	408.8	421.0	8
13	408.8	421.0	416.4	420.1	8
14	416.4	420.1	919.1	422.4	8
15	104.0	468.0	213.2	423.9	6
16	213.2	423.9	408.8	420.9	6
17	408.8	420.9	416.4	420.0	6
18	416.4	420.0	919.1	422.3	6
19	99.2	468.0	108.1	464.4	9
20	108.1	464.4	148.8	448.0	8
21	148.8	448.0	168.5	440.0	2
22	168.5	440.0	213.2	421.9	3
23	213.2	421.9	408.8	418.9	3
24	408.8	418.9	416.4	418.0	3
25	416.4	418.0	919.1	420.3	3
26	85.5	464.4	108.1	464.4	9
27	.0	448.0	148.8	448.0	2
28	.0	440.0	168.5	440.0	3

ISOTROPIC Soil Parameters
---

9 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	80.0	8.00	.000	.0	0
8	115.0	120.0	80.0	8.00	.000	.0	0
9	115.0	120.0	1074.0	13.10	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

1	.00	442.00
2	163.60	442.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 39.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	218.1	423.8	268.1	423.1	4.0
2	408.8	420.9	416.4	420.0	4.0
3	613.9	420.9	663.9	421.1	4.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	168.41	486.33
2	171.90	483.69
3	195.27	468.23
4	227.79	446.70
5	260.31	425.18
6	262.99	423.16

7	263.02	423.14
8	263.71	422.61
9	415.84	420.08
10	655.64	421.01
11	655.70	421.09
12	655.79	421.20
13	657.23	423.10
14	678.75	455.62
15	700.28	488.14
16	721.80	520.67
17	743.33	553.19
18	764.85	585.71
19	786.38	618.23
20	801.44	640.99
21	804.78	645.42

** Corrected JANBU FOS = 1.994 ** (Fo factor = 1.085)

Failure surface No. 2 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	147.29	481.05
2	150.79	478.42
3	165.49	468.69
4	198.01	447.16
5	230.53	425.63
6	232.22	424.36
7	414.83	420.17
8	640.54	420.90
9	640.63	421.03
10	640.72	421.13
11	642.15	423.03
12	663.68	455.55
13	685.20	488.08
14	706.73	520.60
15	728.25	553.12
16	749.78	585.64
17	771.31	618.16
18	783.44	636.49
19	786.77	640.92

** Corrected JANBU FOS = 2.010 ** (Fo factor = 1.084)

Failure surface No. 3 specified by 20 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	135.97	478.22
2	139.46	475.59
3	149.52	468.93
4	182.04	447.40
5	214.56	425.88

6	216.90	423.84
7	219.17	422.13
8	411.45	421.42
9	659.15	421.10
10	659.16	421.11
11	659.25	421.21
12	660.69	423.12
13	682.21	455.64
14	703.74	488.16
15	725.26	520.68
16	746.79	553.20
17	768.31	585.73
18	789.84	618.25
19	805.57	642.02
20	808.92	646.45

** Corrected JANBU FOS = 2.062 ** (Fo factor = 1.083)

Failure surface No. 4 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	146.19	480.77
2	149.69	478.14
3	163.94	468.71
4	196.46	447.18
5	228.98	425.66
6	231.67	423.63
7	231.69	423.62
8	234.18	421.74
9	414.79	420.06
10	654.72	420.67
11	655.04	421.09
12	655.12	421.19
13	656.56	423.10
14	678.09	455.62
15	699.61	488.14
16	721.14	520.66
17	742.66	553.18
18	764.19	585.71
19	785.71	618.23
20	800.65	640.79
21	803.99	645.22

** Corrected JANBU FOS = 2.082 ** (Fo factor = 1.084)

Failure surface No. 5 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	138.10	478.75
2	141.59	476.12
3	152.52	468.88

4	185.04	447.36
5	217.56	425.83
6	220.26	423.80
7	220.27	423.79
8	222.23	422.31
9	414.37	421.26
10	661.10	422.58
11	661.51	423.12
12	683.04	455.64
13	704.57	488.16
14	726.09	520.69
15	747.62	553.21
16	769.14	585.73
17	790.67	618.25
18	806.56	642.27
19	809.91	646.70

** Corrected JANBU FOS = 2.086 ** (Fo factor = 1.083)

Failure surface No. 6 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	156.65	483.39
2	160.15	480.75
3	178.69	468.48
4	211.21	446.96
5	243.73	425.43
6	245.01	424.47
7	414.60	420.00
8	641.39	421.57
9	642.49	423.03
10	664.01	455.56
11	685.54	488.08
12	707.07	520.60
13	728.59	553.12
14	750.12	585.64
15	771.64	618.16
16	783.84	636.59
17	787.18	641.02

** Corrected JANBU FOS = 2.096 ** (Fo factor = 1.084)

Failure surface No. 7 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	147.88	481.19
2	151.37	478.56
3	166.31	468.67
4	198.83	447.15
5	231.35	425.62
6	234.05	423.59

7	234.06	423.58
8	235.58	422.43
9	409.07	421.67
10	661.40	420.51
11	661.87	421.12
12	661.95	421.22
13	663.39	423.13
14	684.92	455.65
15	706.44	488.17
16	727.97	520.69
17	749.49	553.22
18	771.02	585.74
19	792.54	618.26
20	808.80	642.83
21	812.15	647.26

** Corrected JANBU FOS = 2.097 ** (Fo factor = 1.084)

Failure surface No. 8 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	155.92	483.21
2	159.42	480.57
3	177.66	468.50
4	210.18	446.97
5	242.70	425.45
6	243.53	424.82
7	409.77	419.82
8	662.68	422.48
9	663.17	423.13
10	684.69	455.65
11	706.22	488.17
12	727.74	520.69
13	749.27	553.22
14	770.80	585.74
15	792.32	618.26
16	808.54	642.76
17	811.88	647.20

** Corrected JANBU FOS = 2.100 ** (Fo factor = 1.084)

Failure surface No. 9 specified by 21 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	146.26	480.79
2	149.76	478.16
3	164.04	468.71
4	196.56	447.18
5	229.08	425.66
6	231.77	423.62
7	231.79	423.61

8	231.82	423.59
9	413.21	420.09
10	652.91	419.87
11	653.83	421.09
12	653.92	421.19
13	655.36	423.09
14	676.88	455.61
15	698.41	488.14
16	719.93	520.66
17	741.46	553.18
18	762.99	585.70
19	784.51	618.22
20	799.21	640.43
21	802.55	644.86

** Corrected JANBU FOS = 2.104 ** (Fo factor = 1.084)

Failure surface No.10 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	137.99	478.72
2	141.48	476.09
3	152.36	468.89
4	184.89	447.36
5	217.41	425.84
6	219.08	424.58
7	415.05	419.34
8	656.56	419.33
9	657.90	421.10
10	657.98	421.21
11	659.42	423.11
12	680.95	455.63
13	702.47	488.15
14	724.00	520.68
15	745.52	553.20
16	767.05	585.72
17	788.57	618.24
18	804.06	641.64
19	807.40	646.08

** Corrected JANBU FOS = 2.105 ** (Fo factor = 1.083)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - FINAL COVER SEC 6-4R

Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)

1.	1.994	1.085	168.41	804.78	1.698E+06
2.	2.010	1.084	147.29	786.77	1.690E+06
3.	2.062	1.083	135.97	808.92	1.880E+06
4.	2.082	1.084	146.19	803.99	1.858E+06
5.	2.086	1.083	138.10	809.91	1.905E+06
6.	2.096	1.084	156.65	787.18	1.752E+06
7.	2.097	1.084	147.88	812.15	1.899E+06
8.	2.100	1.084	155.92	811.88	1.882E+06
9.	2.104	1.084	146.26	802.55	1.872E+06
10.	2.105	1.083	137.99	807.40	1.925E+06

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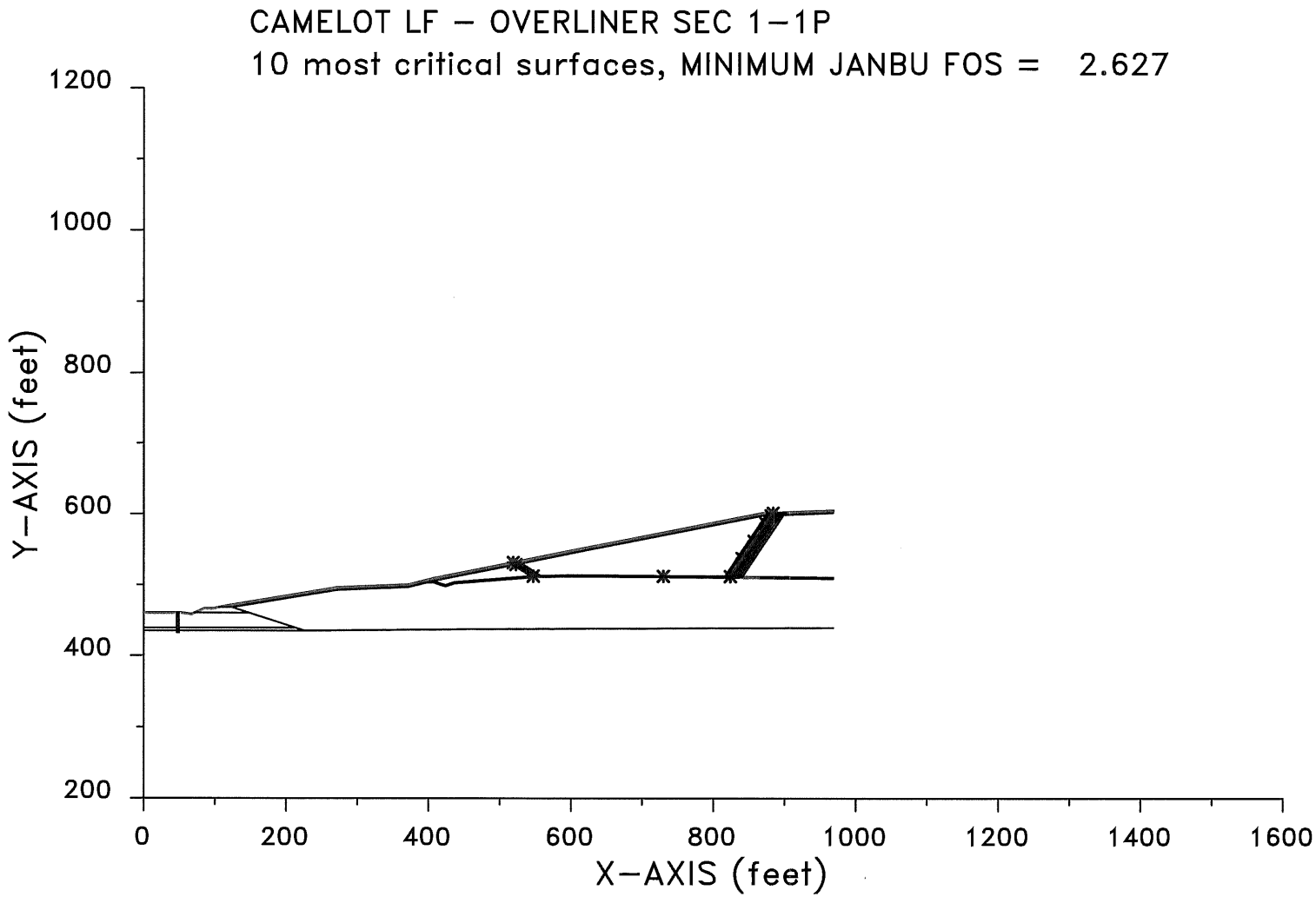

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Problem Description : CAMELOT LF - OVERLINER SEC 1-1P

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 30.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	542.0	511.0	592.0	512.5	2.0
2	686.4	511.9	736.4	511.4	2.0
3	814.0	510.8	864.0	510.3	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	518.92	531.12
2	522.69	528.27
3	547.04	512.16
4	547.12	512.10

5	729.84	511.86
6	823.86	511.57
7	823.97	511.72
8	840.53	536.73
9	857.09	561.75
10	873.65	586.76
11	881.08	597.99
12	883.81	601.62

** Corrected JANBU FOS = 2.627 ** (Fo factor = 1.074)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	515.57	530.45
2	519.35	527.60
3	542.88	512.03
4	543.70	511.41
5	720.86	512.48
6	825.99	509.85
7	827.37	511.68
8	843.93	536.70
9	860.49	561.72
10	877.04	586.73
11	884.59	598.13
12	887.32	601.76

** Corrected JANBU FOS = 2.640 ** (Fo factor = 1.074)

Failure surface No. 3 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	521.93	531.72
2	525.71	528.88
3	525.78	528.83
4	550.79	512.27
5	550.97	512.14
6	709.94	512.04
7	830.21	511.53
8	830.30	511.65
9	846.86	536.67
10	863.41	561.69
11	879.97	586.70
12	887.62	598.25
13	890.35	601.88

** Corrected JANBU FOS = 2.641 ** (Fo factor = 1.073)

Failure surface No. 4 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	519.92	531.32
2	523.70	528.47
3	548.29	512.19
4	549.04	511.63
5	701.76	512.42
6	815.78	510.73
7	816.58	511.79
8	833.14	536.80
9	849.70	561.82
10	866.25	586.84
11	873.43	597.68
12	876.17	601.31

** Corrected JANBU FOS = 2.643 ** (Fo factor = 1.075)

Failure surface No. 5 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	520.51	531.44
2	524.28	528.59
3	549.03	512.22
4	549.10	512.16
5	686.54	511.16
6	818.62	510.67
7	819.44	511.76
8	835.99	536.78
9	852.55	561.79
10	869.11	586.81
11	876.39	597.80
12	879.12	601.43

** Corrected JANBU FOS = 2.644 ** (Fo factor = 1.075)

Failure surface No. 6 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	519.75	531.28
2	523.52	528.44
3	548.08	512.19
4	548.93	511.54
5	718.46	512.51
6	832.62	510.48
7	833.48	511.62
8	850.04	536.64
9	866.59	561.66
10	883.15	586.67
11	890.90	598.38
12	893.64	602.01

** Corrected JANBU FOS = 2.651 ** (Fo factor = 1.073)

Failure surface No. 7 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	523.58	532.05
2	527.35	529.21
3	527.83	528.89
4	552.85	512.33
5	552.91	512.29
6	695.77	512.29
7	833.26	510.97
8	833.75	511.62
9	850.31	536.64
10	866.86	561.65
11	883.42	586.67
12	891.18	598.40
13	893.92	602.02

** Corrected JANBU FOS = 2.656 ** (Fo factor = 1.074)

Failure surface No. 8 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	517.58	530.85
2	521.36	528.01
3	545.38	512.10
4	545.62	511.92
5	729.04	512.10
6	840.42	510.66
7	841.09	511.55
8	857.65	536.56
9	874.20	561.58
10	890.76	586.60
11	898.77	598.70
12	901.50	602.32

** Corrected JANBU FOS = 2.658 ** (Fo factor = 1.072)

Failure surface No. 9 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	527.43	532.82
2	531.20	529.98
3	532.62	529.04
4	557.64	512.48
5	558.98	511.47

6	706.28	512.70
7	814.89	509.84
8	816.36	511.79
9	832.91	536.81
10	849.47	561.82
11	866.03	586.84
12	873.20	597.67
13	875.94	601.30

** Corrected JANBU FOS = 2.679 ** (Fo factor = 1.076)

Failure surface No.10 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	526.41	532.62
2	530.19	529.77
3	531.35	529.00
4	556.37	512.44
5	557.50	511.59
6	724.52	512.14
7	836.18	510.04
8	837.35	511.58
9	853.90	536.60
10	870.46	561.62
11	887.02	586.63
12	894.90	598.55
13	897.63	602.17

** Corrected JANBU FOS = 2.684 ** (Fo factor = 1.074)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - OVERLINER SEC 1-1P

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.627	1.074	518.92	883.81	4.696E+05
2.	2.640	1.074	515.57	887.32	4.818E+05
3.	2.641	1.073	521.93	890.35	4.808E+05
4.	2.643	1.075	519.92	876.17	4.553E+05
5.	2.644	1.075	520.51	879.12	4.656E+05
6.	2.651	1.073	519.75	893.64	4.906E+05
7.	2.656	1.074	523.58	893.92	4.876E+05
8.	2.658	1.072	517.58	901.50	5.071E+05
9.	2.679	1.076	527.43	875.94	4.534E+05
10.	2.684	1.074	526.41	897.63	4.985E+05

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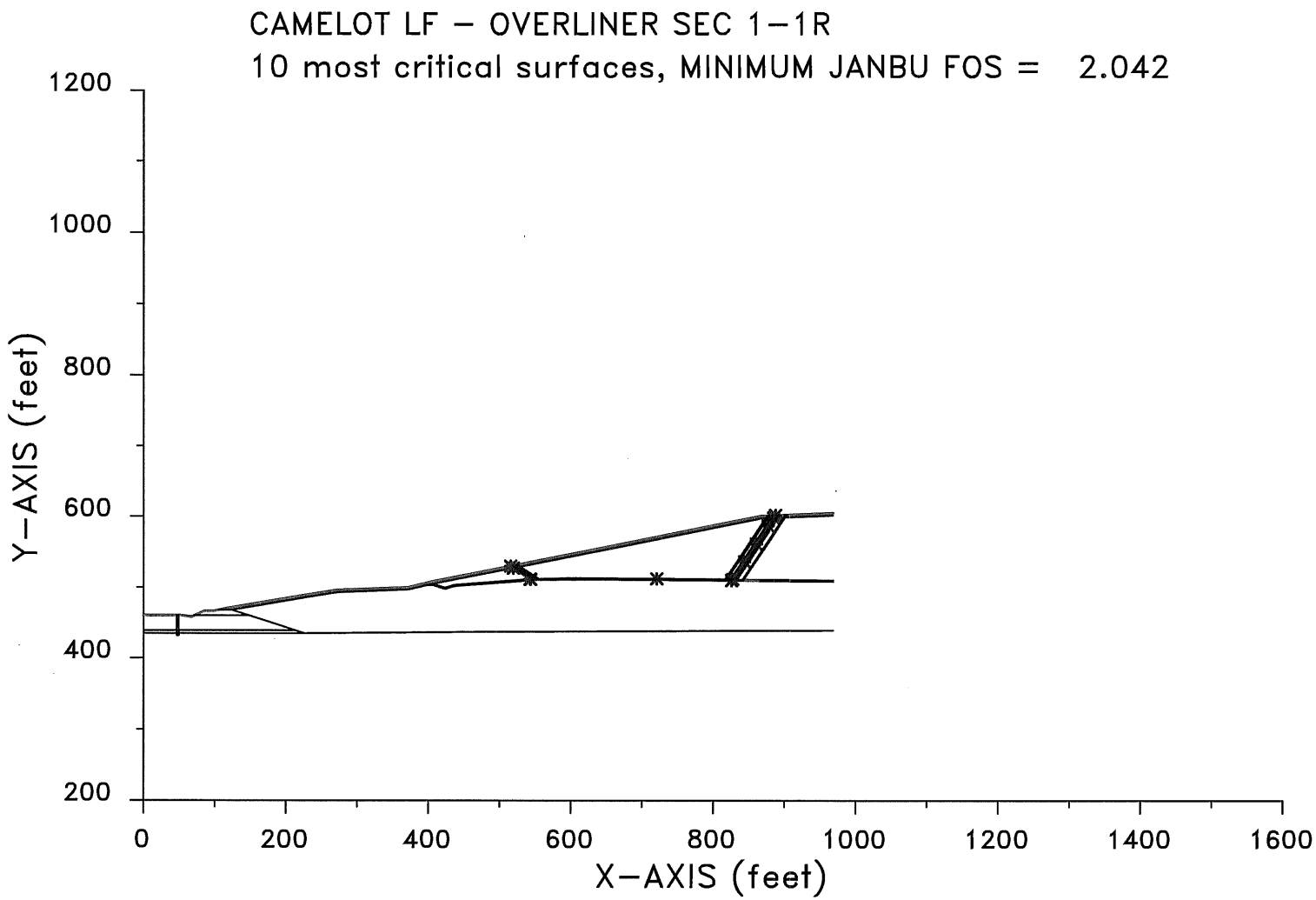

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*               using the               *
*            Method of Slices           *
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Problem Description : CAMELOT LF - OVERLINER SEC 1-1R

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	460.0	46.3	460.0	1
2	46.3	460.0	49.3	460.0	8
3	49.3	460.0	52.3	460.0	1
4	52.3	460.0	64.7	458.4	1
5	64.7	458.4	66.8	457.7	1
6	66.8	457.7	71.9	460.0	1
7	71.9	460.0	85.3	466.0	7
8	85.3	466.0	98.2	466.0	7
9	98.2	466.0	105.5	467.7	7
10	105.5	467.7	117.0	470.0	5
11	117.0	470.0	235.0	490.0	5
12	235.0	490.0	272.2	496.0	5
13	272.2	496.0	371.9	500.0	5
14	371.9	500.0	405.8	508.5	5
15	405.8	508.5	868.4	601.0	5
16	868.4	601.0	968.4	605.0	5

42 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	105.5	467.7	124.2	467.7	7

2	124.2	467.7	235.6	486.5	4
3	235.6	486.5	272.6	492.5	4
4	272.6	492.5	372.4	496.5	4
5	372.4	496.5	398.3	503.0	4
6	398.3	503.0	406.3	505.0	6
7	406.3	505.0	868.9	597.5	4
8	868.9	597.5	968.4	601.5	4
9	406.3	505.0	407.4	505.0	6
10	407.4	505.0	416.7	501.9	6
11	416.7	501.9	423.7	499.6	6
12	423.7	499.6	436.0	503.7	6
13	436.0	503.7	542.0	512.0	6
14	542.0	512.0	597.3	513.7	6
15	597.3	513.7	794.9	512.0	6
16	794.9	512.0	968.4	510.3	6
17	398.3	503.0	407.1	503.0	4
18	407.1	503.0	416.1	500.0	4
19	416.1	500.0	423.7	497.5	4
20	423.7	497.5	436.4	501.7	4
21	436.4	501.7	542.1	510.0	4
22	542.1	510.0	597.3	511.7	4
23	597.3	511.7	794.9	510.0	4
24	794.9	510.0	968.4	508.3	4
25	124.2	467.7	148.0	460.0	7
26	148.0	460.0	213.0	439.0	1
27	213.0	439.0	226.0	434.8	2
28	226.0	434.8	456.9	437.0	3
29	456.9	437.0	885.9	439.0	3
30	885.9	439.0	968.4	439.2	3
31	46.3	460.0	46.4	439.0	1
32	.0	439.0	46.4	439.0	2
33	49.3	460.0	49.4	439.0	8
34	71.9	460.0	148.0	460.0	1
35	49.4	439.0	213.0	439.0	2
36	46.4	439.0	46.5	434.8	2
37	.0	434.8	46.5	434.8	3
38	49.4	439.0	49.5	434.8	8
39	49.5	434.8	226.0	434.8	3
40	46.5	434.8	46.6	431.8	3
41	49.5	434.8	49.6	431.8	8
42	46.6	431.8	49.6	431.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	80.0	10.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 30.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	542.0	511.0	592.0	512.5	2.0
2	686.4	511.9	736.4	511.4	2.0
3	814.0	510.8	864.0	510.3	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	515.64	530.46
2	519.41	527.62
3	542.96	512.03
4	543.70	511.41

5	720.86	512.48
6	825.99	509.85
7	827.53	511.68
8	844.08	536.70
9	860.64	561.71
10	877.20	586.73
11	884.75	598.14
12	887.48	601.76

** Corrected JANBU FOS = 2.042 ** (Fo factor = 1.074)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	518.92	531.12
2	522.70	528.27
3	547.05	512.16
4	547.12	512.10
5	729.84	511.86
6	823.86	511.57
7	823.99	511.71
8	840.55	536.73
9	857.10	561.75
10	873.66	586.76
11	881.09	597.99
12	883.82	601.62

** Corrected JANBU FOS = 2.042 ** (Fo factor = 1.074)

Failure surface No. 3 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	517.60	530.86
2	521.38	528.01
3	545.41	512.10
4	545.62	511.92
5	729.04	512.10
6	840.42	510.66
7	841.16	511.55
8	857.72	536.56
9	874.28	561.58
10	890.84	586.60
11	898.85	598.70
12	901.58	602.33

** Corrected JANBU FOS = 2.052 ** (Fo factor = 1.072)

Failure surface No. 4 specified by 13 coordinate points

Point	x-surf	y-surf

No.	(ft)	(ft)
1	521.94	531.72
2	525.72	528.88
3	525.79	528.83
4	550.81	512.27
5	550.97	512.14
6	709.94	512.04
7	830.21	511.53
8	830.31	511.65
9	846.87	536.67
10	863.42	561.69
11	879.98	586.70
12	887.63	598.25
13	890.36	601.88

** Corrected JANBU FOS = 2.053 ** (Fo factor = 1.073)

Failure surface No. 5 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	520.52	531.44
2	524.29	528.59
3	549.03	512.22
4	549.10	512.16
5	686.54	511.16
6	818.62	510.67
7	819.53	511.76
8	836.09	536.78
9	852.64	561.79
10	869.20	586.81
11	876.48	597.80
12	879.21	601.43

** Corrected JANBU FOS = 2.054 ** (Fo factor = 1.075)

Failure surface No. 6 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	519.82	531.30
2	523.59	528.45
3	548.16	512.19
4	548.93	511.54
5	718.46	512.51
6	832.62	510.48
7	833.57	511.62
8	850.13	536.64
9	866.69	561.65
10	883.25	586.67
11	891.00	598.39
12	893.74	602.01

** Corrected JANBU FOS = 2.054 ** (Fo factor = 1.073)

Failure surface No. 7 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	519.98	531.33
2	523.75	528.49
3	548.37	512.20
4	549.04	511.63
5	701.76	512.42
6	815.78	510.73
7	816.67	511.79
8	833.23	536.80
9	849.79	561.82
10	866.34	586.84
11	873.53	597.69
12	876.26	601.31

** Corrected JANBU FOS = 2.059 ** (Fo factor = 1.075)

Failure surface No. 8 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	523.58	532.05
2	527.36	529.21
3	527.83	528.89
4	552.85	512.33
5	552.91	512.29
6	695.77	512.29
7	833.26	510.97
8	833.80	511.62
9	850.36	536.64
10	866.92	561.65
11	883.48	586.67
12	891.24	598.40
13	893.97	602.02

** Corrected JANBU FOS = 2.064 ** (Fo factor = 1.074)

Failure surface No. 9 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	525.63	532.46
2	529.40	529.62
3	530.38	528.97
4	555.39	512.41
5	556.12	511.80

6	726.06	511.49
7	840.64	510.48
8	841.53	511.54
9	858.08	536.56
10	874.64	561.58
11	891.20	586.59
12	899.23	598.72
13	901.96	602.34

** Corrected JANBU FOS = 2.078 ** (Fo factor = 1.073)

Failure surface No.10 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	523.60	532.06
2	527.38	529.21
3	527.86	528.89
4	552.88	512.33
5	553.12	512.13
6	691.67	512.33
7	841.52	509.71
8	843.05	511.53
9	859.60	536.54
10	876.16	561.56
11	892.72	586.58
12	900.80	598.78
13	903.53	602.41

** Corrected JANBU FOS = 2.080 ** (Fo factor = 1.073)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - OVERLINER SEC 1-1R

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.042	1.074	515.64	887.48	3.543E+05
2.	2.042	1.074	518.92	883.82	3.466E+05
3.	2.052	1.072	517.60	901.58	3.719E+05
4.	2.053	1.073	521.94	890.36	3.549E+05
5.	2.054	1.075	520.52	879.21	3.438E+05
6.	2.054	1.073	519.82	893.74	3.612E+05
7.	2.059	1.075	519.98	876.26	3.370E+05
8.	2.064	1.074	523.58	893.97	3.598E+05
9.	2.078	1.073	525.63	901.96	3.739E+05
10.	2.080	1.073	523.60	903.53	3.754E+05

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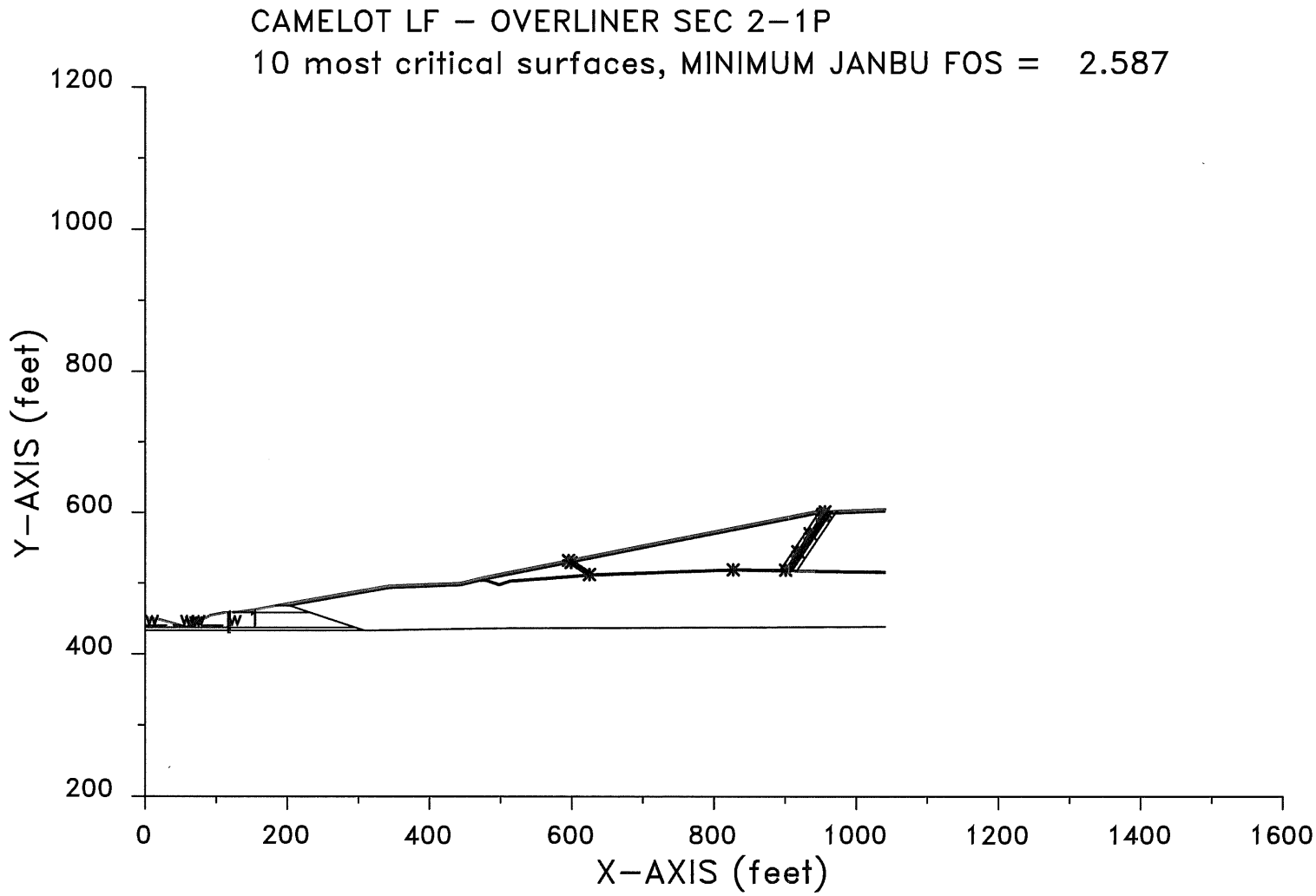

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Problem Description : CAMELOT LF - OVERLINER SEC 2-1P

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment

1	183.6	467.7	203.5	467.7	7
2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.

1	127.0	131.0	854.0	11.00	.000	.0	1
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 31.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	619.8	511.0	669.8	513.0	2.0
2	783.5	517.2	833.4	518.8	2.0
3	890.7	517.8	940.7	516.9	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	595.44	532.01
2	599.16	529.21
3	624.85	512.20
4	624.92	512.15
5	826.86	518.99
6	900.56	518.49
7	900.65	518.60
8	917.76	544.45
9	934.87	570.31
10	951.98	596.16
11	953.20	598.00
12	955.93	601.63

** Corrected JANBU FOS = 2.587 ** (Fo factor = 1.071)

Failure surface No. 2 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	596.46	532.22
2	600.18	529.41
3	600.26	529.36
4	626.11	512.25
5	626.84	511.70
6	798.83	518.37
7	892.48	517.71
8	893.25	518.74
9	910.36	544.59
10	927.47	570.44
11	944.58	596.29
12	945.51	597.69
13	948.24	601.32

** Corrected JANBU FOS = 2.600 ** (Fo factor = 1.072)

Failure surface No. 3 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	592.05	531.33
2	595.77	528.53
3	620.69	512.04
4	621.50	511.43
5	817.89	519.23
6	902.69	516.76
7	904.04	518.54
8	921.15	544.39
9	938.26	570.25
10	955.37	596.10
11	956.72	598.14
12	959.45	601.77

** Corrected JANBU FOS = 2.602 ** (Fo factor = 1.071)

Failure surface No. 4 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	598.49	532.62
2	602.22	529.82
3	602.75	529.46
4	628.60	512.35
5	628.77	512.23
6	806.99	518.33
7	906.91	518.40
8	906.97	518.49
9	924.08	544.34
10	941.19	570.19
11	958.30	596.04
12	959.78	598.27
13	962.50	601.89

** Corrected JANBU FOS = 2.605 ** (Fo factor = 1.070)

Failure surface No. 5 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	592.13	531.35
2	595.86	528.55
3	620.79	512.04
4	621.23	511.71
5	828.58	517.97

6	907.71	516.50
7	909.17	518.45
8	926.28	544.30
9	943.39	570.15
10	960.50	596.00
11	962.06	598.36
12	964.79	601.98

** Corrected JANBU FOS = 2.610 ** (Fo factor = 1.071)

Failure surface No. 6 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	597.72	532.47
2	601.45	529.66
3	601.81	529.42
4	627.66	512.31
5	629.25	511.12
6	824.93	518.47
7	892.39	516.93
8	893.74	518.73
9	910.85	544.58
10	927.96	570.43
11	945.07	596.28
12	946.02	597.71
13	948.75	601.34

** Corrected JANBU FOS = 2.613 ** (Fo factor = 1.072)

Failure surface No. 7 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	596.29	532.18
2	600.01	529.38
3	600.05	529.35
4	625.90	512.24
5	626.73	511.61
6	815.50	519.15
7	909.32	517.33
8	910.15	518.44
9	927.26	544.29
10	944.37	570.14
11	961.48	595.99
12	963.08	598.40
13	965.80	602.02

** Corrected JANBU FOS = 2.618 ** (Fo factor = 1.071)

Failure surface No. 8 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	599.33	532.79
2	603.05	529.99
3	603.78	529.50
4	629.63	512.39
5	631.86	510.71
6	817.70	519.01
7	908.61	518.01
8	908.95	518.46
9	926.06	544.31
10	943.17	570.16
11	960.28	596.01
12	961.83	598.35
13	964.56	601.97

** Corrected JANBU FOS = 2.618 ** (Fo factor = 1.071)

Failure surface No. 9 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	592.93	531.51
2	596.66	528.71
3	621.78	512.08
4	623.29	510.94
5	784.06	517.83
6	916.43	517.76
7	916.85	518.32
8	933.96	544.17
9	951.07	570.02
10	968.18	595.87
11	970.04	598.68
12	972.76	602.30

** Corrected JANBU FOS = 2.621 ** (Fo factor = 1.069)

Failure surface No.10 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	600.16	532.96
2	603.89	530.15
3	604.81	529.54
4	630.66	512.43
5	630.71	512.40
6	792.85	517.99
7	909.96	517.82
8	910.42	518.43
9	927.53	544.28
10	944.64	570.13
11	961.75	595.98

12	963.36	598.41
13	966.09	602.03

** Corrected JANBU FOS = 2.624 ** (Fo factor = 1.071)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - OVERLINER SEC 2-1P

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.587	1.071	595.44	955.93	4.336E+05
2.	2.600	1.072	596.46	948.24	4.220E+05
3.	2.602	1.071	592.05	959.45	4.454E+05
4.	2.605	1.070	598.49	962.50	4.458E+05
5.	2.610	1.071	592.13	964.79	4.616E+05
6.	2.613	1.072	597.72	948.75	4.283E+05
7.	2.618	1.071	596.29	965.80	4.543E+05
8.	2.618	1.071	599.33	964.56	4.536E+05
9.	2.621	1.069	592.93	972.76	4.722E+05
10.	2.624	1.071	600.16	966.09	4.531E+05

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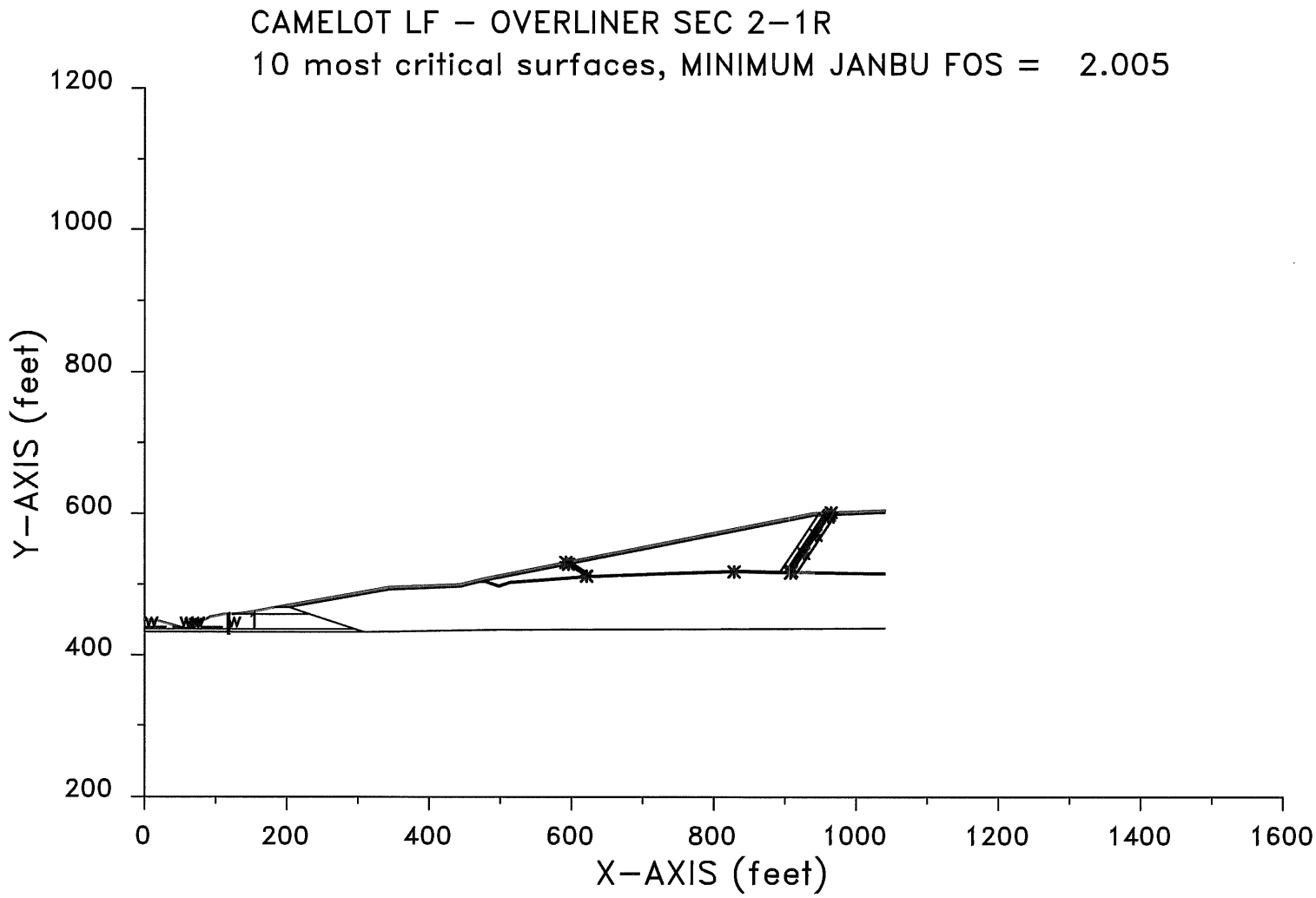

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Problem Description : CAMELOT LF - OVERLINER SEC 2-1R

SEGMENT BOUNDARY COORDINATES
---

16 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	450.9	21.0	448.1	1
2	21.0	448.1	56.0	438.1	1
3	56.0	438.1	62.0	438.1	1
4	62.0	438.1	92.0	454.1	1
5	92.0	454.1	112.0	458.1	1
6	112.0	458.1	116.3	458.1	1
7	116.3	458.1	119.3	458.1	8
8	119.3	458.1	123.8	458.1	1
9	123.8	458.1	141.0	460.0	7
10	141.0	460.0	183.6	467.7	7
11	183.6	467.7	196.5	470.0	5
12	196.5	470.0	343.4	496.0	5
13	343.4	496.0	443.7	500.0	5
14	443.7	500.0	477.4	508.4	5
15	477.4	508.4	940.3	601.0	5
16	940.3	601.0	1040.3	605.0	5

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	183.6	467.7	203.5	467.7	7

2	203.5	467.7	343.8	492.5	4
3	343.8	492.5	444.2	496.5	4
4	444.2	496.5	470.1	503.0	4
5	470.1	503.0	478.1	505.0	6
6	478.1	505.0	940.7	597.5	4
7	940.7	597.5	1040.3	601.5	4
8	478.1	505.0	479.1	505.0	6
9	479.1	505.0	497.9	498.8	6
10	497.9	498.8	513.3	503.9	6
11	513.3	503.9	555.5	507.0	6
12	555.5	507.0	619.8	512.0	6
13	619.8	512.0	744.8	517.0	6
14	744.8	517.0	833.4	519.8	6
15	833.4	519.8	990.9	517.0	6
16	990.9	517.0	1040.3	516.6	6
17	470.1	503.0	478.8	503.0	4
18	478.8	503.0	497.9	496.7	4
19	497.9	496.7	513.7	501.9	4
20	513.7	501.9	555.7	505.0	4
21	555.7	505.0	619.9	510.0	4
22	619.9	510.0	744.9	515.0	4
23	744.9	515.0	833.4	517.8	4
24	833.4	517.8	990.9	515.0	4
25	990.9	515.0	1040.3	514.6	4
26	203.5	467.7	232.2	458.1	7
27	232.2	458.1	295.5	437.0	1
28	295.5	437.0	308.1	432.8	2
29	308.1	432.8	316.0	433.0	3
30	316.0	433.0	496.8	436.0	3
31	496.8	436.0	802.4	437.0	3
32	802.4	437.0	1040.3	438.2	3
33	123.8	458.1	232.2	458.1	1
34	116.3	458.1	116.4	437.0	1
35	.0	437.0	116.4	437.0	2
36	119.3	460.0	119.4	437.0	8
37	119.4	437.0	295.5	437.0	2
38	116.4	437.0	116.5	432.8	2
39	.0	432.8	116.5	432.8	3
40	119.4	437.0	119.5	432.8	8
41	119.5	432.8	308.1	432.8	3
42	116.5	432.8	116.6	429.8	3
43	119.5	432.8	119.6	432.8	3
44	116.6	429.8	119.6	429.8	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	1

2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	80.0	10.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	440.00
2	49.40	440.00
3	56.00	438.10
4	62.00	438.10
5	65.60	440.00
6	116.40	440.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 31.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)

1	619.8	511.0	669.8	513.0	2.0
2	783.5	517.2	833.4	518.8	2.0
3	890.7	517.8	940.7	516.9	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	592.17	531.36
2	595.89	528.55
3	620.84	512.04
4	621.23	511.71
5	828.58	517.97
6	907.71	516.50
7	909.34	518.45
8	926.45	544.30
9	943.56	570.15
10	960.67	596.00
11	962.23	598.36
12	964.96	601.99

** Corrected JANBU FOS = 2.005 ** (Fo factor = 1.070)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	595.44	532.01
2	599.17	529.21
3	624.86	512.20
4	624.92	512.15
5	826.86	518.99
6	900.56	518.49
7	900.66	518.60
8	917.77	544.45
9	934.88	570.31
10	951.99	596.16
11	953.21	598.00
12	955.94	601.63

** Corrected JANBU FOS = 2.006 ** (Fo factor = 1.071)

Failure surface No. 3 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	592.11	531.35
2	595.84	528.54
3	620.77	512.04
4	621.50	511.43
5	817.89	519.23
6	902.69	516.76
7	904.19	518.54
8	921.30	544.39
9	938.41	570.24
10	955.52	596.09
11	956.88	598.15
12	959.61	601.77

** Corrected JANBU FOS = 2.007 ** (Fo factor = 1.071)

Failure surface No. 4 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	593.05	531.54
2	596.78	528.73
3	621.92	512.09
4	623.29	510.94
5	784.06	517.83
6	916.43	517.76
7	916.89	518.32
8	934.00	544.17
9	951.11	570.02
10	968.22	595.87
11	970.08	598.68
12	972.81	602.30

** Corrected JANBU FOS = 2.014 ** (Fo factor = 1.069)

Failure surface No. 5 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	596.52	532.23
2	600.24	529.42
3	600.33	529.37
4	626.18	512.26
5	626.84	511.70
6	798.83	518.37
7	892.48	517.71
8	893.34	518.73
9	910.45	544.58

10	927.56	570.44
11	944.67	596.29
12	945.60	597.70
13	948.33	601.32

** Corrected JANBU FOS = 2.018 ** (Fo factor = 1.072)

Failure surface No. 6 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	598.51	532.63
2	602.23	529.82
3	602.77	529.46
4	628.62	512.35
5	628.77	512.23
6	806.99	518.33
7	906.91	518.40
8	906.98	518.49
9	924.09	544.34
10	941.20	570.19
11	958.31	596.04
12	959.78	598.27
13	962.51	601.89

** Corrected JANBU FOS = 2.019 ** (Fo factor = 1.070)

Failure surface No. 7 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	596.35	532.20
2	600.08	529.39
3	600.13	529.36
4	625.98	512.25
5	626.73	511.61
6	815.50	519.15
7	909.32	517.33
8	910.24	518.43
9	927.35	544.28
10	944.46	570.13
11	961.57	595.99
12	963.17	598.40
13	965.90	602.02

** Corrected JANBU FOS = 2.023 ** (Fo factor = 1.071)

Failure surface No. 8 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	597.85	532.49
2	601.57	529.69
3	601.96	529.43
4	627.81	512.32
5	629.25	511.12
6	824.93	518.47
7	892.39	516.93
8	893.89	518.72
9	911.00	544.58
10	928.11	570.43
11	945.22	596.28
12	946.17	597.72
13	948.91	601.34

** Corrected JANBU FOS = 2.023 ** (Fo factor = 1.072)

Failure surface No. 9 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	596.06	532.14
2	599.79	529.33
3	625.62	512.23
4	627.40	510.74
5	803.40	518.03
6	917.76	517.93
7	918.06	518.29
8	935.17	544.15
9	952.28	570.00
10	969.39	595.85
11	971.30	598.73
12	974.03	602.35

** Corrected JANBU FOS = 2.024 ** (Fo factor = 1.070)

Failure surface No.10 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	594.10	531.75
2	597.82	528.94
3	623.21	512.14
4	623.42	511.96
5	826.05	519.19
6	917.12	517.45
7	917.83	518.30
8	934.94	544.15
9	952.05	570.00
10	969.16	595.85
11	971.06	598.72
12	973.79	602.34

** Corrected JANBU FOS = 2.025 ** (Fo factor = 1.070)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - OVERLINER SEC 2-1R

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.005	1.070	592.17	964.96	3.378E+05
2.	2.006	1.071	595.44	955.94	3.198E+05
3.	2.007	1.071	592.11	959.61	3.272E+05
4.	2.014	1.069	593.05	972.81	3.453E+05
5.	2.018	1.072	596.52	948.33	3.118E+05
6.	2.019	1.070	598.51	962.51	3.286E+05
7.	2.023	1.071	596.35	965.90	3.340E+05
8.	2.023	1.072	597.85	948.91	3.160E+05
9.	2.024	1.070	596.06	974.03	3.476E+05
10.	2.025	1.070	594.10	973.79	3.435E+05

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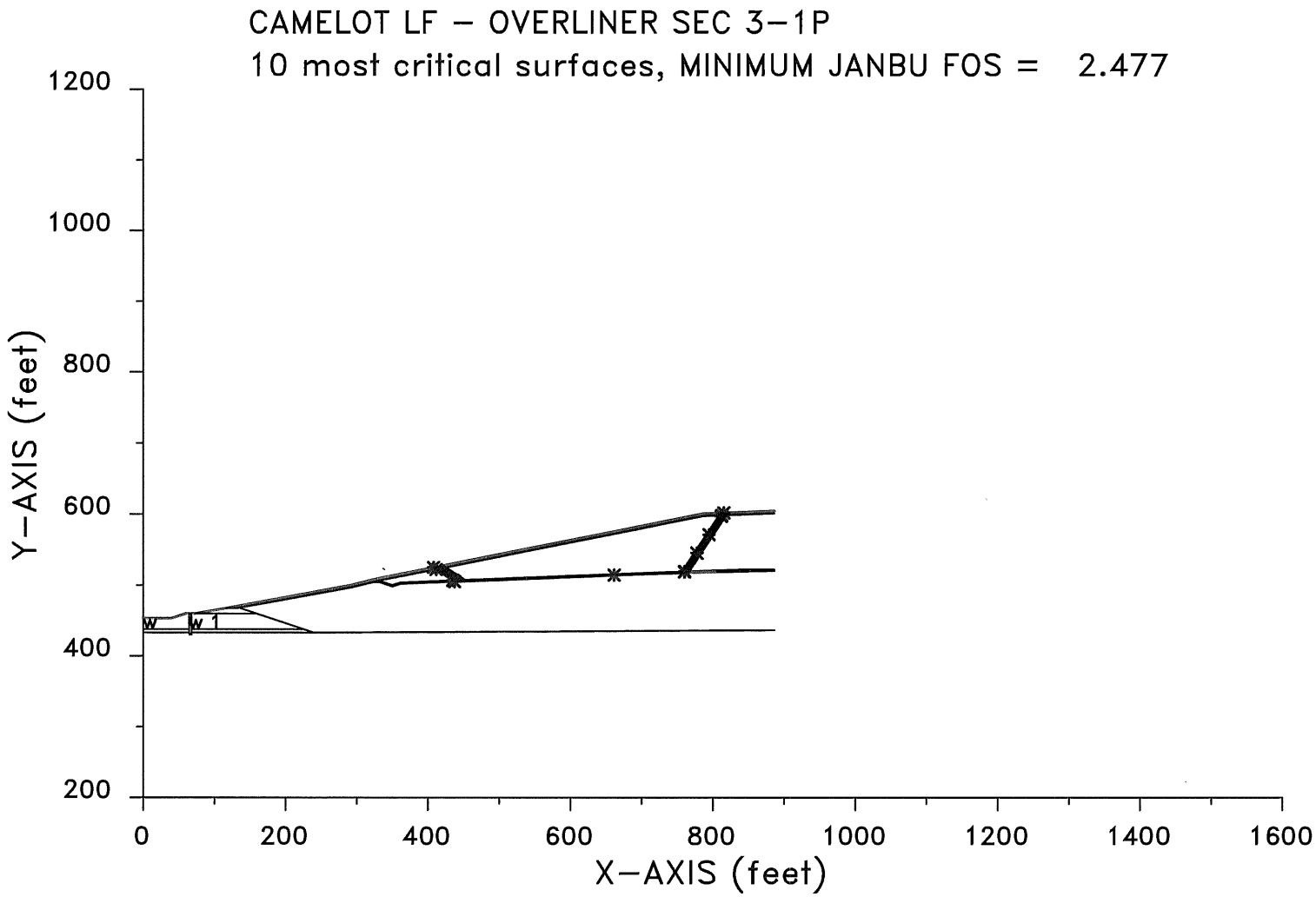

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Problem Description : CAMELOT LF - OVERLINER SEC 3-1P

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 31.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	434.5	506.0	484.5	508.0	2.0
2	620.6	513.4	670.6	515.4	2.0
3	753.4	518.0	803.4	519.6	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	407.97	525.28
2	411.69	522.48
3	435.04	507.02
4	437.44	505.21
5	661.44	514.57
6	760.25	519.21
7	760.65	519.74
8	777.76	545.59
9	794.87	571.44
10	811.98	597.29
11	812.80	598.54
12	815.53	602.16

** Corrected JANBU FOS = 2.477 ** (Fo factor = 1.065)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	412.67	526.22
2	416.39	523.41
3	440.81	507.25
4	441.54	506.70
5	635.96	514.69
6	755.18	518.00
7	756.38	519.59
8	773.49	545.44
9	790.60	571.29
10	807.71	597.14
11	808.52	598.37
12	811.25	601.99

** Corrected JANBU FOS = 2.491 ** (Fo factor = 1.067)

Failure surface No. 3 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	410.86	525.86
2	414.58	523.05
3	438.59	507.16
4	440.54	505.70
5	622.18	513.33
6	761.95	518.90
7	762.64	519.81
8	779.75	545.66
9	796.86	571.51

10	813.97	597.36
11	814.80	598.62
12	817.53	602.24

** Corrected JANBU FOS = 2.491 ** (Fo factor = 1.066)

Failure surface No. 4 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	411.65	526.01
2	415.37	523.21
3	439.55	507.20
4	439.62	507.15
5	664.04	515.54
6	763.26	519.18
7	763.77	519.85
8	780.88	545.70
9	797.99	571.55
10	815.10	597.40
11	815.93	598.67
12	818.66	602.29

** Corrected JANBU FOS = 2.492 ** (Fo factor = 1.065)

Failure surface No. 5 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	413.26	526.34
2	416.98	523.53
3	441.53	507.28
4	441.60	507.23
5	620.74	512.67
6	758.02	518.07
7	759.24	519.69
8	776.35	545.54
9	793.46	571.39
10	810.57	597.24
11	811.39	598.48
12	814.12	602.10

** Corrected JANBU FOS = 2.493 ** (Fo factor = 1.067)

Failure surface No. 6 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	413.93	526.47
2	417.65	523.67
3	442.36	507.31

4	443.95	506.12
5	662.12	515.01
6	755.09	517.22
7	756.89	519.61
8	774.00	545.46
9	791.11	571.31
10	808.22	597.16
11	809.03	598.39
12	811.76	602.01

** Corrected JANBU FOS = 2.501 ** (Fo factor = 1.067)

Failure surface No. 7 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	417.81	527.25
2	421.53	524.44
3	447.12	507.50
4	447.92	506.90
5	639.42	513.66
6	755.73	517.73
7	757.14	519.61
8	774.25	545.47
9	791.36	571.32
10	808.47	597.17
11	809.29	598.40
12	812.02	602.02

** Corrected JANBU FOS = 2.505 ** (Fo factor = 1.067)

Failure surface No. 8 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	408.26	525.34
2	411.98	522.53
3	435.39	507.04
4	436.20	506.43
5	655.06	515.71
6	765.39	517.56
7	767.22	519.98
8	784.33	545.83
9	801.44	571.68
10	818.55	597.53
11	819.39	598.80
12	822.12	602.42

** Corrected JANBU FOS = 2.510 ** (Fo factor = 1.066)

Failure surface No. 9 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	422.00	528.08
2	425.72	525.28
3	426.42	524.82
4	452.27	507.71
5	453.18	507.02
6	633.71	513.23
7	755.71	518.09
8	756.85	519.60
9	773.96	545.45
10	791.07	571.31
11	808.18	597.16
12	809.00	598.39
13	811.73	602.01

** Corrected JANBU FOS = 2.512 ** (Fo factor = 1.068)

Failure surface No.10 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	413.47	526.38
2	417.19	523.57
3	441.79	507.29
4	443.60	505.93
5	641.35	514.19
6	763.90	517.70
7	765.58	519.92
8	782.69	545.77
9	799.80	571.62
10	816.91	597.47
11	817.75	598.74
12	820.48	602.36

** Corrected JANBU FOS = 2.515 ** (Fo factor = 1.066)

The following is a summary of the TEN most critical surfaces

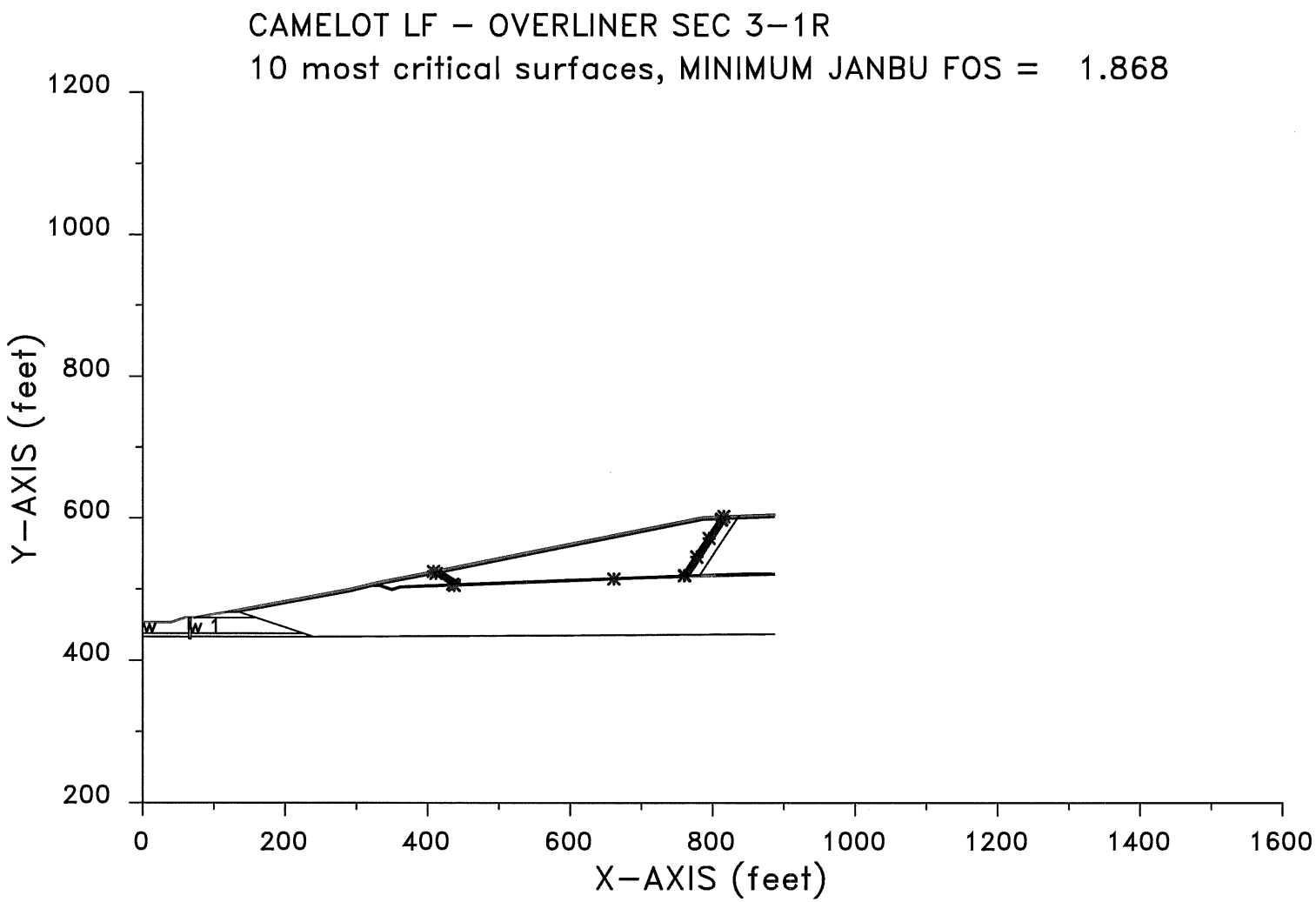
Problem Description : CAMELOT LF - OVERLINER SEC 3-1P

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.477	1.065	407.97	815.53	5.019E+05
2.	2.491	1.067	412.67	811.25	4.840E+05
3.	2.491	1.066	410.86	817.53	5.016E+05
4.	2.492	1.065	411.65	818.66	4.944E+05
5.	2.493	1.067	413.26	814.12	4.949E+05

6.	2.501	1.067	413.93	811.76	4.919E+05
7.	2.505	1.067	417.81	812.02	4.899E+05
8.	2.510	1.066	408.26	822.12	5.058E+05
9.	2.512	1.068	422.00	811.73	4.878E+05
10.	2.515	1.066	413.47	820.48	5.084E+05

* * * END OF FILE * * *

3-1R 2-18-16 13:28



XSTABL File: 3-1R 2-18-16 13:28

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
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*****************************************
```

Problem Description : CAMELOT LF - OVERLINER SEC 3-1R

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	453.3	40.0	453.3	1
2	40.0	453.3	59.9	460.0	1
3	59.9	460.0	64.5	460.0	1
4	64.5	460.0	67.5	460.0	8
5	67.5	460.0	73.3	460.0	1
6	73.3	460.0	116.6	467.7	7
7	116.6	467.7	129.4	470.0	5
8	129.4	470.0	291.1	500.0	5
9	291.1	500.0	329.6	509.6	5
10	329.6	509.6	786.5	601.0	5
11	786.5	601.0	886.5	605.0	5

38 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	116.6	467.7	132.3	467.7	7
2	132.3	467.7	291.8	496.6	4
3	291.8	496.6	322.3	504.2	4
4	322.3	504.2	330.3	506.2	6
5	330.3	506.2	786.9	597.5	4
6	786.9	597.5	886.5	601.5	4

7	330.3	506.2	332.6	506.2	6
8	332.6	506.2	350.1	500.3	6
9	350.1	500.3	361.5	504.1	6
10	361.5	504.1	434.5	507.0	6
11	434.5	507.0	684.5	517.0	6
12	684.5	517.0	851.2	523.0	6
13	851.2	523.0	886.5	522.7	6
14	322.3	504.2	332.3	504.2	4
15	332.3	504.2	350.1	498.2	4
16	350.1	498.2	361.9	502.1	4
17	361.9	502.1	434.6	505.0	4
18	434.6	505.0	684.6	515.0	4
19	684.6	515.0	851.3	520.0	4
20	851.3	520.0	886.5	520.7	4
21	136.3	467.7	159.4	460.0	7
22	159.4	460.0	225.4	438.0	1
23	225.4	438.0	239.5	433.3	2
24	239.5	433.3	579.8	435.0	3
25	579.8	435.0	879.3	437.0	3
26	879.3	437.0	886.5	437.1	3
27	73.3	460.0	159.4	460.0	1
28	64.5	460.0	64.6	438.0	1
29	.0	438.0	64.6	438.0	2
30	67.5	460.0	67.6	438.0	8
31	67.6	438.0	225.4	438.0	2
32	64.6	438.0	64.7	433.3	2
33	.0	433.3	64.7	433.2	3
34	67.6	438.0	67.7	433.3	8
35	67.7	433.3	239.5	433.3	3
36	64.7	433.3	64.8	430.3	3
37	67.7	433.3	67.8	430.3	8
38	64.8	430.3	67.8	430.3	3

ISOTROPIC Soil Parameters
---

8 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0
4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	80.0	10.00	.000	.0	0
7	115.0	120.0	1074.0	13.10	.000	.0	0
8	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	64.50	438.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 31.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	434.5	506.0	484.5	508.0	2.0
2	620.6	513.4	670.6	515.4	2.0
3	753.4	518.0	803.4	519.6	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	408.16	525.32
2	411.88	522.51
3	435.27	507.03
4	437.44	505.21
5	661.44	514.57
6	760.25	519.21
7	760.70	519.74
8	777.81	545.59
9	794.92	571.44
10	812.03	597.29
11	812.85	598.54
12	815.58	602.16

** Corrected JANBU FOS = 1.868 ** (Fo factor = 1.065)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	411.02	525.89
2	414.74	523.08
3	438.78	507.17
4	440.54	505.70
5	622.18	513.33
6	761.95	518.90
7	762.72	519.82
8	779.83	545.67
9	796.94	571.52
10	814.05	597.37
11	814.88	598.62
12	817.61	602.24

** Corrected JANBU FOS = 1.881 ** (Fo factor = 1.066)

Failure surface No. 3 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	413.27	526.34
2	416.99	523.53
3	441.54	507.28
4	441.60	507.23
5	620.74	512.67
6	758.02	518.07
7	759.38	519.70
8	776.49	545.55
9	793.60	571.40

10	810.71	597.25
11	811.54	598.49
12	814.26	602.11

** Corrected JANBU FOS = 1.886 ** (Fo factor = 1.067)

Failure surface No. 4 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	411.65	526.01
2	415.37	523.21
3	439.56	507.20
4	439.62	507.15
5	664.04	515.54
6	763.26	519.18
7	763.83	519.86
8	780.94	545.71
9	798.05	571.56
10	815.16	597.41
11	815.99	598.67
12	818.72	602.29

** Corrected JANBU FOS = 1.888 ** (Fo factor = 1.065)

Failure surface No. 5 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	412.73	526.23
2	416.45	523.43
3	440.88	507.26
4	441.54	506.70
5	635.96	514.69
6	755.18	518.00
7	756.52	519.59
8	773.63	545.44
9	790.74	571.29
10	807.85	597.14
11	808.66	598.37
12	811.39	602.00

** Corrected JANBU FOS = 1.889 ** (Fo factor = 1.067)

Failure surface No. 6 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	408.32	525.35
2	412.04	522.54
3	435.47	507.04

4	436.20	506.43
5	655.06	515.71
6	765.39	517.56
7	767.43	519.98
8	784.54	545.84
9	801.65	571.69
10	818.76	597.54
11	819.61	598.81
12	822.33	602.43

** Corrected JANBU FOS = 1.892 ** (Fo factor = 1.066)

Failure surface No. 7 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	414.06	526.50
2	417.78	523.69
3	442.51	507.32
4	443.95	506.12
5	662.12	515.01
6	755.09	517.22
7	757.10	519.61
8	774.21	545.46
9	791.32	571.31
10	808.43	597.16
11	809.24	598.40
12	811.97	602.02

** Corrected JANBU FOS = 1.893 ** (Fo factor = 1.067)

Failure surface No. 8 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	405.94	524.87
2	409.65	522.07
3	432.54	506.92
4	434.56	505.22
5	662.18	514.20
6	781.26	519.63
7	782.00	520.51
8	799.11	546.36
9	816.22	572.21
10	833.33	598.06
11	834.22	599.40
12	836.94	603.02

** Corrected JANBU FOS = 1.895 ** (Fo factor = 1.063)

Failure surface No. 9 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	413.61	526.41
2	417.33	523.60
3	441.97	507.30
4	443.60	505.93
5	641.35	514.19
6	763.90	517.70
7	765.77	519.93
8	782.88	545.78
9	799.99	571.63
10	817.10	597.48
11	817.94	598.75
12	820.67	602.37

** Corrected JANBU FOS = 1.897 ** (Fo factor = 1.066)

Failure surface No.10 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	417.87	527.26
2	421.59	524.45
3	447.20	507.51
4	447.92	506.90
5	639.42	513.66
6	755.73	517.73
7	757.31	519.62
8	774.42	545.47
9	791.53	571.32
10	808.64	597.17
11	809.46	598.41
12	812.19	602.03

** Corrected JANBU FOS = 1.900 ** (Fo factor = 1.067)

The following is a summary of the TEN most critical surfaces

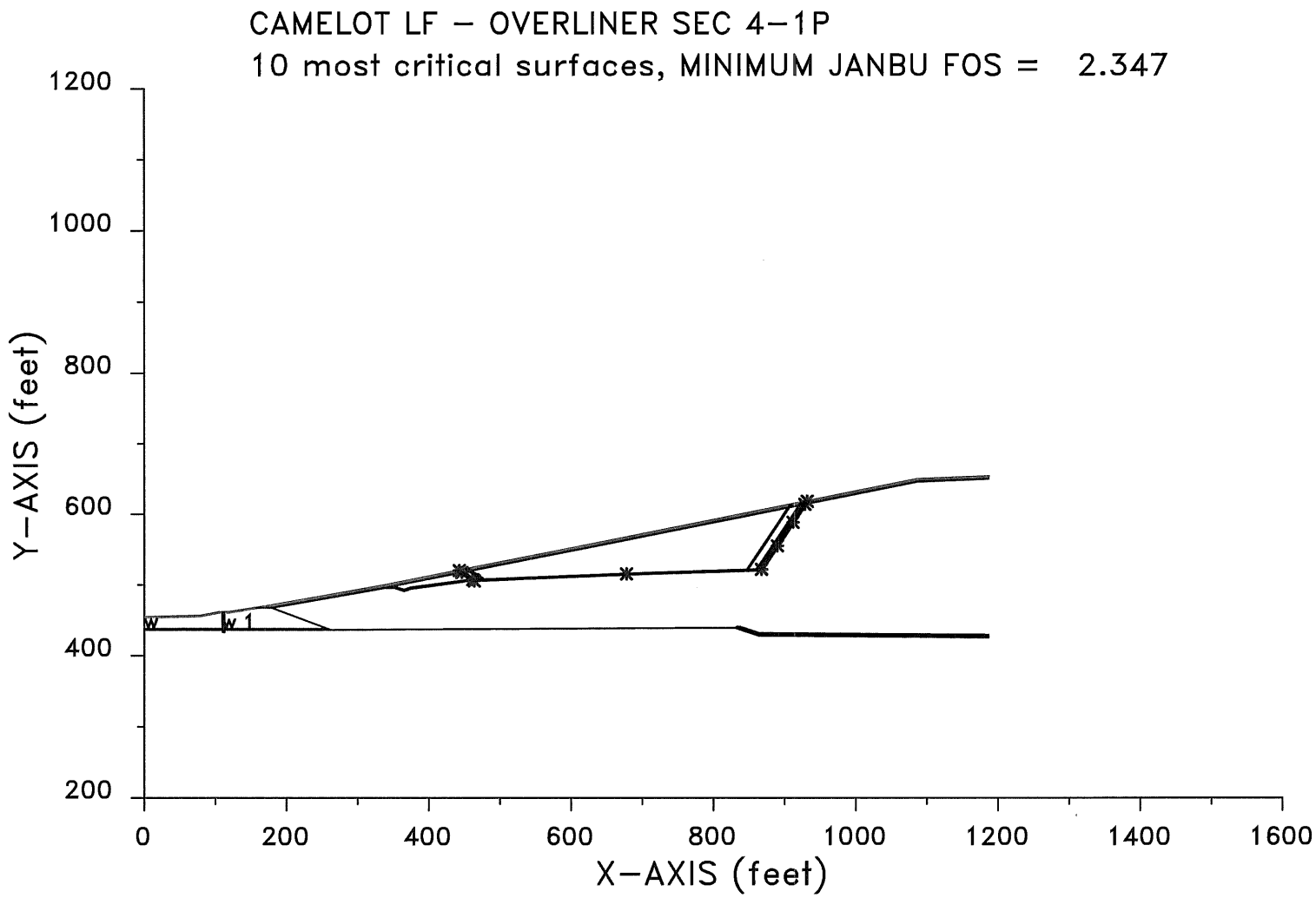
Problem Description : CAMELOT LF - OVERLINER SEC 3-1R

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.868	1.065	408.16	815.58	3.608E+05
2.	1.881	1.066	411.02	817.61	3.613E+05
3.	1.886	1.067	413.27	814.26	3.573E+05
4.	1.888	1.065	411.65	818.72	3.570E+05
5.	1.889	1.067	412.73	811.39	3.503E+05
6.	1.892	1.066	408.32	822.33	3.640E+05

7.	1.893	1.067	414.06	811.97	3.555E+05
8.	1.895	1.063	405.94	836.94	3.871E+05
9.	1.897	1.066	413.61	820.67	3.662E+05
10.	1.900	1.067	417.87	812.19	3.547E+05

* * * END OF FILE * * *

4-1P 2-18-16 13:45



XSTABL File: 4-1P 2-18-16 13:45

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
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```

Problem Description : CAMELOT LF - OVERLINER SEC 4-1P

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4

7	347.5	497.6	352.4	497.6	9
8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	100.0	16.00	.000	.0	0
10	115.0	120.0	1074.0	13.10	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 40.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	459.8	506.2	509.8	508.2	2.0
2	641.2	513.5	691.2	515.5	2.0

3	820.4	519.5	870.3	521.0	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	442.75	520.21
2	446.49	517.39
3	461.75	507.29
4	463.93	505.65
5	677.82	515.47
6	867.51	521.66
7	867.69	521.89
8	889.76	555.25
9	911.84	588.61
10	928.50	613.77
11	931.68	618.00

** Corrected JANBU FOS = 2.347 ** (Fo factor = 1.063)

Failure surface No. 2 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	440.15	519.69
2	443.89	516.87
3	458.55	507.17
4	460.87	505.42
5	658.65	514.62
6	865.56	520.87
7	866.31	521.85
8	888.38	555.21
9	910.46	588.56
10	926.94	613.46
11	930.12	617.68

** Corrected JANBU FOS = 2.351 ** (Fo factor = 1.063)

Failure surface No. 3 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	439.37	519.53
2	443.11	516.72
3	457.60	507.13
4	459.86	505.42
5	682.78	514.30
6	848.20	521.07
7	848.39	521.32
8	870.47	554.67
9	892.54	588.03
10	906.70	609.41
11	909.88	613.64

** Corrected JANBU FOS = 2.358 ** (Fo factor = 1.063)

Failure surface No. 4 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	452.09	522.08
2	455.83	519.26
3	473.21	507.75
4	475.57	505.97
5	675.57	514.02
6	868.04	521.75
7	868.16	521.91
8	890.24	555.26
9	912.31	588.62
10	929.03	613.87
11	932.22	618.10

** Corrected JANBU FOS = 2.359 ** (Fo factor = 1.064)

Failure surface No. 5 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	441.32	519.92
2	445.06	517.11
3	459.99	507.22
4	460.78	506.63
5	682.30	514.73
6	862.98	519.91
7	864.40	521.80
8	886.47	555.15
9	908.55	588.51
10	924.78	613.02
11	927.97	617.25

** Corrected JANBU FOS = 2.359 ** (Fo factor = 1.064)

Failure surface No. 6 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	441.95	520.05
2	445.69	517.23
3	460.77	507.25
4	461.88	506.42
5	672.43	513.97
6	858.80	519.98
7	860.07	521.67
8	882.15	555.02
9	904.23	588.38
10	919.90	612.05
11	923.08	616.28

** Corrected JANBU FOS = 2.362 ** (Fo factor = 1.064)

Failure surface No. 7 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	456.21	522.90
2	459.95	520.08
3	478.27	507.95
4	479.82	506.79
5	687.04	516.08
6	870.06	521.71
7	870.26	521.97
8	892.34	555.33
9	914.42	588.68
10	931.40	614.35
11	934.59	618.58

** Corrected JANBU FOS = 2.363 ** (Fo factor = 1.064)

Failure surface No. 8 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	443.19	520.30
2	446.93	517.48
3	462.28	507.32
4	464.51	505.64
5	667.01	513.88
6	861.99	519.88
7	863.41	521.77
8	885.49	555.12
9	907.57	588.48
10	923.67	612.80
11	926.86	617.03

** Corrected JANBU FOS = 2.364 ** (Fo factor = 1.064)

Failure surface No. 9 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	442.76	520.21
2	446.50	517.39
3	461.76	507.29
4	463.29	506.14
5	641.76	514.13
6	846.08	520.70
7	846.50	521.26
8	868.58	554.61
9	890.65	587.97
10	904.56	608.98
11	907.75	613.21

** Corrected JANBU FOS = 2.366 ** (Fo factor = 1.064)

Failure surface No.10 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	443.91	520.44
2	447.65	517.62
3	463.17	507.35
4	463.42	507.16
5	683.84	515.84
6	846.77	520.42
7	847.42	521.29
8	869.50	554.64
9	891.58	588.00
10	905.60	609.19
11	908.79	613.42

** Corrected JANBU FOS = 2.368 ** (Fo factor = 1.064)

The following is a summary of the TEN most critical surfaces

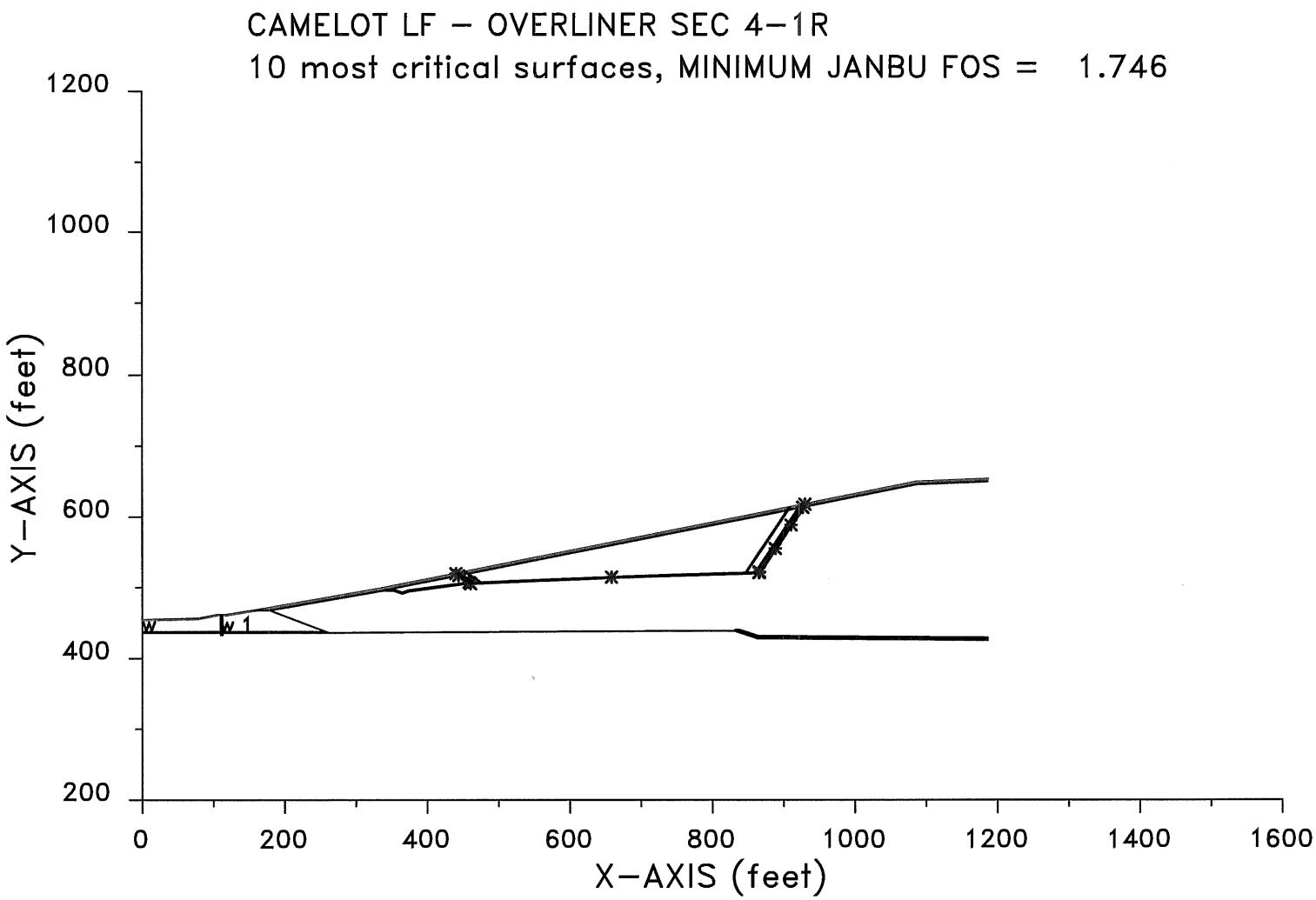
Problem Description : CAMELOT LF - OVERLINER SEC 4-1P

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.347	1.063	442.75	931.68	5.939E+05
2.	2.351	1.063	440.15	930.12	5.958E+05
3.	2.358	1.063	439.37	909.88	5.625E+05
4.	2.359	1.064	452.09	932.22	6.007E+05

5.	2.359	1.064	441.32	927.97	5.950E+05
6.	2.362	1.064	441.95	923.08	5.882E+05
7.	2.363	1.064	456.21	934.59	5.916E+05
8.	2.364	1.064	443.19	926.86	5.986E+05
9.	2.366	1.064	442.76	907.75	5.474E+05
10.	2.368	1.064	443.91	908.79	5.455E+05

* * * END OF FILE * * *

4-1R 2-18-16 13:46



XSTABL File: 4-1R 2-18-16 13:46

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
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*****************************************
```

Problem Description : CAMELOT LF - OVERLINER SEC 4-1R

SEGMENT BOUNDARY COORDINATES
---

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	454.0	78.8	456.0	1
2	78.8	456.0	105.3	461.2	1
3	105.3	461.2	109.7	461.2	1
4	109.7	461.2	112.7	461.2	11
5	112.7	461.2	118.2	461.2	1
6	118.2	461.2	157.8	467.6	10
7	157.8	467.6	172.9	470.0	5
8	172.9	470.0	342.7	500.0	5
9	342.7	500.0	346.7	501.0	5
10	346.7	501.0	1086.7	649.0	5
11	1086.7	649.0	1186.7	653.0	5

47 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	157.8	467.6	179.3	467.6	10
2	179.3	467.6	337.9	495.6	4
3	337.9	495.6	343.4	496.6	9
4	343.4	496.6	347.5	497.6	9
5	347.5	497.6	1087.2	645.5	4
6	1087.2	645.5	1186.7	649.5	4

7	347.5	497.6	352.4	497.6	9
8	352.4	497.6	365.1	493.3	9
9	365.1	493.3	374.1	496.4	9
10	374.1	496.4	454.4	507.0	4
11	454.4	507.0	704.5	517.0	9
12	704.5	517.0	871.2	522.0	9
13	337.9	495.6	352.1	495.6	4
14	352.1	495.6	365.1	491.2	4
15	365.1	491.2	374.6	494.4	4
16	374.6	494.4	454.6	505.0	4
17	454.6	505.0	704.6	515.0	4
18	704.6	515.0	871.3	520.0	4
19	179.3	467.6	196.2	461.2	10
20	196.2	461.2	257.6	438.0	1
21	257.6	438.0	262.1	436.3	2
22	262.1	436.3	372.0	437.0	3
23	372.0	437.0	779.4	439.0	3
24	779.4	439.0	830.6	439.0	3
25	830.6	439.0	833.0	440.9	6
26	833.0	440.9	837.5	440.9	6
27	837.5	440.9	864.2	432.0	6
28	864.2	432.0	1110.2	430.0	6
29	1110.2	430.0	1186.7	429.4	6
30	830.6	439.0	836.9	439.0	7
31	836.9	439.0	863.9	430.0	7
32	863.9	430.0	1110.2	428.0	8
33	1110.2	428.0	1186.7	427.4	8
34	830.6	439.0	863.6	428.0	3
35	863.6	428.0	1110.2	426.0	3
36	1110.2	426.0	1186.7	425.4	3
37	109.7	461.2	109.8	438.0	1
38	.0	438.0	109.8	438.0	2
39	112.7	461.2	112.8	438.0	11
40	112.8	438.0	257.6	438.0	2
41	109.8	438.0	109.9	436.3	2
42	.0	436.3	109.9	436.3	3
43	112.8	438.0	112.9	436.3	11
44	112.9	436.3	262.1	436.3	3
45	109.9	436.3	110.0	433.3	3
46	112.9	436.3	113.0	433.3	11
47	110.0	433.3	113.0	433.0	3

ISOTROPIC Soil Parameters
---

11 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	127.0	131.0	854.0	11.00	.000	.0	0
2	132.0	135.0	488.0	16.40	.000	.0	1
3	130.0	135.0	5000.0	.00	.000	.0	0

4	65.0	65.0	288.0	23.00	.000	.0	0
5	115.0	120.0	100.0	16.00	.000	.0	0
6	115.0	120.0	100.0	16.00	.000	.0	0
7	115.0	120.0	100.0	16.00	.000	.0	0
8	115.0	120.0	100.0	16.00	.000	.0	0
9	115.0	120.0	80.0	10.00	.000	.0	0
10	115.0	120.0	1074.0	13.10	.000	.0	0
11	75.0	75.0	.0	5.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	438.00
2	109.70	438.00

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

100 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 40.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	459.8	506.2	509.8	508.2	2.0
2	641.2	513.5	691.2	515.5	2.0

3	820.4	519.5	870.3	521.0	2.0

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	440.33	519.73
2	444.07	516.91
3	458.78	507.17
4	460.87	505.42
5	658.65	514.62
6	865.56	520.87
7	866.39	521.86
8	888.47	555.21
9	910.55	588.57
10	927.04	613.48
11	930.22	617.70

** Corrected JANBU FOS = 1.746 ** (Fo factor = 1.063)

Failure surface No. 2 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	442.93	520.25
2	446.66	517.43
3	461.96	507.30
4	463.93	505.65
5	677.82	515.47
6	867.51	521.66
7	867.71	521.90
8	889.78	555.25
9	911.86	588.61
10	928.52	613.77
11	931.71	618.00

** Corrected JANBU FOS = 1.747 ** (Fo factor = 1.063)

Failure surface No. 3 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	441.39	519.94
2	445.12	517.12
3	460.07	507.23
4	460.78	506.63
5	682.30	514.73
6	862.98	519.91
7	864.56	521.80
8	886.64	555.16
9	908.72	588.51
10	924.97	613.06
11	928.15	617.29

** Corrected JANBU FOS = 1.751 ** (Fo factor = 1.064)

Failure surface No. 4 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	439.55	519.57
2	443.29	516.75
3	457.82	507.14
4	459.86	505.42
5	682.78	514.30
6	848.20	521.07
7	848.41	521.32
8	870.49	554.67
9	892.56	588.03
10	906.72	609.41
11	909.91	613.64

** Corrected JANBU FOS = 1.752 ** (Fo factor = 1.063)

Failure surface No. 5 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	442.04	520.07
2	445.78	517.25
3	460.87	507.26
4	461.88	506.42
5	672.43	513.97
6	858.80	519.98
7	860.22	521.67
8	882.30	555.03
9	904.38	588.38
10	920.06	612.08
11	923.25	616.31

** Corrected JANBU FOS = 1.753 ** (Fo factor = 1.064)

Failure surface No. 6 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	443.36	520.33
2	447.10	517.52
3	462.50	507.32
4	464.51	505.64
5	667.01	513.88
6	861.99	519.88
7	863.58	521.77
8	885.66	555.13
9	907.73	588.48
10	923.86	612.84
11	927.04	617.07

** Corrected JANBU FOS = 1.753 ** (Fo factor = 1.064)

Failure surface No. 7 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	452.27	522.11
2	456.01	519.30
3	473.44	507.76
4	475.57	505.97
5	675.57	514.02
6	868.04	521.75
7	868.17	521.91
8	890.25	555.26
9	912.33	588.62
10	929.04	613.88
11	932.23	618.11

** Corrected JANBU FOS = 1.757 ** (Fo factor = 1.064)

Failure surface No. 8 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	442.88	520.24
2	446.62	517.42
3	461.91	507.30
4	463.29	506.14
5	641.76	514.13
6	846.08	520.70
7	846.55	521.26
8	868.63	554.62
9	890.70	587.97
10	904.62	608.99
11	907.80	613.22

** Corrected JANBU FOS = 1.766 ** (Fo factor = 1.064)

Failure surface No. 9 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	453.94	522.45
2	457.68	519.63
3	475.49	507.84
4	477.28	506.34
5	642.97	513.97
6	867.81	520.63
7	868.90	521.93
8	890.97	555.29
9	913.05	588.64
10	929.86	614.04
11	933.05	618.27

** Corrected JANBU FOS = 1.768 ** (Fo factor = 1.065)

Failure surface No.10 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	445.89	520.84
2	449.63	518.02
3	465.60	507.45
4	467.40	505.94
5	661.14	514.49
6	847.41	520.93
7	847.71	521.30
8	869.79	554.65
9	891.87	588.01
10	905.93	609.26
11	909.12	613.48

** Corrected JANBU FOS = 1.768 ** (Fo factor = 1.064)

The following is a summary of the TEN most critical surfaces

Problem Description : CAMELOT LF - OVERLINER SEC 4-1R

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.746	1.063	440.33	930.22	4.220E+05
2.	1.747	1.063	442.93	931.71	4.213E+05
3.	1.751	1.064	441.39	928.15	4.215E+05
4.	1.752	1.063	439.55	909.91	3.984E+05

5.	1.753	1.064	442.04	923.25	4.166E+05
6.	1.753	1.064	443.36	927.04	4.236E+05
7.	1.757	1.064	452.27	932.23	4.265E+05
8.	1.766	1.064	442.88	907.80	3.893E+05
9.	1.768	1.065	453.94	933.05	4.250E+05
10.	1.768	1.064	445.89	909.12	3.925E+05

* * * END OF FILE * * *

APPENDIX IIIJ-B

SETTLEMENT, STRAIN, AND HEAVE ANALYSES

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JASON A. EDWARDS, P.E.,
TEXAS LICENSE NO. 99336, ON

8-5-16

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BIDDING, OR PERMIT PURPOSES.

Includes page IIIJ-B-1

APPENDIX IIIJ-B-1

LINER SYSTEM SETTLEMENT, STRAIN, AND HEAVE ANALYSES

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Includes pages IIIJ-B-1-1 through IIIJ-B-1-26

APPROXIMATE LOCATION OF MAXIMUM EXCAVATION OF NATURAL SOILS (76 FEET) USED FOR THE HEAVE ANALYSIS ON PAGE IIIJ-B-1-23 (SEE NOTE 3).

OPERATIONS SUPPORT AND WOOD WASTE PROCESSING AREA

MIDWAY BRANCH

LFG FLARE FACILITY

LANDFILL GAS TO ENERGY FACILITY

PRE-SUBTITLE D AREA

ELM FORK OF THE TRINITY RIVER

CELL 1 · CELL 2 · CELL 3 · CELL 4A · CELL 4B · CELL 5A · CELL 5B · CELL 5C · CELL 6 · CELL 6A · CELL 7 · CELL 7A · CELL 8 & 9A · CELL 10 · CELL 11 · CELL 12 · CELL 13

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D GEOMEMBRANE LINER (SEE NOTE 4)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 435 — PRE-SUBTITLE D BOTTOM OF WASTE CONTOUR
- 435 — TOP OF SHALE CONTOUR (SEE NOTE 5)
- 3H:1V SLOPE (TYPICAL)
- EXISTING SLURRY WALL (SEE NOTE 6)
- 26 — EVALUATION POINT
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. REVISED EVALUATION POINT LOCATIONS.
3. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. THE LOCATION SHOWN INDICATES NATURAL SOILS TO BE EXCAVATED. THERE MAY BE RECENTLY DISTURBED AREAS TO PLACE SOIL STOCKPILES.
4. AS-BUILT TOP OF GEOMEMBRANE LINER CONTOURS WERE DEVELOPED FROM HISTORICAL SLERS MAINTAINED IN THE SITE OPERATING PLAN.
5. TOP OF SHALE CONTOURS REPRODUCED FROM APPENDIX IIIG-GEOLOGY REPORT.
6. REFER TO APPENDIX IIIA FOR SLURRY WALL INFORMATION.

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-1-2 FOUNDATION.DWG
DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FOUNDATION SETTLEMENT
EVALUATION POINTS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL · NAPERVILLE, IL · COLUMBUS, OH · DENVER, CO · FORT WORTH, TX (817) 735-9770 · GRIFFITH, IN · SOUTH BEND, IN · SPRINGFIELD, IL · ST. LOUIS, MO

SHEET IIIJ-B-1-2

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIA\IIIJ-B\IIIJ-B-1-2 FOUNDATION SETTLEMENT.dwg, sford, 1:2

INCREASE IN OVERBURDEN STRESS DUE TO DEVELOPMENT OF LANDFILL:

Note: Weights of materials above the evaluated strata are assumed to have moist units weights for the purpose of calculating the overburden pressure generated by these layers to estimate Δp. The unit weight of waste was based on the average waste thickness using the Unit Weight Profile for Waste/Daily Cover within an MSW Landfill chart from Ref. 5.

Evaluation Point 1

Final Cover Elevation (ft-msl)=	515.0	Top of Waste Elevation (ft-msl)=			511.5
Top of Protective Cover Elevation (ft-msl)=	414.0	Top of Liner Elevation (ft-msl)=			412.0
Waste Thickness (ft)=	97.5	γ_{waste}(pcf)=	56	$p_{(waste)}$ (psf)=	5460.0
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	6342.5

Evaluation Point 2

Final Cover Elevation (ft-msl)=	~~655.9~~ 649.0	Top of Waste Elevation (ft-msl)=			~~652.4~~ 645.5
Top of Protective Cover Elevation (ft-msl)=	~~416.8~~ 416.7	Top of Liner Elevation (ft-msl)=			~~414.8~~ 414.7
Waste Thickness (ft)=	~~235.6~~ 228.8	γ_{waste}(pcf)=	~~75~~ 74	$p_{(waste)}$ (psf)=	~~17670.0~~ 16931.2
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~18552.5~~ 17813.7

Evaluation Point 3

Final Cover Elevation (ft-msl)=	~~670.0~~ 652.4	Top of Waste Elevation (ft-msl)=			~~666.5~~ 648.9
Top of Protective Cover Elevation (ft-msl)=	419.9	Top of Liner Elevation (ft-msl)=			417.9
Waste Thickness (ft)=	~~246.6~~ 229.0	γ_{waste}(pcf)=	~~76~~ 74	$p_{(waste)}$ (psf)=	~~18741.6~~ 16946.0
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~19624.1~~ 17828.5

Evaluation Point 4

Final Cover Elevation (ft-msl)=	515.0	Top of Waste Elevation (ft-msl)=			511.5
Top of Protective Cover Elevation (ft-msl)=	414.0	Top of Liner Elevation (ft-msl)=			412.0
Waste Thickness (ft)=	97.5	γ_{waste}(pcf)=	56	$p_{(waste)}$ (psf)=	5460.0
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	6342.5

Evaluation Point 5

Final Cover Elevation (ft-msl)=	~~701.0~~ 649.0	Top of Waste Elevation (ft-msl)=			~~697.5~~ 645.5
Top of Protective Cover Elevation (ft-msl)=	~~417.7~~ 416.7	Top of Liner Elevation (ft-msl)=			~~415.7~~ 414.7
Waste Thickness (ft)=	~~279.8~~ 228.8	γ_{waste}(pcf)=	~~78~~ 74	$p_{(waste)}$ (psf)=	~~21824.4~~ 16931.2
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~22706.9~~ 16931.2

Evaluation Point 6

Final Cover Elevation (ft-msl)=	~~707.2~~ 663.5	Top of Waste Elevation (ft-msl)=			~~703.7~~ 660.0
Top of Protective Cover Elevation (ft-msl)=	419.9	Top of Liner Elevation (ft-msl)=			417.9
Waste Thickness (ft)=	~~283.8~~ 240.1	γ_{waste}(pcf)=	~~78~~ 75	$p_{(waste)}$ (psf)=	~~22136.4~~ 18007.5
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~23018.9~~ 18890.0

Evaluation Point 7

Final Cover Elevation (ft-msl)=	515.0	Top of Waste Elevation (ft-msl)=			511.5
Top of Protective Cover Elevation (ft-msl)=	413.9	Top of Liner Elevation (ft-msl)=			411.9
Waste Thickness (ft)=	97.6	γ_{waste}(pcf)=	56	$p_{(waste)}$ (psf)=	5465.6
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	6468.1

Evaluation Point 8

Final Cover Elevation (ft-msl)=	~~701.0~~ 649.0	Top of Waste Elevation (ft-msl)=			~~697.5~~ 645.5
Top of Protective Cover Elevation (ft-msl)=	~~417.8~~ 416.8	Top of Liner Elevation (ft-msl)=			~~415.8~~ 414.8
Waste Thickness (ft)=	~~279.7~~ 228.7	γ_{waste}(pcf)=	~~78~~ 74	$p_{(waste)}$ (psf)=	~~21816.6~~ 16923.8
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~22819.1~~ 16923.8

Evaluation Point 9

Final Cover Elevation (ft-msl)=	~~715.4~~ 666.4	Top of Waste Elevation (ft-msl)=			~~711.9~~ 662.9
Top of Protective Cover Elevation (ft-msl)=	420.0	Top of Liner Elevation (ft-msl)=			418.0
Waste Thickness (ft)=	~~291.9~~ 242.9	γ_{waste}(pcf)=	~~79~~ 75	$p_{(waste)}$ (psf)=	~~23060.1~~ 18217.5
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~23942.6~~ 19100.0

Evaluation Point 10

Final Cover Elevation (ft-msl)=	~~701.0~~ 649.0	Top of Waste Elevation (ft-msl)=			~~697.5~~ 645.5
Top of Protective Cover Elevation (ft-msl)=	~~418.1~~ 416.9	Top of Liner Elevation (ft-msl)=			~~416.1~~ 414.9
Waste Thickness (ft)=	~~279.4~~ 228.6	γ_{waste}(pcf)=	~~78~~ 74	$p_{(waste)}$ (psf)=	~~21793.2~~ 16916.4
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~22675.7~~ 17798.9

Evaluation Point 11

Final Cover Elevation (ft-msl)=	~~707.2~~ 657.3	Top of Waste Elevation (ft-msl)=			~~703.7~~ 653.8
Top of Protective Cover Elevation (ft-msl)=	420.4	Top of Liner Elevation (ft-msl)=			418.4
Waste Thickness (ft)=	~~283.3~~ 233.4	γ_{waste}(pcf)=	~~78~~ 75	$p_{(waste)}$ (psf)=	~~22097.4~~ 17505.0
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~22979.9~~ 18387.5

Evaluation Point 12

Final Cover Elevation (ft-msl)=	529.7	Top of Waste Elevation (ft-msl)=			526.2
Top of Protective Cover Elevation (ft-msl)=	394.4	Top of Liner Elevation (ft-msl)=			392.4
Waste Thickness (ft)=	131.8	γ_{waste}(pcf)=	61	$p_{(waste)}$ (psf)=	8039.8
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	9042.3

Evaluation Point 13

Final Cover Elevation (ft-msl)=	~~653.8~~ 649.8	Top of Waste Elevation (ft-msl)=			~~650.3~~ 646.3
Top of Protective Cover Elevation (ft-msl)=	400.2	Top of Liner Elevation (ft-msl)=			398.2
Waste Thickness (ft)=	~~250.1~~ 246.1	γ_{waste}(pcf)=	76	$p_{(waste)}$ (psf)=	~~19007.6~~ 18703.6
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~20010.1~~ 19706.1

Evaluation Point 14

Final Cover Elevation (ft-msl)=	~~639.6~~ 617.6	Top of Waste Elevation (ft-msl)=			~~636.1~~ 614.1
Top of Protective Cover Elevation (ft-msl)=	403.5	Top of Liner Elevation (ft-msl)=			401.5
Waste Thickness (ft)=	~~232.6~~ 210.6	γ_{waste}(pcf)=	~~74~~ 72	$p_{(waste)}$ (psf)=	~~17212.4~~ 15163.2
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~18214.9~~ 16165.7

Evaluation Point 15

Final Cover Elevation (ft-msl)=	529.7	Top of Waste Elevation (ft-msl)=			526.2
Top of Protective Cover Elevation (ft-msl)=	394.3	Top of Liner Elevation (ft-msl)=			392.3
Waste Thickness (ft)=	131.9	γ_{waste}(pcf)=	61	$p_{(waste)}$ (psf)=	8045.9
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	8928.4

Evaluation Point 16

Final Cover Elevation (ft-msl)=	~~560.3~~ 551.2	Top of Waste Elevation (ft-msl)=			~~556.8~~ 547.7
Top of Protective Cover Elevation (ft-msl)=	400.9	Top of Liner Elevation (ft-msl)=			398.9
Waste Thickness (ft)=	~~155.9~~ 146.8	γ_{waste}(pcf)=	~~65~~ 63	$p_{(waste)}$ (psf)=	~~10133.5~~ 9248.4
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~11016.0~~ 10130.9

Evaluation Point 17

Final Cover Elevation (ft-msl)=	~~580.2~~ 563.8	Top of Waste Elevation (ft-msl)=			~~576.7~~ 560.3
Top of Protective Cover Elevation (ft-msl)=	406.3	Top of Liner Elevation (ft-msl)=			404.3
Waste Thickness (ft)=	~~170.4~~ 154.0	γ_{waste}(pcf)=	~~67~~ 64	$p_{(waste)}$ (psf)=	~~11416.8~~ 9856.0
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~12299.3~~ 10738.5

Evaluation Point 18

Final Cover Elevation (ft-msl)=	501.6	Top of Waste Elevation (ft-msl)=			498.1
Top of Protective Cover Elevation (ft-msl)=	419.2	Top of Liner Elevation (ft-msl)=			417.2
Waste Thickness (ft)=	78.9	γ_{waste}(pcf)=	53	$p_{(waste)}$ (psf)=	4181.7
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	5064.2

Evaluation Point 19

Final Cover Elevation (ft-msl)=	599.4	Top of Waste Elevation (ft-msl)=			595.9
Top of Protective Cover Elevation (ft-msl)=	421.2	Top of Liner Elevation (ft-msl)=			419.2
Waste Thickness (ft)=	174.7	γ_{waste}(pcf)=	67	$p_{(waste)}$ (psf)=	11704.9
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	12707.4

Evaluation Point 20

Final Cover Elevation (ft-msl)=	512.0	Top of Waste Elevation (ft-msl)=			508.5
Top of Protective Cover Elevation (ft-msl)=	417.1	Top of Liner Elevation (ft-msl)=			415.1
Waste Thickness (ft)=	91.4	γ_{waste}(pcf)=	55	$p_{(waste)}$ (psf)=	5027.0
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	6029.5

Evaluation Point 21

Final Cover Elevation (ft-msl)=	~~701.0~~ 649.0	Top of Waste Elevation (ft-msl)=			~~697.5~~ 645.5
Top of Protective Cover Elevation (ft-msl)=	~~420.9~~ 419.9	Top of Liner Elevation (ft-msl)=			~~418.9~~ 417.9
Waste Thickness (ft)=	~~276.6~~ 225.7	γ_{waste}(pcf)=	~~78~~ 74	$p_{(waste)}$ (psf)=	~~21574.8~~ 16698.1
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~22577.3~~ 17700.6

Evaluation Point 22

Final Cover Elevation (ft-msl)=	~~719.3~~ 675.0	Top of Waste Elevation (ft-msl)=			~~715.8~~ 671.5
Top of Protective Cover Elevation (ft-msl)=	423.2	Top of Liner Elevation (ft-msl)=			421.2
Waste Thickness (ft)=	~~292.6~~ 248.3	γ_{waste}(pcf)=	~~79~~ 76	$p_{(waste)}$ (psf)=	~~23115.4~~ 18870.8
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~24117.9~~ 19873.3

Evaluation Point 23

Final Cover Elevation (ft-msl)=	~~722.5~~ 670.2	Top of Waste Elevation (ft-msl)=			~~719~~ 666.7
Top of Protective Cover Elevation (ft-msl)=	423.8	Top of Liner Elevation (ft-msl)=			421.8
Waste Thickness (ft)=	~~295.2~~ 242.9	γ_{waste}(pcf)=	~~79~~ 75	$p_{(waste)}$ (psf)=	~~23320.8~~ 18217.5
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~24323.3~~ 19220.0

Evaluation Point 24

Final Cover Elevation (ft-msl)=	~~701.0~~ 647.7	Top of Waste Elevation (ft-msl)=			~~697.5~~ 644.2
Top of Protective Cover Elevation (ft-msl)=	430.6	Top of Liner Elevation (ft-msl)=			428.6
Waste Thickness (ft)=	~~267.0~~ 213.7	γ_{waste}(pcf)=	~~77~~ 73	$p_{(waste)}$ (psf)=	~~20555.2~~ 15596.5
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~21557.7~~ 16599.0

Evaluation Point 25

Final Cover Elevation (ft-msl)=	~~664.1~~ 617.5	Top of Waste Elevation (ft-msl)=	~~660.6~~ 614		
Top of Protective Cover Elevation (ft-msl)=	432.1	Top of Liner Elevation (ft-msl)=	430.1		
Waste Thickness (ft)=	~~228.5~~ 181.9	γ_{waste}(pcf)=	~~74~~ 68	$p_{(waste)}$ (psf)=	~~16909.0~~ 12369.2
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	3.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	360
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~17911.5~~ 13371.7

Evaluation Point 26

Final Cover Elevation (ft-msl)=	~~716.1~~ 672.4	Top of Waste Elevation (ft-msl)=	~~712.6~~ 668.90		
Top of Protective Cover Elevation (ft-msl)=	421.9	Top of Liner Elevation (ft-msl)=	419.9		
Waste Thickness (ft)=	~~290.7~~ 247.0	γ_{waste}(pcf)=	~~79~~ 76	$p_{(waste)}$ (psf)=	~~22965.3~~ 18772.0
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~23847.8~~ 19654.5

Evaluation Point 27

Final Cover Elevation (ft-msl)=	~~707.2~~ 663.5	Top of Waste Elevation (ft-msl)=	~~703.7~~ 660.00		
Top of Protective Cover Elevation (ft-msl)=	418.7	Top of Liner Elevation (ft-msl)=	416.7		
Waste Thickness (ft)=	~~285.0~~ 241.3	γ_{waste}(pcf)=	~~78~~ 75	$p_{(waste)}$ (psf)=	~~22230.0~~ 18097.5
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~23112.5~~ 18980.0

Evaluation Point 28

Final Cover Elevation (ft-msl)=	~~717.7~~ 668.0	Top of Waste Elevation (ft-msl)=	~~714.2~~ 664.50		
Top of Protective Cover Elevation (ft-msl)=	422.0	Top of Liner Elevation (ft-msl)=	420.0		
Waste Thickness (ft)=	~~292.2~~ 242.5	γ_{waste}(pcf)=	~~79~~ 75	$p_{(waste)}$ (psf)=	~~23083.8~~ 18187.5
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~23966.3~~ 19070.0

Evaluation Point 29

Final Cover Elevation (ft-msl)=	~~706.7~~ 624.3	Top of Waste Elevation (ft-msl)=	~~703.20~~ 620.8		
Top of Protective Cover Elevation (ft-msl)=	432.0	Top of Liner Elevation (ft-msl)=	430.0		
Waste Thickness (ft)=	~~271.2~~ 188.8	γ_{waste}(pcf)=	~~77~~ 69	$p_{(waste)}$ (psf)=	~~20882.4~~ 13027.2
Protective Cover Thickness (ft)=	2.0	γ_{pc} (pcf)=	120	$p_{(pc)}$ (psf)=	240
Liner Thickness (ft)=	2.0	γ_{liner} (pcf)=	120	$p_{(liner)}$ (psf)=	240
Final Cover Thickness (ft)=	3.5	γ_{fc} (pcf)=	115	$p_{(fc)}$ (psf)=	402.5
				Δp (psf)=	~~21764.9~~ 13909.7

Prep By: MDM
Date: 2/19/2016

Chkd By: CAM
Date: 2/23/2016

CAMELOT LANDFILL
1339-351-11
APPENDIX IIIJ-B
FOUNDATION SETTLEMENT

Evaluation Point 1:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	410.0	400	10	111.5	0.60	0.063	0.012	6840	557.5	6342.5	0.083	9.917
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	8513	1672.5	6342.5	0.051	9.949
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	9628	2787.5	6342.5	0.039	9.961
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	10743	3902.5	6342.5	0.031	9.969
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	11858	5017.5	6342.5	0.027	9.973
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	12973	6132.5	6342.5	0.023	9.977
										Total Settlement (ft) =	0.254	

Evaluation Point 2:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	~~412.8~~ 412.7	410	~~2.80~~ 2.70	111.5	0.60	0.063	0.012	6840	~~156.1~~ 150.5	~~18552.5~~ 17813.7	~~0.083~~ 0.078	~~2.717~~ 2.622
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	~~7710~~ 7699	~~869.7~~ 858.5	~~18552.5~~ 17813.7	~~0.229~~ 0.223	~~9.771~~ 9.777
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	~~8825~~ 8814	~~1984.7~~ 1973.6	~~18552.5~~ 17813.7	~~0.193~~ 0.187	~~9.807~~ 9.813
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	~~9940~~ 9929	~~3099.7~~ 3088.6	~~18552.5~~ 17813.7	~~0.171~~ 0.165	~~9.829~~ 9.835
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	~~11055~~ 11044	~~4214.7~~ 4203.6	~~18552.5~~ 17813.7	~~0.155~~ 0.149	~~9.845~~ 9.851
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	~~12170~~ 12159	~~5329.7~~ 5318.6	~~18552.5~~ 17813.7	~~0.142~~ 0.137	~~9.858~~ 9.863
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	~~13285~~ 13274	~~6444.7~~ 6433.6	~~18552.5~~ 17813.7	~~0.132~~ 0.127	~~9.868~~ 9.873
										Total Settlement (ft) =	~~1.105~~ 1.066	

Evaluation Point 3:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	415.9	410	5.9	111.5	0.60	0.063	0.012	6840	328.9	~~19624.1~~ 17828.5	~~0.166~~ 0.157	~~5.734~~ 5.743
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8055	1215.4	~~19624.1~~ 17828.5	~~0.224~~ 0.209	~~9.776~~ 9.791
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9170	2330.4	~~19624.1~~ 17828.5	~~0.194~~ 0.179	~~9.806~~ 9.821
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10285	3445.4	~~19624.1~~ 17828.5	~~0.174~~ 0.160	~~9.826~~ 9.840
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11400	4560.4	~~19624.1~~ 17828.5	~~0.158~~ 0.145	~~9.842~~ 9.855
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12515	5675.4	~~19624.1~~ 17828.5	~~0.146~~ 0.134	~~9.854~~ 9.866
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13630	6790.4	~~19624.1~~ 17828.5	~~0.136~~ 0.124	~~9.864~~ 9.876
										Total Settlement (ft) =	~~1.199~~ 1.107	

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 1:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	410.0	400	10	111.5	0.60	0.063	0.012	6840	557.5	6342.5	0.083	9.917
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	8513	1672.5	6342.5	0.051	9.949
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	9628	2787.5	6342.5	0.039	9.961
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	10743	3902.5	6342.5	0.031	9.969
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	11858	5017.5	6342.5	0.027	9.973
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	12973	6132.5	6342.5	0.023	9.977
										Total Settlement (ft) =	0.254	

Evaluation Point 2:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	~~412.8~~ 412.7	410	~~2.80~~ 2.70	111.5	0.60	0.063	0.012	6840	~~156.1~~ 150.5	~~18552.5~~ 17813.7	~~0.083~~ 0.078	~~2.717~~ 2.622
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	~~7710~~ 7699	~~869.7~~ 858.5	~~18552.5~~ 17813.7	~~0.229~~ 0.223	~~9.771~~ 9.777
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	~~8825~~ 8814	~~1984.7~~ 1973.6	~~18552.5~~ 17813.7	~~0.193~~ 0.187	~~9.807~~ 9.813
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	~~9940~~ 9929	~~3099.7~~ 3088.6	~~18552.5~~ 17813.7	~~0.171~~ 0.165	~~9.829~~ 9.835
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	~~11055~~ 11044	~~4214.7~~ 4203.6	~~18552.5~~ 17813.7	~~0.155~~ 0.149	~~9.845~~ 9.851
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	~~12170~~ 12159	~~5329.7~~ 5318.6	~~18552.5~~ 17813.7	~~0.142~~ 0.137	~~9.858~~ 9.863
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	~~13285~~ 13274	~~6444.7~~ 6433.6	~~18552.5~~ 17813.7	~~0.132~~ 0.127	~~9.868~~ 9.873
										Total Settlement (ft) =	~~1.105~~ 1.066	

Evaluation Point 3:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	415.9	410	5.9	111.5	0.60	0.063	0.012	6840	328.9	~~19624.1~~ 17828.5	~~0.166~~ 0.157	~~5.734~~ 5.743
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8055	1215.4	~~19624.1~~ 17828.5	~~0.224~~ 0.209	~~9.776~~ 9.791
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9170	2330.4	~~19624.1~~ 17828.5	~~0.194~~ 0.179	~~9.806~~ 9.821
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10285	3445.4	~~19624.1~~ 17828.5	~~0.174~~ 0.160	~~9.826~~ 9.840
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11400	4560.4	~~19624.1~~ 17828.5	~~0.158~~ 0.145	~~9.842~~ 9.855
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12515	5675.4	~~19624.1~~ 17828.5	~~0.146~~ 0.134	~~9.854~~ 9.866
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13630	6790.4	~~19624.1~~ 17828.5	~~0.136~~ 0.124	~~9.864~~ 9.876
										Total Settlement (ft) =	~~1.199~~ 1.107	

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 4:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	410.0	400	10	111.5	0.60	0.063	0.012	6840	557.5	6342.5	0.083	9.917
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	8513	1672.5	6342.5	0.051	9.949
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	9628	2787.5	6342.5	0.039	9.961
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	10743	3902.5	6342.5	0.031	9.969
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	11858	5017.5	6342.5	0.027	9.973
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	12973	6132.5	6342.5	0.023	9.977
										Total Settlement (ft) =	0.254	

Evaluation Point 5:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	~~413.7~~ 412.7	410	~~3.7~~ 2.7	111.5	0.60	0.063	0.012	6840	~~206.3~~ 150.5	~~22706.9~~ 16931.2	~~0.119~~ 0.076	~~3.581~~ 2.624
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	~~7810~~ 7699	~~970.0~~ 858.5	~~22706.9~~ 16931.2	~~0.258~~ 0.215	~~9.742~~ 9.785
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	~~8925~~ 8814	~~2085.1~~ 1973.6	~~22706.9~~ 16931.2	~~0.222~~ 0.179	~~9.778~~ 9.821
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	~~10040~~ 9929	~~3200.1~~ 3088.6	~~22706.9~~ 16931.2	~~0.199~~ 0.158	~~9.801~~ 9.842
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	~~11155~~ 11044	~~4315.1~~ 4203.6	~~22706.9~~ 16931.2	~~0.182~~ 0.142	~~9.818~~ 9.858
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	~~12270~~ 12159	~~5430.1~~ 5318.6	~~22706.9~~ 16931.2	~~0.168~~ 0.130	~~9.832~~ 9.870
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	~~13385~~ 13274	~~6545.1~~ 6433.6	~~22706.9~~ 16931.2	~~0.157~~ 0.120	~~9.843~~ 9.880
										Total Settlement (ft) =	~~1.305~~ 1.021	

Evaluation Point 6:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	415.9	410	5.9	111.5	0.60	0.063	0.012	6840	328.9	~~23018.9~~ 18890.0	~~0.182~~ 0.163	~~5.718~~ 5.737
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8055	1215.4	~~23018.9~~ 18890.0	~~0.250~~ 0.218	~~9.750~~ 9.782
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9170	2330.4	~~23018.9~~ 18890.0	~~0.218~~ 0.188	~~9.782~~ 9.812
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10285	3445.4	~~23018.9~~ 18890.0	~~0.197~~ 0.168	~~9.803~~ 9.832
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11400	4560.4	~~23018.9~~ 18890.0	~~0.181~~ 0.153	~~9.819~~ 9.847
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12515	5675.4	~~23018.9~~ 18890.0	~~0.168~~ 0.141	~~9.832~~ 9.859
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13630	6790.4	~~23018.9~~ 18890.0	~~0.157~~ 0.131	~~9.843~~ 9.869
										Total Settlement (ft) =	~~1.353~~ 1.162	

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Chkd By: CAM
Date: 2/23/2016

Evaluation Point 7:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	408.9	400	8.90	111.5	0.60	0.063	0.012	6840	496.2	6468.1	0.079	8.821
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	8390	1549.9	6468.1	0.054	9.946
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	9505	2664.9	6468.1	0.040	9.960
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	10620	3779.9	6468.1	0.032	9.968
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	11735	4894.9	6468.1	0.027	9.973
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	12850	6009.9	6468.1	0.024	9.976
										Total Settlement (ft) =	0.256	

Evaluation Point 8:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	~~412.8~~ 411.8	410	~~2.8~~ 1.8	111.5	0.60	0.063	0.012	6840	~~156.1~~ 100.4	~~22819.1~~ 16923.8	~~0.092~~ 0.053	~~2.708~~ 1.747
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	~~7710~~ 7598	~~869.7~~ 758.2	~~22819.1~~ 16923.8	~~0.263~~ 0.220	~~9.737~~ 9.780
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	~~8825~~ 8713	~~1984.7~~ 1873.2	~~22819.1~~ 16923.8	~~0.225~~ 0.182	~~9.775~~ 9.818
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	~~9940~~ 9828	~~3099.7~~ 2988.2	~~22819.1~~ 16923.8	~~0.202~~ 0.160	~~9.798~~ 9.840
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	~~11055~~ 10943	~~4214.7~~ 4103.2	~~22819.1~~ 16923.8	~~0.184~~ 0.144	~~9.816~~ 9.856
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	~~12170~~ 12058	~~5329.7~~ 5218.2	~~22819.1~~ 16923.8	~~0.170~~ 0.131	~~9.830~~ 9.869
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	~~13285~~ 13173	~~6444.7~~ 6333.2	~~22819.1~~ 16923.8	~~0.159~~ 0.121	~~9.841~~ 9.879
										Total Settlement (ft) =	~~1.296~~ 1.009	

Evaluation Point 9:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	416.0	410	6.0	111.5	0.60	0.063	0.012	6840	334.5	~~23942.6~~ 19100.0	~~0.189~~ 0.166	~~5.811~~ 5.834
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8067	1226.5	~~23942.6~~ 19100.0	~~0.256~~ 0.219	~~9.744~~ 9.781
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9182	2341.5	~~23942.6~~ 19100.0	~~0.224~~ 0.190	~~9.776~~ 9.810
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10297	3456.5	~~23942.6~~ 19100.0	~~0.203~~ 0.170	~~9.797~~ 9.830
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11412	4571.5	~~23942.6~~ 19100.0	~~0.186~~ 0.155	~~9.814~~ 9.845
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12527	5686.5	~~23942.6~~ 19100.0	~~0.173~~ 0.142	~~9.827~~ 9.858
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13642	6801.5	~~23942.6~~ 19100.0	~~0.162~~ 0.132	~~9.838~~ 9.868
										Total Settlement (ft) =	~~1.393~~ 1.174	

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 10:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	~~414.1~~ 412.9	~~410~~	~~4.1~~ 2.9	111.5	0.60	0.063	0.012	6840	~~228.6~~ 161.7	~~22675.7~~ 17798.9	0.130 0.083	~~3.970~~ 2.817
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	~~7855~~ 7163	~~1014.7~~ 323.3	~~22675.7~~ 17798.9	~~0.255~~ 0.260	~~9.745~~ 9.740
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	~~8970~~ 7721	~~2129.7~~ 880.8	~~22675.7~~ 17798.9	~~0.221~~ 0.222	~~9.779~~ 9.778
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	~~10085~~ 8836	~~3244.7~~ 1995.9	~~22675.7~~ 17798.9	~~0.198~~ 0.186	~~9.802~~ 9.814
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	~~11200~~ 9951	~~4359.7~~ 3110.9	~~22675.7~~ 17798.9	~~0.181~~ 0.165	~~9.819~~ 9.835
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	~~12315~~ 11066	~~5474.7~~ 4225.9	~~22675.7~~ 17798.9	~~0.168~~ 0.149	~~9.832~~ 9.851
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	~~13430~~ 12181	~~6589.7~~ 5340.9	~~22675.7~~ 17798.9	~~0.156~~ 0.137	~~9.844~~ 9.863
											Total Settlement (ft) =	~~1.310~~ 1.202

Evaluation Point 11:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	416.4	410	6.4	111.5	0.60	0.063	0.012	6840	356.8	~~22979.9~~ 18387.5	~~0.196~~ 0.172	~~6.204~~ 6.228
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8111	1271.1	~~22979.9~~ 18387.5	~~0.248~~ 0.212	~~9.752~~ 9.788
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9226	2386.1	~~22979.9~~ 18387.5	~~0.217~~ 0.183	~~9.783~~ 9.817
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10341	3501.1	~~22979.9~~ 18387.5	~~0.196~~ 0.164	~~9.804~~ 9.836
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11456	4616.1	~~22979.9~~ 18387.5	~~0.180~~ 0.149	~~9.820~~ 9.851
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12571	5731.1	~~22979.9~~ 18387.5	~~0.167~~ 0.137	~~9.833~~ 9.863
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13686	6846.1	~~22979.9~~ 18387.5	~~0.156~~ 0.127	~~9.844~~ 9.873
											Total Settlement (ft) =	~~1.359~~ 1.143

Evaluation Point 12:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	389.4	380	9.4	111.5	0.60	0.063	0.012	6840	524.0	9042.3	0.133	9.267
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	8446	1605.6	9042.3	0.094	9.906
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	9561	2720.6	9042.3	0.076	9.924
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	10676	3835.6	9042.3	0.065	9.935
											Total Settlement (ft) =	0.368

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 13:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	395.2	390	5.2	111.5	0.60	0.063	0.012	6840	289.9	~~20010.1~~	19706.1	~~0.150~~	0.149	~~5.050~~	5.051
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	7977	1137.3	~~20010.1~~	19706.1	~~0.230~~	0.228	~~9.770~~	9.772
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	9092	2252.3	~~20010.1~~	19706.1	~~0.199~~	0.196	~~9.801~~	9.804
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	10207	3367.3	~~20010.1~~	19706.1	~~0.178~~	0.176	~~9.822~~	9.824
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	11322	4482.3	~~20010.1~~	19706.1	~~0.162~~	0.160	~~9.838~~	9.840
											Total Settlement (ft) =	~~0.919~~	0.908		

Evaluation Point 14:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	398.5	390	8.5	111.5	0.60	0.063	0.012	6840	473.9	~~18214.9~~	16165.7	~~0.220~~	0.203	~~8.280~~	8.297
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	8345	1505.3	~~18214.9~~	16165.7	~~0.203~~	0.184	~~9.797~~	9.816
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	9460	2620.3	~~18214.9~~	16165.7	~~0.177~~	0.159	~~9.823~~	9.841
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	10575	3735.3	~~18214.9~~	16165.7	~~0.159~~	0.142	~~9.841~~	9.858
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	11690	4850.3	~~18214.9~~	16165.7	~~0.145~~	0.129	~~9.855~~	9.871
											Total Settlement (ft) =	~~0.903~~	0.817		

Evaluation Point 15:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	390.3	380	10.3	111.5	0.60	0.063	0.012	6840	574.2	8928.4	0.141	10.159
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	8546	1706.0	8928.4	0.090	9.910
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	9661	2821.0	8928.4	0.074	9.926
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	10776	3936.0	8928.4	0.063	9.937
										Total Settlement (ft) =	0.368	

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 16:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	396.9	390	6.9	111.5	0.60	0.063	0.012	6840	384.7	~~11016.0~~	10130.9	~~0.125~~	0.115	~~6.775~~	6.785
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	8167	1326.9	~~11016.0~~	10130.9	~~0.130~~	0.117	~~9.870~~	9.883
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	9282	2441.9	~~11016.0~~	10130.9	~~0.107~~	0.095	~~9.893~~	9.905
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	10397	3556.9	~~11016.0~~	10130.9	~~0.093~~	0.082	~~9.907~~	9.918
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	11512	4671.9	~~11016.0~~	10130.9	~~0.082~~	0.072	~~9.918~~	9.928
											Total Settlement (ft) =	~~0.537~~	0.482		

Evaluation Point 17:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	402.3	400	2.3	111.5	0.60	0.063	0.012	6840	128.2	~~12299.3~~	10738.5	~~0.053~~	0.048	~~2.247~~	2.252
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	7654	814.0	~~12299.3~~	10738.5	~~0.165~~	0.143	~~9.835~~	9.857
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	8769	1929.0	~~12299.3~~	10738.5	~~0.132~~	0.112	~~9.868~~	9.888
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	9884	3044.0	~~12299.3~~	10738.5	~~0.114~~	0.095	~~9.886~~	9.905
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	10999	4159.0	~~12299.3~~	10738.5	~~0.101~~	0.084	~~9.899~~	9.916
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	12114	5274.0	~~12299.3~~	10738.5	~~0.091~~	0.075	~~9.909~~	9.925
											Total Settlement (ft) =	~~0.655~~	0.557		

Evaluation Point 18:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	415.2	410	5.2	111.5	0.60	0.063	0.012	6840	289.9	5064.2	0.049	5.151
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	7977	1137.3	5064.2	0.055	9.945
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9092	2252.3	5064.2	0.038	9.962
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10207	3367.3	5064.2	0.030	9.970
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11322	4482.3	5064.2	0.025	9.975
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12437	5597.3	5064.2	0.021	9.979
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13552	6712.3	5064.2	0.018	9.982
										Total Settlement (ft) =	0.237	

[1] C_c and C_r are the slopes of the *e* -log *p* plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 19:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	416.2	410	6.2	111.5	0.60	0.063	0.012	6840	345.6	12707.4	0.129	6.071
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8089	1248.8	12707.4	0.154	9.846
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9204	2363.8	12707.4	0.129	9.871
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10319	3478.8	12707.4	0.112	9.888
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11434	4593.8	12707.4	0.101	9.899
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12549	5708.8	12707.4	0.091	9.909
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13664	6823.8	12707.4	0.084	9.916
										Total Settlement (ft) =	0.799	

Evaluation Point 20:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	412.1	410	2.1	111.5	0.60	0.063	0.012	6840	117.1	6029.5	0.027	2.073
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	7632	791.7	6029.5	0.070	9.930
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	8747	1906.7	6029.5	0.046	9.954
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	9862	3021.7	6029.5	0.036	9.964
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	10977	4136.7	6029.5	0.029	9.971
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12092	5251.7	6029.5	0.025	9.975
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13207	6366.7	6029.5	0.022	9.978
										Total Settlement (ft) =	0.255	

Evaluation Point 21:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)	S[2] (ft)	H_f (ft)
Unweathered Shale	~~415.9~~ 414.9	410	~~5.9~~ 4.85	111.5	0.60	0.063	0.012	6840	~~328.9~~ 270.4	~~22577.3~~ 17700.6	~~0.180~~ 0.131	~~5.720~~ 4.719
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	~~8055~~ 7938	~~1215.4~~ 1098.3	~~22577.3~~ 17700.6	~~0.247~~ 0.212	~~9.753~~ 9.788
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	~~9170~~ 9053	~~2330.4~~ 2213.3	~~22577.3~~ 17700.6	~~0.215~~ 0.181	~~9.785~~ 9.819
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	~~10285~~ 10168	~~3445.4~~ 3328.3	~~22577.3~~ 17700.6	~~0.194~~ 0.161	~~9.806~~ 9.839
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	~~11400~~ 11283	~~4560.4~~ 4443.3	~~22577.3~~ 17700.6	~~0.178~~ 0.146	~~9.822~~ 9.854
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	~~12515~~ 12398	~~5675.4~~ 5558.3	~~22577.3~~ 17700.6	~~0.165~~ 0.134	~~9.835~~ 9.866
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	~~13630~~ 13513	~~6790.4~~ 6673.3	~~22577.3~~ 17700.6	~~0.154~~ 0.124	~~9.846~~ 9.876
										Total Settlement (ft) =	~~1.334~~ 1.088	

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 22:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	418.2	410	8.2	111.5	0.60	0.063	0.012	6840	457.1	~~24117.9~~	19873.3	~~0.252~~	0.225	~~7.948~~	7.975
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8312	1471.8	~~24117.9~~	19873.3	~~0.249~~	0.218	~~9.751~~	9.782
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9427	2586.8	~~24117.9~~	19873.3	~~0.220~~	0.191	~~9.780~~	9.809
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10542	3701.8	~~24117.9~~	19873.3	~~0.200~~	0.172	~~9.800~~	9.828
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11657	4816.8	~~24117.9~~	19873.3	~~0.184~~	0.157	~~9.816~~	9.843
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12772	5931.8	~~24117.9~~	19873.3	~~0.171~~	0.145	~~9.829~~	9.855
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13887	7046.8	~~24117.9~~	19873.3	~~0.160~~	0.135	~~9.840~~	9.865
											Total Settlement (ft) =	~~1.436~~	1.243		

Evaluation Point 23:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	418.8	410	8.8	111.5	0.60	0.063	0.012	6840	490.6	~~24323.3~~	19220.0	~~0.269~~	0.235	~~8.531~~	8.565
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8379	1538.7	~~24323.3~~	19220.0	~~0.248~~	0.210	~~9.752~~	9.790
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9494	2653.7	~~24323.3~~	19220.0	~~0.220~~	0.184	~~9.780~~	9.816
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10609	3768.7	~~24323.3~~	19220.0	~~0.200~~	0.166	~~9.800~~	9.834
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11724	4883.7	~~24323.3~~	19220.0	~~0.185~~	0.152	~~9.815~~	9.848
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12839	5998.7	~~24323.3~~	19220.0	~~0.172~~	0.140	~~9.828~~	9.860
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13954	7113.7	~~24323.3~~	19220.0	~~0.161~~	0.131	~~9.839~~	9.869
											Total Settlement (ft) =	~~1.455~~	1.218		

Evaluation Point 24:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	425.6	420	5.6	111.5	0.60	0.063	0.012	6840	309.4	~~21557.7~~	16599.0	~~0.166~~	0.142	~~5.384~~	5.408
Unweathered Shale	420	410	10	111.5	0.60	0.063	0.012	8016	1176.3	~~21557.7~~	16599.0	~~0.241~~	0.199	~~9.759~~	9.801
Unweathered Shale	410	405	5	111.5	0.60	0.063	0.012	8853	2012.6	~~21557.7~~	16599.0	~~0.108~~	0.088	~~4.892~~	4.912
Unweathered Shale	405	400	5	111.5	0.60	0.063	0.012	9410	2570.1	~~21557.7~~	16599.0	~~0.102~~	0.082	~~4.898~~	4.918
Unweathered Shale	400	395	5	111.5	0.60	0.063	0.012	9968	3127.6	~~21557.7~~	16599.0	~~0.096~~	0.077	~~4.904~~	4.923
Unweathered Shale	395	390	5	111.5	0.60	0.063	0.012	10525	3685.1	~~21557.7~~	16599.0	~~0.092~~	0.073	~~4.908~~	4.927
											Total Settlement (ft) =	~~0.805~~	0.661		

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Evaluation Point 25:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	427.1	420	7.1	111.5	0.60	0.063	0.012	6840	395.8	~~17911.5~~	13371.7	~~0.185~~	0.151	~~6.915~~	6.949
Unweathered Shale	420	410	10	111.5	0.60	0.063	0.012	8189	1349.2	~~17911.5~~	13371.7	~~0.205~~	0.159	~~9.795~~	9.841
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	9304	2464.2	~~17911.5~~	13371.7	~~0.177~~	0.134	~~9.823~~	9.866
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	10419	3579.2	~~17911.5~~	13371.7	~~0.159~~	0.118	~~9.841~~	9.882
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	11534	4694.2	~~17911.5~~	13371.7	~~0.144~~	0.106	~~9.856~~	9.894
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	12649	5809.2	~~17911.5~~	13371.7	~~0.133~~	0.097	~~9.867~~	9.903
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	13764	6924.2	~~17911.5~~	13371.7	~~0.123~~	0.089	~~9.877~~	9.911
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	14879	8039.2	~~17911.5~~	13371.7	~~0.115~~	0.082	~~9.885~~	9.918
											Total Settlement (ft) =	~~1.242~~	0.936		

Evaluation Point 26:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	417.9	410	7.9	111.5	0.60	0.063	0.012	6840	440.4	~~23847.8~~	19654.5	~~0.242~~	0.216	~~7.658~~	7.684
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8278	1438.4	~~23847.8~~	19654.5	~~0.248~~	0.217	~~9.752~~	9.783
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9393	2553.4	~~23847.8~~	19654.5	~~0.219~~	0.190	~~9.781~~	9.810
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10508	3668.4	~~23847.8~~	19654.5	~~0.199~~	0.171	~~9.801~~	9.829
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11623	4783.4	~~23847.8~~	19654.5	~~0.183~~	0.156	~~9.817~~	9.844
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12738	5898.4	~~23847.8~~	19654.5	~~0.170~~	0.144	~~9.830~~	9.856
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13853	7013.4	~~23847.8~~	19654.5	~~0.159~~	0.134	~~9.841~~	9.866
											Total Settlement (ft) =	~~1.420~~	1.228		

Evaluation Point 27:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	414.7	410	4.7	111.5	0.60	0.063	0.012	6840	262.0	~~23112.5~~	18980.0	~~0.149~~	0.133	~~4.551~~	4.567
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	7922	1081.6	~~23112.5~~	18980.0	~~0.256~~	0.224	~~9.744~~	9.776
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9037	2196.6	~~23112.5~~	18980.0	~~0.222~~	0.192	~~9.778~~	9.808
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10152	3311.6	~~23112.5~~	18980.0	~~0.200~~	0.171	~~9.800~~	9.829
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11267	4426.6	~~23112.5~~	18980.0	~~0.183~~	0.155	~~9.817~~	9.845
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12382	5541.6	~~23112.5~~	18980.0	~~0.170~~	0.143	~~9.830~~	9.857
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13497	6656.6	~~23112.5~~	18980.0	~~0.158~~	0.133	~~9.842~~	9.867
											Total Settlement (ft) =	~~1.338~~	1.151		

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Date: 2/23/2016

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APPENDIX IIIJ-B
FOUNDATION SETTLEMENT

Evaluation Point 28:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	418.0	410	8	111.5	0.60	0.063	0.012	6840	446.0	~~23966.3~~	19070.0	~~0.245~~	0.215	~~7.755~~	7.785
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	8290	1449.5	~~23966.3~~	19070.0	~~0.248~~	0.212	~~9.752~~	9.788
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	9405	2564.5	~~23966.3~~	19070.0	~~0.220~~	0.185	~~9.780~~	9.815
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	10520	3679.5	~~23966.3~~	19070.0	~~0.199~~	0.166	~~9.801~~	9.834
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	11635	4794.5	~~23966.3~~	19070.0	~~0.184~~	0.152	~~9.816~~	9.848
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	12750	5909.5	~~23966.3~~	19070.0	~~0.171~~	0.140	~~9.829~~	9.860
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	13865	7024.5	~~23966.3~~	19070.0	~~0.160~~	0.130	~~9.840~~	9.870
											Total Settlement (ft) =	~~1.427~~	1.199		

Evaluation Point 29:

Unit	Top Elevation (ft-msl)	Bottom Elevation (ft-msl)	H_o (ft)	γ_d (pcf)	e_o[1]	C_c[1]	C_r[1]	p_c[1] (psf)	p_o (psf)	Δp (psf)		S[2] (ft)		H_f (ft)	
Unweathered Shale	428.0	420	8	111.5	0.60	0.063	0.012	6840	446.0	~~21764.9~~	13909.7	~~0.232~~	0.173	~~7.768~~	7.827
Unweathered Shale	420	410	10	111.5	0.60	0.063	0.012	8290	1449.5	~~21764.9~~	13909.7	~~0.233~~	0.162	~~9.767~~	9.838
Unweathered Shale	410	400	10	111.5	0.60	0.063	0.012	9405	2564.5	~~21764.9~~	13909.7	~~0.205~~	0.138	~~9.795~~	9.862
Unweathered Shale	400	390	10	111.5	0.60	0.063	0.012	10520	3679.5	~~21764.9~~	13909.7	~~0.185~~	0.122	~~9.815~~	9.878
Unweathered Shale	390	380	10	111.5	0.60	0.063	0.012	11635	4794.5	~~21764.9~~	13909.7	~~0.170~~	0.110	~~9.830~~	9.890
Unweathered Shale	380	370	10	111.5	0.60	0.063	0.012	12750	5909.5	~~21764.9~~	13909.7	~~0.158~~	0.100	~~9.842~~	9.900
Unweathered Shale	370	360	10	111.5	0.60	0.063	0.012	13865	7024.5	~~21764.9~~	13909.7	~~0.147~~	0.093	~~9.853~~	9.907
Unweathered Shale	360	350	10	111.5	0.60	0.063	0.012	14980	8139.5	~~21764.9~~	13909.7	~~0.138~~	0.086	~~9.862~~	9.914
											Total Settlement (ft) =	~~1.468~~	0.984		

[1] C_c and C_r are the slopes of the e-log p plot determined using standard laboratory consolidation testing methods. The void ratio and preconsolidation pressure are obtained from the consolidation tests.

[2] Settlement has been estimated from excavation grades.

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Date:2/15/2016

Chkd By: CAM
Date: 2/23/16

CAMELOT LANDFILL
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APPENDIX IIIJ-B
SUMMARY OF LINER SLOPES AFTER SETTLEMENT

Slope from Evaluation Point 3 to Evaluation Point 2

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 3 (ft-msl)	Elevation Point 2 (ft-msl)	Slope (Percent)	Evaluation Point 3 (ft)	Evaluation Point 2 (ft)	Length (ft)	Elevation Point 3 (ft-msl)	Elevation Point 2 (ft-msl)	Slope (Percent)
~~609.9~~ 642.3	417.9	~~414.8~~ 414.7	**~~0.51~~ 0.50**	~~1.199~~ 1.107	~~1.105~~ 1.066	~~609.9~~ 642.3	~~416.70~~ 416.79	~~413.70~~ 413.63	**0.49**

Slope from Evaluation Point 2 to Evaluation Point 1

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 2 (ft-msl)	Elevation Point 1 (ft-msl)	Slope (Percent)	Evaluation Point 2 (ft)	Evaluation Point 1 (ft)	Length	Elevation Point 2 (ft-msl)	Elevation Point 1 (ft-msl)	Slope (Percent)
~~569.6~~ 537.1	~~414.8~~ 414.7	412.0	**~~0.49~~ 0.50**	~~1.105~~ 1.066	0.254	~~569.6~~ 537.1	~~413.70~~ 413.63	411.75	**~~0.34~~ 0.35**

Slope from Evaluation Point 6 to Evaluation Point 5

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 6 (ft-msl)	Elevation Point 5 (ft-msl)	Slope (Percent)	Evaluation Point 6 (ft)	Evaluation Point 5 (ft)	Length	Elevation Point 6 (ft-msl)	Elevation Point 5 (ft-msl)	Slope (Percent)
~~427.2~~ 635.4	417.9	~~415.7~~ 414.7	**~~0.51~~ 0.50**	~~1.353~~ 1.162	~~1.305~~ 1.021	~~427.2~~ 635.40	416.55	~~414.39~~ 413.68	**~~0.50~~ 0.45**

Slope from Evaluation Point 5 to Evaluation Point 4

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 5 (ft-msl)	Elevation Point 4 (ft-msl)	Slope (Percent)	Evaluation Point 5 (ft)	Evaluation Point 4 (ft)	Length	Elevation Point 5 (ft-msl)	Elevation Point 4 (ft-msl)	Slope (Percent)
~~744.6~~ 536.5	~~415.7~~ 414.7	412.0	**0.50**	~~1.305~~ 1.021	0.254	~~744.6~~ 536.5	~~414.39~~ 413.68	411.75	**0.36**

Slope from Evaluation Point 9 to Evaluation Point 8

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 9 (ft-msl)	Elevation Point 8 (ft-msl)	Slope (Percent)	Evaluation Point 9 (ft)	Evaluation Point 8 (ft)	Length	Elevation Point 9 (ft-msl)	Elevation Point 8 (ft-msl)	Slope (Percent)
~~431.9~~ 649.8	418.0	~~415.8~~ 414.8	**~~0.51~~ 0.49**	~~1.393~~ 1.174	~~1.296~~ 1.009	~~431.9~~ 649.8	~~416.61~~ 416.83	~~414.50~~ 413.79	**~~0.49~~ 0.47**

Slope from Evaluation Point 8 to Evaluation Point 7

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 8 (ft-msl)	Elevation Point 7 (ft-msl)	Slope (Percent)	Evaluation Point 8 (ft)	Evaluation Point 7 (ft)	Length	Elevation Point 8 (ft-msl)	Elevation Point 7 (ft-msl)	Slope (Percent)
~~777.3~~ 560.3	~~415.8~~ 414.8	411.9	**~~0.50~~ 0.52**	~~1.296~~ 1.009	0.256	~~777.3~~ 560.3	~~414.5~~ 413.79	411.64	**~~0.37~~ 0.38**

Slope from Evaluation Point 11 to Evaluation Point 10

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 11 (ft-msl)	Elevation Point 10 (ft-msl)	Slope (Percent)	Evaluation Point 11 (ft)	Evaluation Point 10 (ft)	Length	Elevation Point 11 (ft-msl)	Elevation Point 10 (ft-msl)	Slope (Percent)
~~457.7~~ 693.7	418.4	~~416.1~~ 414.9	**0.50**	~~1.359~~ 1.143	~~1.310~~ 1.202	~~457.7~~ 693.7	~~417.04~~ 417.26	~~414.79~~ 413.70	**~~0.49~~ 0.51**

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CAMELOT LANDFILL
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APPENDIX IIIJ-B
SUMMARY OF LINER SLOPES AFTER SETTLEMENT

Slope from Evaluation Point 10 to Evaluation Point 7

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 10 (ft-msl)	Elevation Point 7 (ft-msl)	Slope (Percent)	Evaluation Point 10 (ft)	Evaluation Point 7 (ft)	Length	Elevation Point 10 (ft-msl)	Elevation Point 7 (ft-msl)	Slope (Percent)
~~845.1~~ 606.0	~~416.1~~ 414.9	411.9	**0.50**	~~1.310~~ 1.202	0.256	~~845.1~~ 606.0	~~414.79~~ 413.70	411.64	~~**0.37**~~ **0.34**

Slope from Evaluation Point 14 to Evaluation Point 13

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 14 (ft-msl)	Elevation Point 13 (ft-msl)	Slope (Percent)	Evaluation Point 14 (ft)	Evaluation Point 13 (ft)	Length	Elevation Point 14 (ft-msl)	Elevation Point 13 (ft-msl)	Slope (Percent)
330.4	401.5	398.2	**1.00**	~~0.903~~ 0.817	~~0.919~~ 0.908	330.4	~~400.60~~ 400.68	~~397.28~~ 397.29	~~**1.00**~~ **1.03**

Slope from Evaluation Point 13 to Evaluation Point 12

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 13 (ft-msl)	Elevation Point 12 (ft-msl)	Slope (Percent)	Evaluation Point 13 (ft)	Evaluation Point 12 (ft)	Length	Elevation Point 13 (ft-msl)	Elevation Point 12 (ft-msl)	Slope (Percent)
581.8	398.2	392.4	**1.00**	~~0.919~~ 0.908	0.368	581.8	~~397.28~~ 397.29	392.03	**0.90**

Slope from Evaluation Point 17 to Evaluation Point 16

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 17 (ft-msl)	Elevation Point 16 (ft-msl)	Slope (Percent)	Evaluation Point 17 (ft)	Evaluation Point 16 (ft)	Length	Elevation Point 17 (ft-msl)	Elevation Point 16 (ft-msl)	Slope (Percent)
532.7	404.3	398.9	**1.01**	~~0.655~~ 0.557	~~0.537~~ 0.482	532.7	~~403.64~~ 403.74	~~398.36~~ 398.42	~~**0.99**~~ **1.00**

Slope from Evaluation Point 16 to Evaluation Point 15

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 16 (ft-msl)	Elevation Point 15 (ft-msl)	Slope (Percent)	Evaluation Point 16 (ft)	Evaluation Point 15 (ft)	Length	Elevation Point 16 (ft-msl)	Elevation Point 15 (ft-msl)	Slope (Percent)
662.9	398.9	392.3	**1.00**	~~0.537~~ 0.482	0.368	662.9	~~398.36~~ 398.42	391.93	~~**0.97**~~ **0.98**

Slope from Evaluation Point 19 to Evaluation Point 18

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 19 (ft-msl)	Elevation Point 18 (ft-msl)	Slope (Percent)	Evaluation Point 19 (ft)	Evaluation Point 18 (ft)	Length	Elevation Point 19 (ft-msl)	Elevation Point 18 (ft-msl)	Slope (Percent)
397.0	419.2	417.2	**0.50**	0.799	0.237	397.0	418.40	416.96	**0.36**

Slope from Evaluation Point 22 to Evaluation Point 21

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 22 (ft-msl)	Elevation Point 21 (ft-msl)	Slope (Percent)	Evaluation Point 22 (ft)	Evaluation Point 21 (ft)	Length	Elevation Point 22 (ft-msl)	Elevation Point 21 (ft-msl)	Slope (Percent)
~~463.1~~ 674.7	421.2	~~418.9~~ 417.9	**0.50**	~~1.436~~ 1.243	~~1.334~~ 1.088	~~463.1~~ 674.7	~~419.76~~ 419.96	~~417.57~~ 416.76	**0.47**

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Date: 2/23/16

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APPENDIX IIIJ-B
SUMMARY OF LINER SLOPES AFTER SETTLEMENT

Slope from Evaluation Point 21 to Evaluation Point 20

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 21 (ft-msl)	Elevation Point 20 (ft-msl)	Slope (Percent)	Evaluation Point 21 (ft)	Evaluation Point 20 (ft)	Length	Elevation Point 21 (ft-msl)	Elevation Point 20 (ft-msl)	Slope (Percent)
~~761.2~~ 549.6	~~418.9~~ 417.9	415.1	**0.50**	~~1.334~~ 1.088	0.255	~~761.2~~ 549.6	~~417.57~~ 416.76	414.84	~~**0.36**~~ **0.35**

Slope from Evaluation Point 25 to Evaluation Point 24

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 25 (ft-msl)	Elevation Point 24 (ft-msl)	Slope (Percent)	Evaluation Point 25 (ft)	Evaluation Point 24 (ft)	Length	Elevation Point 25 (ft-msl)	Elevation Point 24 (ft-msl)	Slope (Percent)
153.2	430.1	428.6	**1.01**	~~1.242~~ 0.936	~~0.805~~ 0.661	153.2	~~428.86~~ 429.16	~~427.75~~ 427.89	~~**0.73**~~ **0.83**

Slope from Evaluation Point 24 to Evaluation Point 23

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 24 (ft-msl)	Elevation Point 23 (ft-msl)	Slope (Percent)	Evaluation Point 24 (ft)	Evaluation Point 23 (ft)	Length	Elevation Point 24 (ft-msl)	Elevation Point 23 (ft-msl)	Slope (Percent)
658.7	428.6	421.8	**1.02**	~~0.805~~ 0.661	~~1.455~~ 1.218	658.7	~~427.75~~ 427.89	~~420.35~~ 420.58	~~**1.12**~~ **1.11**

Slope from Evaluation Point 23 to Evaluation Point 9

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 23 (ft-msl)	Elevation Point 9 (ft-msl)	Slope (Percent)	Evaluation Point 23 (ft)	Evaluation Point 9 (ft)	Length	Elevation Point 23 (ft-msl)	Elevation Point 9 (ft-msl)	Slope (Percent)
325.0	421.8	418.0	**1.17**	~~1.455~~ 1.218	~~1.393~~ 1.174	325.0	~~420.35~~ 420.58	~~416.61~~ 416.83	~~**1.15**~~ **1.16**

Slope from Evaluation Point 26 to Evaluation Point 27

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 26 (ft-msl)	Elevation Point 27 (ft-msl)	Slope (Percent)	Evaluation Point 26 (ft)	Evaluation Point 27 (ft)	Length	Elevation Point 26 (ft-msl)	Elevation Point 27 (ft-msl)	Slope (Percent)
347.0	419.9	416.7	**0.92**	~~1.420~~ 1.228	~~1.338~~ 1.151	347.0	~~418.48~~ 418.67	~~415.36~~ 415.55	**0.90**

Slope from Evaluation Point 29 to Evaluation Point 28

Prior to Settlement				Estimated Settlement		After Settlement			
Length	Elevation Point 29 (ft-msl)	Elevation Point 28 (ft-msl)	Slope (Percent)	Evaluation Point 29 (ft)	Evaluation Point 28 (ft)	Length	Elevation Point 29 (ft-msl)	Elevation Point 28 (ft-msl)	Slope (Percent)
855.0	430.0	420.0	**1.17**	~~1.468~~ 0.984	~~1.427~~ 1.199	855.0	~~428.53~~ 429.02	~~418.57~~ 418.80	~~**1.16**~~ **1.19**

Conclusion:

The above calculations verify that the slopes and lengths used to design the leachate collection system in Appendix IIIC are valid. As noted in Appendix IIIC-A of Appendix IIIC, the slope between the sector ridgeline and leachate collection line used in the HELP Model analysis was chosen to be 0.9 percent for the undeveloped areas and 1.1 percent for the developed areas, which conservatively represent the lowest post-settlement slope between the sector ridgeline and leachate collection line for the respective areas. The slope used to design the leachate collection line of the leachate collection system in Appendix IIIC was chosen as 0.3 percent to conservatively represent the minimum post-settlement pipe slope calculated above.

Strain Percentage in Liner System

References:

1. Quian, Xuede, R.M. Koerner, D. H. Gray, Geotechnical Aspects of Landfill Design and Construction, Prentice-Hall, Inc., New Jersey, 2002.

2. Koerner, Robert M., Designing with Geosynthetics, Third Edition. Prentice-Hall, New Jersey, 1994.

Required:

Determine the strain percentage in the Subtitle D liner system based on the total settlement between the evaluation points.

Solution:

Strain Equation:

$$Strain = \frac{L_f - L_o}{L_o} x\ 100$$ (Reference 1, Page 472)

L_f = Final distance between evaluation points after total settlement (ft)
L_o = Initial distance between evaluation points before total settlement (ft)

Note: A negative strain value indicates the component is in compression. A positive strain value indicates the component is in tension.

Example Calculation of Strain between Points 3 and 2:

Initial Distance:

Initial Elev. Point 2 =	~~414.8~~	414.7	ft-msl
Initial Elev. Point 3 =	417.9	ft-msl	
Plan View Distance =	~~609.9~~	642.3	ft
L_o =	~~609.9079~~	642.3080	ft

Final Distance:

Initial Elev. Point 2 =	~~416.70~~	416.79	ft-msl
Initial Elev. Point 3 =	413.70	ft-msl	
Plan View Distance =	~~609.9~~	642.3	ft
L_f =	~~609.9074~~	642.3075	ft

Strain = -0.0001 %

Evalution Point[1]		Initial Elevation (ft-msl)		Post-Settlement Elevation (ft-msl)		Plan View Distance (ft)	L_o (ft)	L_f (ft)	Strain (%)
A	B	A	B	A	B				
3	2	417.9	~~414.8~~ 414.7	~~416.7~~ 416.8	~~413.7~~ 413.6	~~609.9~~ 642.3	~~609.9079~~ 642.3080	~~609.9074~~ 642.3078	~~-0.0001~~ 0.0000
2	1	~~414.8~~ 414.7	412.0	~~413.7~~ 413.6	411.7	~~569.6~~ 537.1	~~569.6069~~ 537.1068	~~569.6033~~ 537.1033	-0.0006
6	5	417.9	~~415.7~~ 414.7	416.5	~~414.4~~ 413.7	~~427.2~~ 635.4	~~427.2057~~ 635.4081	~~427.2054~~ 635.4065	~~-0.0001~~ -0.0002
5	4	~~415.7~~ 414.7	412.0	~~414.4~~ 413.7	411.7	~~744.6~~ 536.5	~~744.6092~~ 536.5068	~~744.6047~~ 536.5035	-0.0006
9	8	418.0	~~415.8~~ 414.8	~~416.6~~ 416.8	~~414.5~~ 413.8	~~431.9~~ 649.8	~~431.9056~~ 649.8079	~~431.9051~~ 649.8071	-0.0001
8	7	~~415.8~~ 414.8	411.9	~~414.5~~ 413.8	411.6	~~777.3~~ 560.3	~~777.3098~~ 560.3075	~~777.3053~~ 560.3041	-0.0006
11	10	418.4	~~416.1~~ 414.9	~~417.0~~ 417.3	~~414.8~~ 413.7	~~457.7~~ 693.7	~~457.7058~~ 693.7010	~~457.7055~~ 693.7091	~~-0.0001~~ 0.0012
10	7	~~416.1~~ 414.9	411.9	~~414.8~~ 413.7	411.6	~~845.1~~ 606.0	~~845.1104~~ 606.0074	~~845.1059~~ 606.0035	~~-0.0005~~ -0.0007
14	13	401.5	398.2	~~400.6~~ 400.7	~~397.3~~ 397.3	330.4	330.4165	~~330.4166~~ 330.4174	~~0.0000~~ 0.0003
13	12	398.2	392.4	~~397.3~~ 397.3	392.0	581.8	581.8289	~~581.8237~~ 581.8238	-0.0009
17	16	404.3	398.9	~~403.6~~ 403.7	~~398.4~~ 398.4	532.7	532.7274	~~532.7262~~ 532.7266	~~-0.0002~~ -0.0001
16	15	398.9	392.3	~~398.4~~ 398.4	391.9	662.9	662.9329	~~662.9312~~ 662.9317	~~-0.0003~~ -0.0002
19	18	419.2	417.2	418.4	417.0	397.0	397.0050	397.0026	-0.0006
22	21	421.2	~~418.9~~ 417.9	~~419.8~~ 420.0	~~417.6~~ 416.8	~~463.1~~ 674.7	~~463.1057~~ 674.7083	~~463.1052~~ 674.7076	-0.0001
21	20	~~418.9~~ 417.9	415.1	~~417.6~~ 416.8	414.8	~~761.2~~ 549.6	~~761.2095~~ 549.6069	~~761.2049~~ 549.6033	-0.0006
25	24	430.1	428.6	~~428.9~~ 429.2	~~427.7~~ 427.9	153.2	153.2078	~~153.2040~~ 153.2053	~~-0.0025~~ -0.0017
24	23	428.6	421.8	~~427.7~~ 427.9	~~420.3~~ 420.6	658.7	658.7346	~~658.7416~~ 658.7405	~~0.0011~~ 0.0009
23	9	421.8	418.0	~~420.3~~ 420.6	~~416.6~~ 416.8	325.0	325.0222	~~325.0215~~ 325.0217	-0.0002
26	27	419.9	416.7	~~418.5~~ 418.7	~~415.4~~ 415.5	347.0	347.0148	~~347.0140~~ 347.0141	-0.0002
29	28	430.0	420.0	~~428.5~~ 429.0	~~418.6~~ 418.8	855.0	855.0585	~~855.0580~~ 855.0610	~~-0.0001~~ 0.0003

Conclusion:

Strain is acceptable.

- The allowable tensile strain for an HDPE geomembrane is 25 percent (Reference 1, page 94).
- The allowable tensile strain for a drainage geocomposite is more than 20 percent for the geotextile (reference 2, page 112) and 200 percent for the geonet (reference 2, page 400).
  The allowable tensile strain for compacted clay liner is 0.5 percent (Reference 1, page 469).
- The maximum calculated tensile strain (~~0.0011~~ **0.0012**%) is below the allowable tensile strain for the components of the liner system; therefore, the system will be stable.

APPENDIX IIIJ-B-2

OVERLINER SYSTEM SETTLEMENT AND STRAIN ANALYSES

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THE PURPOSE OF INTERIM REVIEW
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JASON A. EDWARDS, P.E.,
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2-5-16

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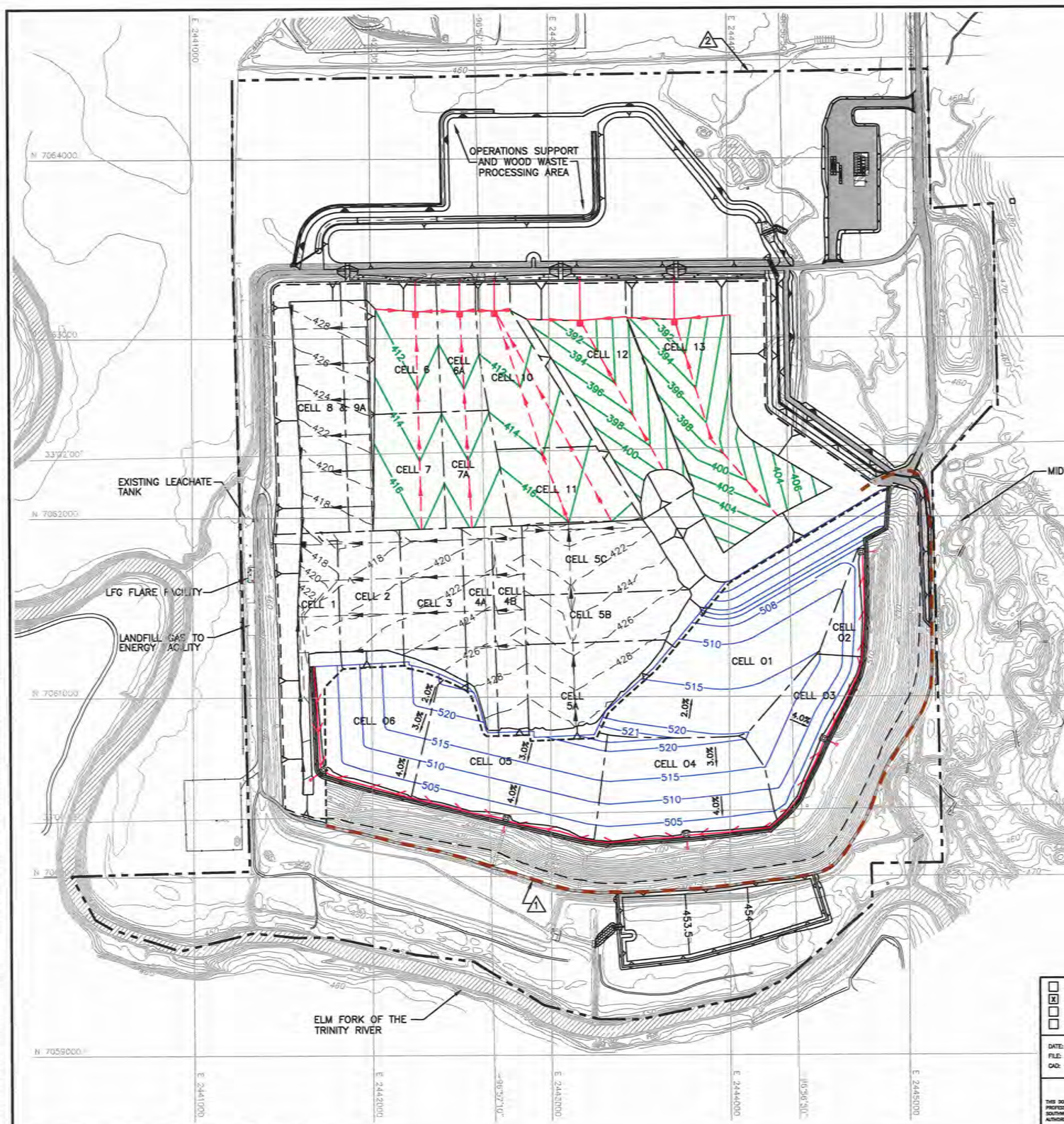
BIDDING, OR PERMIT PURPOSES.

Includes pages IIIJ-B-2-1 through IIIJ-B-2-25



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- 3H:1V SLOPE (TYPICAL)
- EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-2 OVERLINER.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT TOP OF OVERLINER PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIJ-B-2-2

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIJ\IIIJ-B\IIIJ-B-2-2 OVERLINER PLAN.dwg, sford, 1:2

Parameters:

γ_{cov} = 120 pcf
T_c = 3.5 ft
T_p = 2.0 ft
T_s = 1.0 ft
γ_{mswb} = varies (see note below)
γ_{mswa} = varies (see note below)

Note: γ_{mswb} and γ_{mswa} are selected based on the midpoint of the waste thicknesses lying below and above the overliner system, respectively, using the Unit Weight Profile for Waste/Daily Cover within an MSW Landfill chart from Ref. 4.

The settlement points analyzed are shown on Sheets IIIJ-B-2-13 and IIIJ-B-2-18. An example calculation of the estimated primary settlement is shown below for Evaluation Points 73 and 55 for the overliner. The estimated primary settlement for all evaluation points is shown on Sheets IIIJ-B-2-10 through IIIJ-B-2-12 (overliner), and Sheets IIIJ-B-2-16 and IIIJ-B-2-17 (overliner trench pipes).

At Evaluation Point 73:

Top of Waste Elev. (ft-msl) = ~~641.4~~ 600.0
Top of Overliner Protective Cover Elev. (ft-msl) = 522.4
Top of Waste Below Overliner Elev. (ft-msl) = 519.4
Bottom of Waste Elev. (ft-msl) = 435.8

H_o = Top of Waste Below Overliner Elev. - Bottom of Waste Elev.
= 83.6 ft
γ_{mswb} = 54.2 pcf

T_{waste} = Top of Waste Elev. - Top of Overliner Protective Cover Elev.
= ~~119.0~~ 77.6 ft
γ_{mswa} = ~~59.1~~ 53.3 pcf

$\sigma'_o = 0.5\ \gamma_{mswb}\ H_o$
σ'_o = 2265.5 psf
σ'_o = 108.5 kPa

$e_o = 1.86 - 0.00102\ \sigma'_o$
e_o = 1.75

$C_c = 0.25\ e_o$
C_c = 0.44

$\Delta\sigma$ = ~~7818.0~~ 4915.9 psf

$$S_p = \frac{83.6 \times 0.44}{1 + 1.75} \log \frac{2265.5 + \cancel{7818.0}\ \mathbf{4915.9}}{2265.5}$$

S_p = ~~8.6~~ 6.7 ft

At Evaluation Point 55:

Top of Waste Elev. (ft-msl) = ~~701.1~~ 612.0
Top of Overliner Protective Cover Elev. (ft-msl) = 510.6
Top of Waste Below Overliner Elev. (ft-msl) = 507.6
Bottom of Waste Elev. (ft-msl) = 438.7

H_o = Top of Waste Below Overliner Elev. - Bottom of Waste Elev.
= 68.8 ft
γ_{mswb} = 51.8 pcf

T_{waste} = Top of Waste Elev. - Top of Overliner Protective Cover Elev.
= ~~190.6~~ 101.5 ft
γ_{mswa} = ~~69.5~~ 56.9 pcf

$\sigma'_o = 0.5\ \gamma_{mswb} H_o$
σ'_o = 1783.6 psf
σ'_o = 85.4 kPa

$e_o = 1.86 - 0.00102\ \sigma'_o$
e_o = 1.77

$C_c = 0.25\ e_o$
C_c = 0.44

$\Delta\sigma$ = ~~14028.5~~ 6547.7 psf

$$S_p = \frac{68.8 \times 0.44}{1 + 1.77} \log \frac{1783.6 + \cancel{14028.5}\ \mathbf{6547.7}}{1783.6}$$

S_p = ~~10.4~~ 7.4 ft

B) Estimate secondary settlement of waste below the overliner system.

Secondary consolidation continues at substantial rates for periods of time well beyond primary settlement. It is a combination of mechanical secondary compression, physico-chemical reaction, and bio-chemical decay. Secondary settlement is calculated using the following expression:

$$S_c = \frac{H'_o\ \alpha}{1 + e'_o} \log (t_2/t_1)$$ (Ref. 2, p. 451)

Parameters:

S_c = secondary settlement, ft
α = secondary compression index
e'_o = average void ratio of waste layer below the overliner after primary settlement has occurred
H'_o = waste thickness between the overliner system and the bottom of waste after primary settlement, ft
t_1 = starting time of secondary settlement in years
t_2 = time at which settlement is determined in years

For this site assume: $\alpha = 0.06 \times e'_o$ (Ref. 1, p. 210)

As reported by Sowers (Ref. 1), the secondary compression index is used to estimate waste decomposition. The secondary compression index ranges from $\alpha = 0.03e'_o$ to $\alpha = 0.09e'_o$ for conditions that are unfavorable and favorable to decay, respectively. An average secondary compression index value was chosen because it is consistent with the types of waste accepted in the past. It is also representative of the minimal amount of settlement the site has experienced in the pre-Subtitle D area.

The void ratio below the overliner at closure is a function of the overburden pressure caused by waste/cover soil, and the final cover system located above the overliner. The void ratio is calculated for each settlement evaluation point using the following equation.

$$e'_o = 1.86 - 0.00102\,\sigma''_o$$ (Ref. 5, p. 590)

where: σ''_o = overburden pressure in kPa

$\sigma''_o = 0.5\,\gamma'_{mswb}\,H'_o$

γ'_{mswb} = unit weight of waste below the overliner after primary settlement has occurred, pcf

For this site, the void ratio after primary settlement for the waste/cover soils below the overliner varies between 1.8 to 1.9. Therefore, the secondary compression index will range between 0.10 to 0.11. Most literature sources report the secondary compression index in terms of the "modified secondary compression index" (Refs. 2, 6). The modified secondary compression index is defined by the following.

$$C'_\alpha = \frac{\alpha}{1 + e'_o}$$

The secondary compression index calculated for this site translates to a modified secondary compression index of 0.04 (for a void ratio of 1.8 to 1.9). These values are consistent with reported values for the modified secondary compression index which vary from 0.03 to 0.1 (Refs. 2, 6).

Time frame used for this analysis:

t_1 = 0.083 years
t_2 = 60 years (see note below)

The site life calculated in Appendix IIIN is ~~29.3~~ **25.8** years. However, as shown in Parts I/II, Appendix I/IIA, the overliner will be the last portion of the site developed. The waste filling on top of the overliner will likely be around 10 years.However, to provide a conservative approach, the time at which settlement is calculated was chosen to be 60 years. This assumes filling over the overliner for 30 years plus 30 years for the postclosure period.

An example calculation of the estimated secondary settlement using the above secondary settlement period is shown below for Evaluation Points 73 and 55. The estimated secondary settlement for all evaluation points is shown on Sheets IIIJ-B-2-10 through IIIJ-B-2-12 (overliner), and Sheets IIIJ-B-2-16 and IIIJ-B-2-17 (overliner trench pipe).

At Evaluation Point 73:

$H'_o = H_o - S_p$

$H_o' =$ ~~75.0~~ 77.0 ft

$\sigma''_o = 0.5\ \gamma'_{mswb}\ H'_o$

$\gamma'_{mswb} =$ ~~79.6~~ 74.4 pcf

$\sigma''_o =$ ~~2984.6~~ 2861.7 psf

$\sigma''_o =$ ~~142.9~~ 137.0 kPa

$e'_o = 1.86 - 0.00102\ \sigma''_o$

$e'_o =$ ~~1.71~~ 1.72

$\alpha = 0.06\ e'_o$

$\alpha = 0.10$

$$S_c = \frac{H'_o\ \alpha}{1 + e'_o} \log (t_2/t_1)$$

$$S_c = \frac{\cancel{75.0}\ \mathbf{77.0} \times 0.10}{1 + \cancel{1.71}\ \mathbf{1.72}} \log (60/0.083)$$

$S_c =$ ~~8.1~~ 8.3 ft

At Evaluation Point 55:

$H'_o = H_o - S_p$

$H_o' =$ ~~58.4~~ 61.5 ft

$\sigma''_o = 0.5\ \gamma'_{mswb}\ H'_o$

$\gamma'_{mswb} =$ ~~81.4~~ 77.0 pcf

$\sigma''_o =$ ~~2377.8~~ 2367.0 psf

$\sigma''_o =$ ~~113.9~~ 113.3 kPa

$e'_o = 1.86 - 0.00102\ \sigma''_o$

$e'_o =$ 1.74

$\alpha = 0.06\ e'_o$

$\alpha = 0.10$

$$S_c = \frac{H'_o\ \alpha}{1 + e'_o} \log (t_2/t_1)$$

$$S_c = \frac{\cancel{58.4}\ \mathbf{61.5} \times 0.10}{1+1.74} \log (60.0/0.083)$$

$S_c =$ ~~6.4~~ 6.7 ft

C) Estimate total settlement of waste below the overliner system.

Total settlement is the combination of primary, and secondary settlement. An example calculation of the estimated total settlement is shown below for Evaluation Points 73 and 55. The estimated total settlement for all evaluation points is shown on pages IIIJ-B-2-10 through IIIJ-B-2-12 (overliner) and Sheets IIIJ-B-2-16 through IIIJ-B-2-17 (overliner trench pipe).

At Evaluation Point 73:				
Thickness of waste column	Primary Settlement =	~~8.6~~	6.7	ft
below overliner, ft = 83.6	Secondary Settlement =	~~8.1~~	8.3	ft
	Total Settlement =	~~16.8~~	15.0	ft
At Evaluation Point 55:				
Thickness of waste column	Primary Settlement =	~~10.4~~	7.4	ft
below overliner, ft = 68.8	Secondary Settlement =	~~6.4~~	6.7	ft
	Total Settlement =	~~16.8~~	14.1	ft

D) Verify that strain induced on the overliner system components due to settlement is within acceptable limits.

Determine the after settlement slope of the overliner system and verify the strain induced on the overliner system components due to settlement is within acceptable limits.

$$\text{Strain} = \frac{L_f - L_o}{L_o} x100 \qquad \text{(Ref. 2, p. 472)}$$

L_f = Final distance between evaluation points after total settlement (ft)
L_o = Initial distance between evaluation points before total settlement (ft)

An example calculation of the estimated strain is shown below for Evaluation Points S1 and S2 for the overliner. The estimated strain for select evaluation points is shown on page IIIJ-B-2-21. The evaluation points are shown on Sheet IIIJ-B-2-22.

Initial Distance:

Evaluation Point S1 Elev. =	522.9	ft-msl
Evaluation Point S2 Elev. =	498.4	ft-msl
Plan View Distance =	696.8	ft
L_o =	697.19	ft

Final Distance (after settlement):

Evaluation Point S1 Elev. =	~~505.2~~	508.0	ft-msl
Evaluation Point S2 Elev. =	489.4	ft-msl	
Plan View Distance =	696.8	ft	
L_f =	~~696.94~~	697.01	ft

$$\text{Strain} = \frac{\cancel{697.19 - 696.94}}{\cancel{697.19}} \quad \frac{697.19 - 697.01}{697.19} \times 100$$

Strain = ~~-0.036~~ -0.026 %

The allowable tensile strain for the overliner system components are listed below.

- Geotextile - 20 % (Reference 3, page 111)
- Geonet - 200% (Reference 3, page 401)
- GCL - 10% (Reference 3, page 645)

As shown on page IIIJ-B-2-21, the estimated strain between select points ranges from ~~0.873~~ **-0.808%** to ~~-0.001~~ **-0.004%.** The estimated strain values are acceptable and the system will be stable. Note that a negative strain value indicates that the component is in compression.

E) Estimate the after settlement slope of the overliner.

Determine the after settlement slope of the overliner system.

An example calculation of the estimated after settlement slope is shown below for Evaluation Points S1 and S2 for the overliner. Evaluation points are shown on Sheet IIIJ-B-2-22.

Prior to Settlement:

Evaluation Point S1 Elev. =	522.9	ft-msl
Evaluation Point S2 Elev. =	498.4	ft-msl
Plan View Distance =	696.8	ft
Initial Slope =	3.5	%

After Settlement:

Evaluation Point S1 Elev. =	505.2	508.0	ft-msl
Evaluation Point S2 Elev. =	489.4	ft-msl	
Plan View Distance =	696.8	ft	
After settlement Slope =	~~2.27~~	2.68	%

Post-settlement slope calculations are provided for select evaluations points, including all trench pipes, on Sheets IIIJ-B-2-23 and IIIJ-B-2-24.

Prep By: MDM
Date: 2/19/2016

CAMELOT LANDFILL
1339-351-11-02
APPENDIX IIIJ-B
OVERLINER SYSTEM SETTLEMENT SUMMARY

Chkd By: _____
Date: _____

Evaluation Point	Top of Waste Elevation (ft-msl)	Initial Top of Overliner Elevation (ft-msl)	Initial Top of Waste Below Overliner Elevation (ft-msl)	Bottom of Waste Elevation (ft-msl)	H_o (ft)	T_{waste} (ft)	γ_{mswb} (pcf)	γ_{mswa} (pcf)	σ'_o (psf)	$\Delta\sigma$ (psf)	e_o	C_c	S_p (ft)	H'_o (ft)	γ'_{mswb} (pcf)	σ''_o (psf)	e'_o	α	S_c (ft)	Total Settlement (ft)	Post-Settlement Top of Overliner Elevation (ft-msl)	Post-Settlement Top of Waste Below Overliner Elevation (ft-msl)
1	509.6	498.2	497.2	427.7	69.4	9.5	52.1	43.2	1808.6	1189.0	1.77	0.44	2.4	67.0	54.5	1824.6	1.77	0.11	7.3	9.8	488.4	487.4
2	555.8	507.4	506.4	439.1	67.4	~~46.3~~ 46.3	51.8	48.0	1744.9	3005.7	1.77	0.44	4.7	62.7	64.7	2026.2	1.76	0.11	6.9	11.5	495.9	494.9
3	~~603.1~~ 599.6	515.0	514.0	437.8	76.2	~~86.1~~ 82.6	53.0	~~54.5~~ 53.9	2019.5	~~5470.5~~ 5229.3	1.76	0.44	~~6.9~~ 6.7	~~69.3~~ 69.5	~~75.3~~ 74.6	~~2607.4~~ 2589.4	~~1.73~~ 1.73	~~0.10~~ 0.10	~~7.5~~ 7.6	~~14.5~~ 14.3	~~500.5~~ 500.7	~~499.5~~ 499.7
4	~~636.3~~ 605.4	519.0	518.0	436.7	81.3	~~115.3~~ 84.4	53.9	~~58.9~~ 54.2	2189.9	~~7564.8~~ 5353.9	1.75	0.44	~~8.4~~ 6.9	~~72.9~~ 74.3	~~79.3~~ 75.4	~~2890.9~~ 2803.6	~~1.72~~ 1.72	~~0.10~~ 0.10	~~7.9~~ 8.1	~~16.3~~ 15.0	~~502.7~~ 504.0	~~501.7~~ 503.0
5	~~680.2~~ 606.3	522.9	521.9	440.9	81.0	~~155.3~~ 81.4	53.6	~~64.7~~ 53.9	2170.0	~~10823.7~~ 5164.1	1.75	0.44	~~10.0~~ 6.8	~~71.0~~ 74.2	~~80.9~~ 74.7	~~2871.2~~ 2771.5	~~1.72~~ 1.72	~~0.10~~ 0.10	~~7.7~~ 8.1	~~17.7~~ 14.9	~~505.2~~ 508.0	~~504.2~~ 507.0
6	~~673.0~~ 606.0	523.0	522.0	439.8	82.2	~~148.0~~ 81.1	53.9	~~63.4~~ 53.9	2213.5	~~10170.1~~ 5148.3	1.75	0.44	~~9.8~~ 6.8	~~72.4~~ 75.3	~~80.8~~ 74.9	~~2923.1~~ 2822.0	~~1.72~~ 1.72	~~0.10~~ 0.10	~~7.8~~ 8.2	~~17.6~~ 15.0	~~505.3~~ 508.0	~~504.3~~ 507.0
7	513.1	498.7	497.7	436.4	61.3	~~12.4~~ 12.4	50.9	43.4	1561.5	1319.0	1.78	0.45	2.6	58.7	54.2	1590.7	1.78	0.11	6.5	9.1	489.6	488.6
8	570.7	509.7	508.7	439.8	68.8	~~59.1~~ 59.1	51.8	50.6	1783.5	3771.6	1.77	0.44	5.4	63.4	68.4	2170.0	1.75	0.11	6.9	12.4	497.3	496.3
9	~~620.7~~ 597.8	517.0	516.0	439.6	76.4	~~101.7~~ 78.8	53.0	~~56.9~~ 53.3	2024.5	~~6564.4~~ 4978.3	1.76	0.44	~~7.6~~ 6.6	~~68.8~~ 69.8	~~77.5~~ 74.0	~~2663.5~~ 2582.5	~~1.73~~ 1.73	~~0.10~~ 0.10	~~7.5~~ 7.6	~~15.1~~ 14.2	~~501.9~~ 502.8	~~500.9~~ 501.8
10	~~643.5~~ 599.9	520.6	519.6	439.1	80.5	~~120.9~~ 77.3	53.6	~~59.4~~ 53.3	2157.1	~~7964.4~~ 4901.5	1.75	0.44	~~8.6~~ 6.6	~~71.9~~ 73.9	~~79.7~~ 74.0	~~2863.8~~ 2733.0	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.8~~ 8.0	~~16.4~~ 14.6	~~504.2~~ 506.0	~~503.2~~ 505.0
11	~~647.2~~ 604.0	520.9	519.9	439.3	80.6	~~124.3~~ 81.1	53.6	~~60.0~~ 53.9	2160.4	~~8239.0~~ 5147.9	1.75	0.44	~~8.8~~ 6.8	~~71.9~~ 73.8	~~79.9~~ 74.7	~~2870.5~~ 2759.0	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.8~~ 8.0	~~16.6~~ 14.8	~~504.3~~ 506.1	~~503.3~~ 505.1
12	~~618.1~~ 587.6	517.9	516.9	437.8	79.0	~~98.3~~ 67.7	53.6	~~56.3~~ 51.8	2117.3	~~6308.1~~ 4289.1	1.76	0.44	~~7.6~~ 6.1	~~71.5~~ 73.0	~~77.3~~ 71.8	~~2760.7~~ 2619.9	~~1.73~~ 1.73	~~0.10~~ 0.10	~~7.8~~ 7.9	~~15.3~~ 14.0	~~502.6~~ 503.9	~~501.6~~ 502.9
13	~~623.5~~ 592.2	518.5	517.5	439.4	78.1	~~103.0~~ 71.7	53.3	~~56.9~~ 52.4	2082.3	~~6635.1~~ 4537.4	1.76	0.44	~~7.7~~ 6.3	~~70.4~~ 71.9	~~77.7~~ 72.7	~~2736.3~~ 2614.5	~~1.73~~ 1.73	~~0.10~~ 0.10	~~7.6~~ 7.8	~~15.4~~ 14.1	~~503.1~~ 504.4	~~502.1~~ 503.4
14	~~634.0~~ 600.1	519.8	518.8	439.4	79.4	~~112.2~~ 78.4	53.6	~~58.3~~ 53.3	2127.7	~~7320.7~~ 4956.9	1.76	0.44	~~8.2~~ 6.6	~~71.2~~ 72.8	~~79.0~~ 74.2	~~2811.6~~ 2700.1	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.7~~ 7.9	~~15.9~~ 14.5	~~503.8~~ 505.2	~~502.8~~ 504.2
15	~~628.8~~ 597.4	519.1	518.1	437.7	80.4	~~107.6~~ 76.2	53.6	~~57.7~~ 53.0	2154.2	~~6989.5~~ 4819.5	1.75	0.44	~~8.0~~ 6.5	~~72.4~~ 73.9	~~78.5~~ 73.8	~~2839.2~~ 2724.6	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.9~~ 8.0	~~15.9~~ 14.6	~~503.3~~ 504.6	~~502.3~~ 503.6
16	~~642.3~~ 603.3	520.5	519.5	437.4	82.1	~~119.8~~ 80.8	53.9	~~59.4~~ 53.6	2212.6	~~7899.6~~ 5108.6	1.75	0.44	~~8.6~~ 6.8	~~73.5~~ 75.3	~~79.7~~ 74.7	~~2927.5~~ 2815.0	~~1.72~~ 1.72	~~0.10~~ 0.10	~~8.0~~ 8.2	~~16.6~~ 15.0	~~503.9~~ 505.5	~~502.9~~ 504.5
17	~~659.3~~ 606.4	521.8	520.8	448.6	72.2	~~135.5~~ 82.6	52.4	~~61.6~~ 53.9	1893.0	~~9130.8~~ 5229.9	1.77	0.44	~~8.8~~ 6.6	~~63.4~~ 65.6	~~80.2~~ 74.2	~~2542.4~~ 2433.3	~~1.74~~ 1.74	~~0.10~~ 0.10	~~6.9~~ 7.1	~~15.7~~ 13.8	~~506.1~~ 508.0	~~505.1~~ 507.0
18	516.2	499.1	498.1	437.5	60.6	15.1	50.6	44.0	1534.6	1442.0	1.79	0.45	2.8	57.8	54.8	1583.8	1.78	0.11	6.4	9.1	490.0	489.0
19	~~567.4~~ 549.9	509.3	508.3	438.4	69.9	~~56.1~~ 38.6	52.1	~~49.9~~ 46.7	1822.2	~~3578.9~~ 2579.8	1.77	0.44	~~5.3~~ 4.3	~~64.7~~ 65.7	~~67.6~~ 62.5	~~2185.3~~ 2051.1	~~1.75~~ 1.76	~~0.11~~ 0.11	~~7.1~~ 7.2	~~12.3~~ 11.5	~~497.0~~ 497.8	~~496.0~~ 496.8
20	~~583.0~~ 560.1	513.2	512.2	437.8	74.4	~~67.8~~ 44.9	52.7	~~51.8~~ 47.7	1960.8	~~4294.7~~ 2920.3	1.76	0.44	~~6.0~~ 4.7	~~68.4~~ 69.7	~~71.3~~ 65.3	~~2440.6~~ 2275.8	~~1.74~~ 1.75	~~0.10~~ 0.10	~~7.5~~ 7.6	~~13.4~~ 12.3	~~499.8~~ 500.9	~~498.8~~ 499.9
21	~~594.9~~ 570.3	515.1	514.1	437.2	76.9	~~77.8~~ 53.3	53.0	~~53.3~~ 49.5	2037.4	~~4927.0~~ 3417.4	1.76	0.44	~~6.5~~ 5.2	~~70.3~~ 71.6	~~73.8~~ 67.9	~~2594.7~~ 2431.8	~~1.73~~ 1.74	~~0.10~~ 0.10	~~7.7~~ 7.8	~~14.2~~ 13.0	~~500.9~~ 502.0	~~499.9~~ 501.0
22	~~606.7~~ 579.0	516.5	515.5	437.5	78.0	~~88.2~~ 60.5	53.3	~~54.8~~ 50.6	2079.6	~~5613.4~~ 3841.5	1.76	0.44	~~7.1~~ 5.7	~~71.0~~ 72.4	~~75.8~~ 70.0	~~2689.1~~ 2534.9	~~1.73~~ 1.74	~~0.10~~ 0.10	~~7.7~~ 7.9	~~14.8~~ 13.5	~~501.7~~ 503.0	~~500.7~~ 502.0
23	~~517.3~~ 511.1	500.7	499.7	441.9	57.7	~~14.6~~ 8.4	50.3	~~43.7~~ 43.0	1450.4	~~1419.2~~ 1142.0	1.79	0.45	~~2.7~~ 2.3	~~55.0~~ 55.4	~~54.2~~ 52.4	~~1489.4~~ 1451.2	~~1.79~~ 1.79	~~0.11~~ 0.11	~~6.0~~ 6.1	~~8.8~~ 8.4	~~491.9~~ 492.2	~~490.9~~ 491.2
24	~~514.4~~ 506.7	499.2	498.2	437.2	61.0	~~13.2~~ 5.5	50.6	~~43.7~~ 42.7	1543.2	~~1356.9~~ 1015.1	1.78	0.45	~~2.7~~ 2.1	~~58.3~~ 58.8	~~54.2~~ 52.1	~~1579.1~~ 1532.5	~~1.78~~ 1.79	~~0.11~~ 0.11	~~6.4~~ 6.5	~~9.1~~ 8.6	~~490.1~~ 490.6	~~489.1~~ 489.6
25	~~534.4~~ 521.4	505.4	504.4	437.4	67.1	~~26.9~~ 14.0	51.8	~~45.2~~ 43.7	1737.2	~~1996.6~~ 1392.0	1.78	0.44	~~3.6~~ 2.7	~~63.5~~ 64.3	~~59.1~~ 55.4	~~1877.7~~ 1780.5	~~1.77~~ 1.77	~~0.11~~ 0.11	~~7.0~~ 7.1	~~10.5~~ 9.8	~~494.9~~ 495.6	~~493.9~~ 494.6
26	~~546.3~~ 531.3	507.3	506.3	436.0	70.3	~~37.0~~ 22.0	52.1	~~46.4~~ 44.7	1832.9	~~2496.5~~ 1763.3	1.77	0.44	~~4.2~~ 3.3	~~66.1~~ 67.1	~~62.2~~ 58.3	~~2056.8~~ 1954.5	~~1.76~~ 1.76	~~0.11~~ 0.11	~~7.2~~ 7.3	~~11.4~~ 10.6	~~495.9~~ 496.7	~~494.9~~ 495.7
27	~~558.2~~ 539.9	509.2	508.2	436.6	71.7	~~46.9~~ 28.7	52.4	~~48.0~~ 45.4	1877.8	~~3034.5~~ 2082.9	1.77	0.44	~~4.8~~ 3.7	~~66.9~~ 68.0	~~65.3~~ 60.3	~~2183.6~~ 2047.4	~~1.75~~ 1.76	~~0.11~~ 0.11	~~7.3~~ 7.4	~~12.1~~ 11.1	~~497.1~~ 498.1	~~496.1~~ 497.1
28	~~570.0~~ 549.7	511.1	510.1	437.2	72.9	~~56.9~~ 36.5	52.4	~~49.9~~ 46.4	1911.1	~~3617.9~~ 2477.3	1.77	0.44	~~5.4~~ 4.2	~~67.6~~ 68.7	~~68.4~~ 62.5	~~2312.1~~ 2147.2	~~1.75~~ 1.76	~~0.10~~ 0.11	~~7.4~~ 7.5	~~12.7~~ 11.7	~~498.4~~ 499.4	~~497.4~~ 498.4
29	~~581.9~~ 560.3	513.0	512.0	437.1	74.9	~~66.8~~ 45.3	52.7	~~51.5~~ 48.0	1975.0	~~4223.3~~ 2957.3	1.76	0.44	~~5.9~~ 4.8	~~69.0~~ 70.2	~~71.1~~ 65.3	~~2452.3~~ 2291.7	~~1.74~~ 1.75	~~0.10~~ 0.10	~~7.5~~ 7.7	~~13.5~~ 12.4	~~499.6~~ 500.6	~~498.6~~ 499.6
30	~~593.7~~ 575.1	514.9	513.9	436.8	77.2	~~76.8~~ 58.2	53.3	~~53.0~~ 50.3	2056.2	~~4850.8~~ 3704.5	1.76	0.44	~~6.5~~ 5.5	~~70.7~~ 71.7	~~73.6~~ 69.3	~~2601.1~~ 2481.5	~~1.73~~ 1.74	~~0.10~~ 0.10	~~7.7~~ 7.8	~~14.2~~ 13.3	~~500.8~~ 501.6	~~499.8~~ 500.6
31	~~511.3~~ 505.2	498.1	497.1	437.2	59.8	~~11.2~~ 5.1	50.6	~~43.4~~ 42.7	1514.9	~~1266.0~~ 998.5	1.79	0.45	~~2.5~~ 2.1	~~57.3~~ 57.7	~~53.6~~ 51.8	~~1535.7~~ 1495.7	~~1.78~~ 1.79	~~0.11~~ 0.11	~~6.3~~ 6.4	~~8.8~~ 8.5	~~489.3~~ 489.6	~~488.3~~ 488.6
32	~~507.5~~ 504.1	495.8	494.8	435.9	58.9	~~9.7~~ 6.3	50.3	~~43.2~~ 42.7	1479.0	~~1199.2~~ 1047.3	1.79	0.45	~~2.4~~ 2.2	~~56.4~~ 56.7	~~53.0~~ 52.1	~~1495.1~~ 1476.3	~~1.79~~ 1.79	~~0.11~~ 0.11	~~6.2~~ 6.2	~~8.6~~ 8.4	~~487.2~~ 487.4	~~486.2~~ 486.4
33	~~504.9~~ 502.6	493.9	492.9	436.0	56.9	~~9.0~~ 6.6	49.9	~~43.0~~ 42.7	1418.6	~~1164.7~~ 1063.8	1.79	0.45	~~2.4~~ 2.2	~~54.5~~ 54.7	~~52.4~~ 51.8	~~1428.0~~ 1415.9	~~1.79~~ 1.79	~~0.11~~ 0.11	~~6.0~~ 6.0	~~8.4~~ 8.2	~~485.5~~ 485.7	~~484.5~~ 484.7
34	~~514.1~~ 508.2	498.5	497.5	436.3	61.1	~~13.6~~ 7.7	50.9	~~43.7~~ 43.0	1556.4	~~1375.9~~ 1112.5	1.78	0.45	~~2.7~~ 2.3	~~58.4~~ 58.8	~~54.5~~ 52.7	~~1591.7~~ 1550.3	~~1.78~~ 1.78	~~0.11~~ 0.11	~~6.4~~ 6.5	~~9.1~~ 8.8	~~489.3~~ 489.7	~~488.3~~ 488.7
35	~~533.3~~ 523.2	505.2	504.2	436.4	67.9	~~26.0~~ 15.9	51.8	~~45.2~~ 44.0	1758.6	~~1956.3~~ 1479.9	1.77	0.44	~~3.5~~ 2.9	~~64.4~~ 65.0	~~58.9~~ 56.0	~~1893.7~~ 1818.8	~~1.77~~ 1.77	~~0.11~~ 0.11	~~7.1~~ 7.1	~~10.6~~ 10.0	~~494.7~~ 495.2	~~493.7~~ 494.2
36	~~545.2~~ 537.9	507.1	506.1	436.1	70.0	~~36.0~~ 28.8	52.1	~~46.4~~ 45.4	1825.0	~~2452.8~~ 2087.9	1.77	0.44	~~4.1~~ 3.7	~~65.9~~ 66.3	~~61.9~~ 60.0	~~2040.5~~ 1990.0	~~1.76~~ 1.76	~~0.11~~ 0.11	~~7.2~~ 7.3	~~11.3~~ 11.0	~~495.8~~ 496.2	~~494.8~~ 495.2
37	~~514.8~~ 509.3	500.3	499.3	436.1	63.2	~~12.5~~ 7.1	51.2	~~43.4~~ 43.0	1617.4	~~1324.1~~ 1084.6	1.78	0.45	~~2.6~~ 2.3	~~60.5~~ 60.9	~~54.5~~ 53.0	~~1648.7~~ 1613.8	~~1.78~~ 1.78	~~0.11~~ 0.11	~~6.6~~ 6.7	~~9.3~~ 8.9	~~491.0~~ 491.3	~~490.0~~ 490.3
38	~~514.1~~ 514.2	502.0	501.0	435.2	65.8	~~10.1~~ 10.2	51.5	~~43.2~~ 43.2	1695.8	~~1217.5~~ 1219.8	1.78	0.44	~~2.5~~ 2.5	~~63.4~~ 63.4	~~54.2~~ 54.2	~~1716.6~~ 1716.5	~~1.78~~ 1.78	~~0.11~~ 0.11	~~7.0~~ 7.0	~~9.4~~ 9.4	~~492.6~~ 492.6	~~491.6~~ 491.6
39	~~669.8~~ 606.5	520.9	519.9	441.8	78.1	~~146.8~~ 83.5	53.3	~~63.1~~ 54.2	2081.2	~~10047.7~~ 5306.4	1.76	0.44	~~9.5~~ 6.8	~~68.6~~ 71.3	~~80.7~~ 74.9	~~2768.3~~ 2669.4	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.4~~ 7.7	~~17.0~~ 14.6	~~504.0~~ 506.3	~~503.0~~ 505.3
40	~~698.2~~ 614.8	518.1	517.1	438.3	78.8	~~178.1~~ 94.7	53.3	~~67.9~~ 55.7	2100.7	~~12872.1~~ 6053.3	1.76	0.44	~~10.7~~ 7.4	~~68.1~~ 71.4	~~81.3~~ 76.7	~~2767.5~~ 2740.9	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.4~~ 7.8	~~18.1~~ 15.2	~~500.0~~ 503.0	~~499.0~~ 502.0
41	~~702.3~~ 615.9	515.5	514.5	440.6	73.9	~~184.8~~ 98.4	52.7	~~68.7~~ 56.3	1946.9	~~13474.1~~ 6314.0	1.76	0.44	~~10.6~~ 7.4	~~63.3~~ 66.5	~~81.3~~ 77.0	~~2573.6~~ 2559.6	~~1.73~~ 1.73	~~0.10~~ 0.10	~~6.9~~ 7.2	~~17.5~~ 14.6	~~498.0~~ 500.9	~~497.0~~ 499.9
42	~~705.0~~ 619.5	513.8	512.8	443.7	69.1	~~189.2~~ 103.7	52.1	~~69.5~~ 57.1	1800.4	~~13933.9~~ 6706.1	1.77	0.44	~~10.4~~ 7.4	~~58.7~~ 61.6	~~81.4~~ 77.4	~~2389.3~~ 2384.9	~~1.74~~ 1.74	~~0.10~~ 0.10	~~6.4~~ 6.7	~~16.8~~ 14.2	~~497.0~~ 499.6	~~496.0~~ 498.6
43	~~707.0~~ 621.7	510.5	509.5	447.2	62.3	~~194.5~~ 109.2	50.9	~~70.0~~ 58.0	1585.6	~~14399.5~~ 7115.3	1.78	0.45	~~10.0~~ 7.4	~~52.3~~ 54.9	~~81.4~~ 77.6	~~2128.2~~ 2130.8	~~1.76~~ 1.76	~~0.11~~ 0.11	~~5.7~~ 6.0	~~15.7~~ 13.4	~~494.8~~ 497.1	~~493.8~~ 496.1
44	~~705.9~~ 618.2	508.0	507.0	451.8	55.2	~~195.9~~ 108.2	49.9	~~70.3~~ 57.7	1377.6	~~14561.8~~ 7020.7	1.79	0.45	~~9.4~~ 7.0	~~45.8~~ 48.3	~~81.4~~ 77.0	~~1864.3~~ 1858.4	~~1.77~~ 1.77	~~0.11~~ 0.11	~~5.0~~ 5.3	~~14.4~~ 12.2	~~493.6~~ 495.8	~~492.6~~ 494.8
45	~~699.7~~ 614.6	470.3	469.3	458.0	11.3	~~227.4~~ 142.3	43.4	~~74.0~~ 62.5	245.5	~~17598.7~~ 9672.3	1.85	0.46	~~3.4~~ 2.9	~~7.9~~ 8.4	~~81.6~~ 78.7	~~322.0~~ 328.9	~~1.84~~ 1.84	~~0.11~~ 0.11	~~0.9~~ 0.9	~~4.3~~ 3.9	~~466.0~~ 466.4	~~465.0~~ 465.4
46	~~692.2~~ 613.5	460.0	459.0	456.4	2.6	~~230.2~~ 151.5	42.2	~~74.2~~ 64.0	55.2	~~17859.1~~ 10484.7	1.86	0.46	~~1.1~~ 1.0	~~1.5~~ 1.6	~~81.6~~ 79.3	~~63.2~~ 65.3	~~1.86~~ 1.86	~~0.11~~ 0.11	~~0.2~~ 0.2	~~1.2~~ 1.2	~~458.8~~ 458.8	~~457.8~~ 457.8
47	~~636.5~~ 599.8	460.0	459.0	459.0	0.0	~~174.5~~ 137.8	42.0	~~67.3~~ 61.9	0.0	~~12529.7~~ 9313.6	1.86	0.47	~~0.0~~ 0.0	~~0.0~~ 0.0	~~80.5~~ 77.7	~~0.0~~ 0.0	~~1.86~~ 1.86	~~0.11~~ 0.11	~~0.0~~ 0.0	~~0.0~~ 0.0	~~460.0~~ 460.0	~~459.0~~ 459.0
48	~~604.2~~ 582.0	460.0	459.0	458.9	0.1	~~142.2~~ 120.0	42.0	~~62.5~~ 59.4	1.3	~~9664.0~~ 7915.9	1.86	0.46	~~0.0~~ 0.0	~~0.0~~ 0.0	~~78.2~~ 75.1	~~0.9~~ 0.9	~~1.86~~ 1.86	~~0.11~~ 0.11	~~0.0~~ 0.0	~~0.0~~ 0.0	~~460.0~~ 460.0	~~459.0~~ 459.0
49	~~550.8~~ 539.1	460.0	459.0	459.0	0.0	~~88.8~~ 77.1	42.0	~~54.8~~ 53.3	0.0	~~5646.4~~ 4891.1	1.86	0.47	~~0.0~~ 0.0	~~0.0~~ 0.0	~~67.9~~ 64.4	~~0.0~~ 0.0	~~1.86~~ 1.86	~~0.11~~ 0.11	~~0.0~~ 0.0	~~0.0~~ 0.0	~~460.0~~ 460.0	~~459.0~~ 459.0

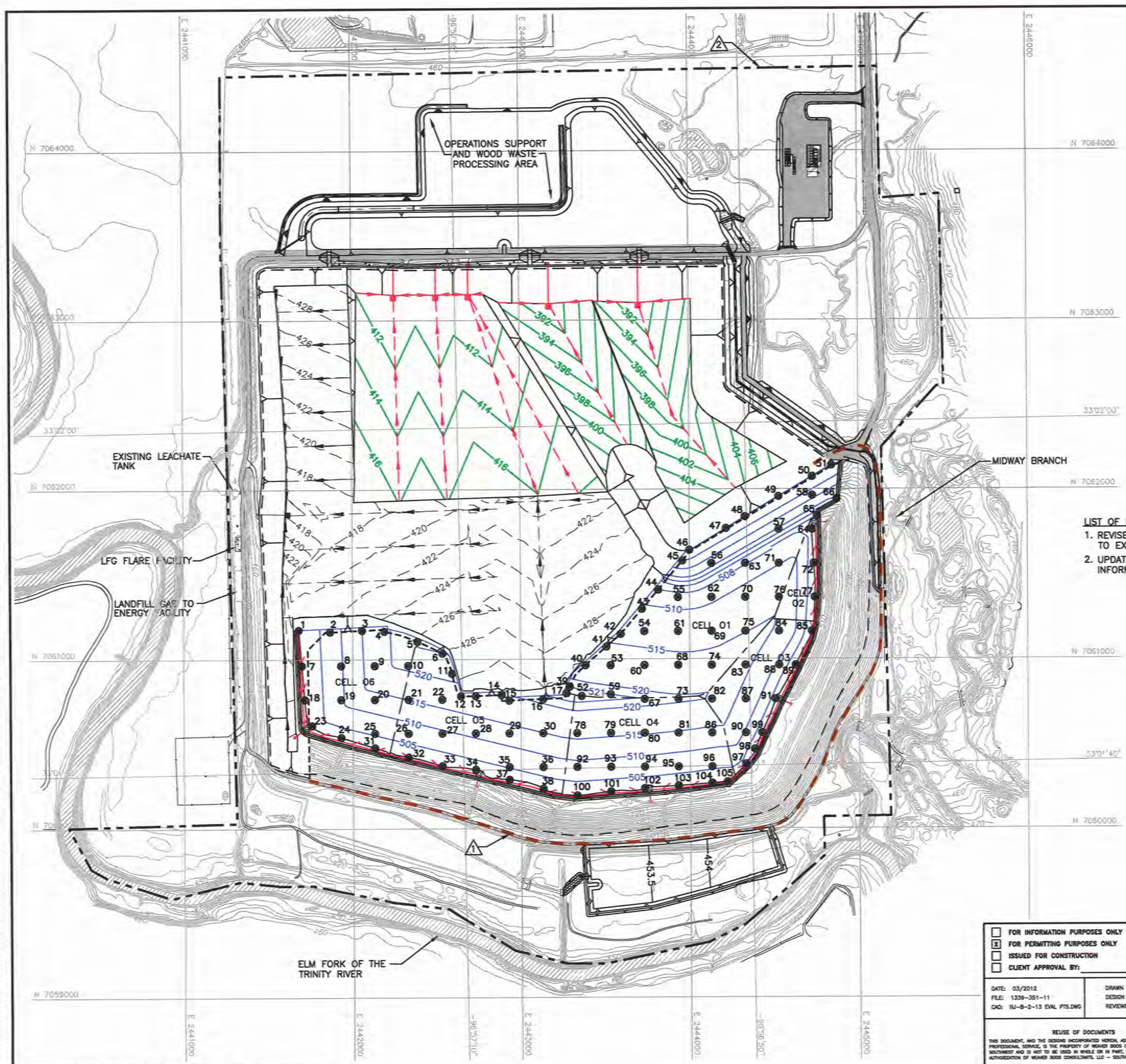
Evaluation Point	Top of Waste Elevation (ft-msl)	Initial Top of Overliner Elevation (ft-msl)	Initial Top of Waste Below Overliner Elevation (ft-msl)	Bottom of Waste Elevation (ft-msl)	H_o (ft)	T_{waste} (ft)	γ_{mswb} (pcf)	γ_{mswa} (pcf)	σ'_o (psf)	$\Delta\sigma$ (psf)	e_o	C_c	S_p (ft)	H'_o (ft)	γ'_{mswb} (pcf)	σ''_o (psf)	e'_o	α	S_c (ft)	Total Settlement (ft)	Post-Settlement Top of Overliner Elevation (ft-msl)	Post-Settlement Top of Waste Below Overliner Elevation (ft-msl)
50	~~497.7~~ 497.4	460.0	459.0	459.0	0.0	~~35.7~~ 35.4	42.0	~~46.4~~ 46.4	0.0	~~2437.9~~ 2422.8	1.86	0.47	~~0.0~~ 0.0	~~0.0~~ 0.0	~~52.4~~ 52.1	~~0.0~~ 0.0	~~1.86~~ 1.86	~~0.11~~ 0.11	~~0.0~~ 0.0	~~0.0~~ 0.0	~~460.0~~ 460.0	~~459.0~~ 459.0
51	469.3	460.0	459.0	459.0	0.0	7.3	42.0	43.0	0.0	1093.7	1.86	0.47	0.0	0.0	43.7	0.0	1.86	0.11	0.0	0.0	460.0	459.0
52	~~657.5~~ 604.2	521.7	520.7	437.2	83.5	~~133.8~~ 80.5	54.2	~~61.4~~ 53.6	2263.3	~~8992.0~~ 5093.8	1.75	0.44	~~9.3~~ 6.8	~~74.3~~ 76.7	~~80.4~~ 74.9	~~2985.1~~ 2874.8	~~1.71~~ 1.72	~~0.10~~ 0.10	~~8.0~~ 8.3	~~17.3~~ 15.1	~~504.4~~ 506.6	~~503.4~~ 505.6
53	~~697.8~~ 611.0	517.6	516.6	436.8	79.8	~~178.2~~ 91.4	53.6	~~67.9~~ 55.4	2137.0	~~12880.1~~ 5841.9	1.76	0.44	~~10.8~~ 7.3	~~69.0~~ 72.5	~~81.3~~ 76.4	~~2804.5~~ 2769.1	~~1.72~~ 1.72	~~0.10~~ 0.10	~~7.5~~ 7.9	~~18.2~~ 15.1	~~499.4~~ 502.5	~~498.4~~ 501.5
54	~~704.4~~ 615.5	513.1	512.1	438.0	74.1	~~189.3~~ 100.5	52.7	~~69.5~~ 56.6	1951.8	~~13942.8~~ 6461.4	1.76	0.44	~~10.8~~ 7.5	~~63.3~~ 66.6	~~81.4~~ 77.3	~~2577.8~~ 2571.5	~~1.73~~ 1.73	~~0.10~~ 0.10	~~6.9~~ 7.2	~~17.7~~ 14.7	~~495.4~~ 498.3	~~494.4~~ 497.3
55	~~701.1~~ 612.0	508.6	507.6	438.7	68.8	~~190.6~~ 101.5	51.8	~~69.5~~ 56.9	1783.6	~~14028.5~~ 6547.7	1.77	0.44	~~10.4~~ 7.4	~~58.4~~ 61.5	~~81.4~~ 77.0	~~2377.8~~ 2367.0	~~1.74~~ 1.74	~~0.10~~ 0.10	~~6.4~~ 6.7	~~16.8~~ 14.1	~~491.8~~ 494.5	~~490.8~~ 493.5
56	~~671.5~~ 604.4	486.6	485.6	438.9	46.7	~~182.9~~ 115.8	48.0	~~68.4~~ 58.9	1121.0	~~13300.9~~ 7595.8	1.81	0.45	~~8.3~~ 6.7	~~38.3~~ 40.0	~~81.1~~ 77.5	~~1555.0~~ 1549.0	~~1.78~~ 1.78	~~0.11~~ 0.11	~~4.2~~ 4.4	~~12.5~~ 11.1	~~474.0~~ 475.5	~~473.0~~ 474.5
57	~~570.7~~ 551.4	491.3	490.3	438.2	52.1	~~77.4~~ 58.1	49.1	~~53.3~~ 50.3	1280.9	~~4904.9~~ 3701.4	1.80	0.45	~~5.7~~ 4.9	~~46.4~~ 47.2	~~71.1~~ 65.9	~~1648.9~~ 1554.5	~~1.78~~ 1.78	~~0.11~~ 0.11	~~5.1~~ 5.2	~~10.8~~ 10.1	~~480.5~~ 481.2	~~479.5~~ 480.2
58	~~514.3~~ 508.9	476.3	475.3	438.1	37.2	~~36.0~~ 30.7	46.7	~~46.4~~ 45.7	867.2	~~2451.3~~ 2181.0	1.82	0.45	~~3.5~~ 3.3	~~33.7~~ 33.9	~~57.4~~ 56.0	~~966.5~~ 948.3	~~1.81~~ 1.81	~~0.11~~ 0.11	~~3.7~~ 3.7	~~7.2~~ 7.0	~~469.1~~ 469.3	~~468.1~~ 468.3
59	~~656.7~~ 603.5	521.0	520.0	436.3	83.7	~~133.7~~ 80.5	54.2	~~61.4~~ 53.6	2267.2	~~8984.5~~ 5091.7	1.75	0.44	~~9.3~~ 6.8	~~74.4~~ 76.9	~~80.4~~ 74.9	~~2990.7~~ 2880.0	~~1.71~~ 1.72	~~0.10~~ 0.10	~~8.1~~ 8.3	~~17.3~~ 15.1	~~503.7~~ 505.9	~~502.7~~ 504.9
60	~~696.2~~ 609.2	517.0	516.0	436.9	79.1	~~177.2~~ 90.2	53.6	~~67.9~~ 55.1	2119.1	~~12808.7~~ 5745.9	1.76	0.44	~~10.7~~ 7.2	~~68.4~~ 71.9	~~81.3~~ 76.1	~~2779.1~~ 2735.1	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.4~~ 7.8	~~18.1~~ 15.0	~~498.9~~ 502.0	~~497.9~~ 501.0
61	~~695.2~~ 608.4	512.5	511.5	438.0	73.5	~~180.7~~ 93.9	52.7	~~68.2~~ 55.7	1937.2	~~13097.9~~ 6005.7	1.77	0.44	~~10.4~~ 7.2	~~63.1~~ 66.3	~~81.3~~ 76.3	~~2562.6~~ 2528.8	~~1.73~~ 1.74	~~0.10~~ 0.10	~~6.9~~ 7.2	~~17.3~~ 14.4	~~495.2~~ 498.1	~~494.2~~ 497.1
62	~~670.8~~ 604.1	509.3	508.3	438.4	69.9	~~159.5~~ 92.7	52.1	~~65.3~~ 55.4	1822.4	~~11192.8~~ 5914.3	1.77	0.44	~~9.5~~ 7.0	~~60.4~~ 62.9	~~80.9~~ 75.8	~~2444.1~~ 2384.2	~~1.74~~ 1.74	~~0.10~~ 0.10	~~6.6~~ 6.9	~~16.1~~ 13.9	~~493.2~~ 495.5	~~492.2~~ 494.5
63	~~621.5~~ 591.9	506.8	505.8	438.3	67.5	~~112.7~~ 83.1	51.8	~~58.3~~ 54.2	1748.8	~~7349.5~~ 5281.3	1.77	0.44	~~7.7~~ 6.5	~~59.8~~ 61.0	~~78.4~~ 74.0	~~2342.2~~ 2255.2	~~1.75~~ 1.75	~~0.10~~ 0.10	~~6.5~~ 6.7	~~14.2~~ 13.2	~~492.6~~ 493.6	~~491.6~~ 492.6
64	~~518.4~~ 511.8	502.0	501.0	437.0	64.0	~~14.4~~ 7.8	51.2	~~43.7~~ 43.0	1638.8	~~1408.1~~ 1115.2	1.78	0.44	~~2.8~~ 2.3	~~61.2~~ 61.7	~~55.1~~ 53.3	~~1686.1~~ 1643.6	~~1.78~~ 1.78	~~0.11~~ 0.11	~~6.7~~ 6.8	~~9.5~~ 9.1	~~492.5~~ 492.9	~~491.5~~ 491.9
65	~~509.1~~ 505.3	500.0	499.0	437.2	61.8	~~7.1~~ 3.3	50.9	~~43.0~~ 42.4	1573.4	~~1086.3~~ 921.8	1.78	0.45	~~2.3~~ 2.0	~~59.5~~ 59.8	~~52.7~~ 51.5	~~1568.8~~ 1540.6	~~1.78~~ 1.78	~~0.11~~ 0.11	~~6.5~~ 6.6	~~8.8~~ 8.6	~~491.2~~ 491.4	~~490.2~~ 490.4
66	491.8	489.8	488.8	436.8	52.0	0.0	49.1	42.0	1278.4	780.1	1.80	0.45	1.7	50.3	48.8	1226.6	1.80	0.11	5.5	7.3	482.5	481.5
67	~~646.3~~ 601.3	520.8	519.8	436.2	83.7	~~123.5~~ 78.4	54.2	~~60.0~~ 53.3	2266.4	~~8190.8~~ 4960.6	1.75	0.44	~~8.8~~ 6.7	~~74.8~~ 77.0	~~79.9~~ 74.6	~~2989.9~~ 2868.6	~~1.71~~ 1.72	~~0.10~~ 0.10	~~8.1~~ 8.3	~~16.9~~ 15.0	~~503.9~~ 505.8	~~502.9~~ 504.8
68	~~674.5~~ 604.9	516.5	515.5	436.9	78.6	~~155.9~~ 86.3	53.3	~~64.7~~ 54.5	2095.5	~~10863.8~~ 5484.1	1.76	0.44	~~9.9~~ 7.0	~~68.7~~ 71.6	~~80.9~~ 75.4	~~2780.7~~ 2702.4	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.5~~ 7.8	~~17.4~~ 14.8	~~499.2~~ 501.8	~~498.2~~ 500.8
69	~~651.3~~ 601.3	513.0	512.0	437.7	74.4	~~136.3~~ 86.3	52.7	~~61.6~~ 54.5	1959.6	~~9178.3~~ 5480.0	1.76	0.44	~~9.0~~ 6.9	~~65.4~~ 67.5	~~80.3~~ 75.1	~~2626.0~~ 2534.5	~~1.73~~ 1.74	~~0.10~~ 0.10	~~7.1~~ 7.3	~~16.1~~ 14.2	~~497.0~~ 498.8	~~496.0~~ 497.8
70	~~620.8~~ 590.5	511.3	510.3	437.8	72.5	~~107.5~~ 77.2	52.4	~~57.7~~ 53.3	1899.0	~~6985.0~~ 4895.8	1.77	0.44	~~7.8~~ 6.4	~~64.7~~ 66.1	~~78.0~~ 73.2	~~2524.0~~ 2418.7	~~1.74~~ 1.74	~~0.10~~ 0.10	~~7.0~~ 7.2	~~14.8~~ 13.6	~~496.5~~ 497.7	~~495.5~~ 496.7
71	~~571.5~~ 551.9	509.8	508.8	437.3	71.5	~~59.7~~ 40.1	52.4	~~50.6~~ 46.9	1872.5	~~3802.0~~ 2660.4	1.77	0.44	~~5.5~~ 4.4	~~66.0~~ 67.1	~~69.0~~ 63.4	~~2275.8~~ 2127.9	~~1.75~~ 1.76	~~0.10~~ 0.11	~~7.2~~ 7.3	~~12.7~~ 11.7	~~497.1~~ 498.1	~~496.1~~ 497.1
72	~~516.3~~ 510.4	502.2	501.2	436.1	65.0	~~12.1~~ 6.2	51.5	~~43.4~~ 42.7	1675.6	~~1306.1~~ 1043.6	1.78	0.44	~~2.6~~ 2.2	~~62.4~~ 62.9	~~54.5~~ 53.0	~~1701.0~~ 1665.8	~~1.78~~ 1.78	~~0.11~~ 0.11	~~6.9~~ 6.9	~~9.5~~ 9.1	~~492.7~~ 493.1	~~491.7~~ 492.1
73	~~641.4~~ 600.0	520.4	519.4	435.8	83.6	~~119.0~~ 77.6	54.2	~~59.1~~ 53.3	2265.5	~~7818.0~~ 4915.9	1.75	0.44	~~8.6~~ 6.7	~~75.0~~ 77.0	~~79.6~~ 74.4	~~2984.6~~ 2861.7	~~1.71~~ 1.72	~~0.10~~ 0.10	~~8.1~~ 8.3	~~16.8~~ 15.0	~~503.6~~ 505.4	~~502.6~~ 504.4
74	~~629.0~~ 597.5	516.9	515.9	436.5	79.5	~~110.0~~ 78.6	53.6	~~58.0~~ 53.3	2129.7	~~7162.0~~ 4968.1	1.76	0.44	~~8.1~~ 6.6	~~71.4~~ 72.9	~~78.7~~ 74.2	~~2808.9~~ 2702.6	~~1.72~~ 1.73	~~0.10~~ 0.10	~~7.7~~ 7.9	~~15.8~~ 14.5	~~501.1~~ 502.4	~~500.1~~ 501.4
75	~~608.9~~ 580.6	514.8	513.8	436.9	77.0	~~92.1~~ 63.8	53.0	~~55.4~~ 51.2	2039.6	~~5879.3~~ 4048.1	1.76	0.44	~~7.2~~ 5.8	~~69.7~~ 71.1	~~76.3~~ 70.6	~~2659.1~~ 2511.0	~~1.73~~ 1.74	~~0.10~~ 0.10	~~7.6~~ 7.7	~~14.8~~ 13.6	~~500.0~~ 501.3	~~499.0~~ 500.3
76	~~570.9~~ 550.7	513.3	512.3	436.6	75.7	~~55.6~~ 35.4	53.0	~~49.9~~ 46.4	2005.5	~~3552.8~~ 2424.8	1.76	0.44	~~5.3~~ 4.2	~~70.3~~ 71.5	~~68.4~~ 62.5	~~2407.1~~ 2234.5	~~1.74~~ 1.75	~~0.10~~ 0.11	~~7.7~~ 7.8	~~13.0~~ 12.0	~~500.3~~ 501.3	~~499.3~~ 500.3
77	~~513.4~~ 508.4	501.3	500.3	435.2	65.1	~~10.2~~ 5.1	51.5	~~43.2~~ 42.7	1676.2	~~1219.4~~ 997.2	1.78	0.44	~~2.5~~ 2.1	~~62.6~~ 63.0	~~53.9~~ 52.7	~~1686.7~~ 1659.1	~~1.78~~ 1.78	~~0.11~~ 0.11	~~6.9~~ 6.9	~~9.3~~ 9.0	~~491.9~~ 492.2	~~490.9~~ 491.2
78	~~603.2~~ 587.9	516.1	515.1	436.3	78.7	~~85.1~~ 69.8	53.3	~~54.5~~ 52.1	2098.3	~~5418.4~~ 4418.7	1.76	0.44	~~7.0~~ 6.2	~~71.8~~ 72.6	~~75.3~~ 72.3	~~2701.3~~ 2621.7	~~1.73~~ 1.73	~~0.10~~ 0.10	~~7.8~~ 7.9	~~14.8~~ 14.1	~~501.3~~ 502.0	~~500.3~~ 501.0
79	~~599.8~~ 582.4	515.7	514.7	435.9	78.8	~~82.1~~ 64.7	53.3	~~53.9~~ 51.2	2099.7	~~5205.2~~ 4095.3	1.76	0.44	~~6.8~~ 5.9	~~72.0~~ 72.9	~~74.7~~ 71.1	~~2690.5~~ 2590.5	~~1.73~~ 1.73	~~0.10~~ 0.10	~~7.8~~ 7.9	~~14.6~~ 13.8	~~501.1~~ 501.8	~~500.1~~ 500.8
80	~~596.4~~ 576.5	515.3	514.3	435.2	79.0	~~79.2~~ 59.3	53.6	~~53.6~~ 50.6	2117.6	~~5023.2~~ 3781.2	1.76	0.44	~~6.6~~ 5.6	~~72.4~~ 73.4	~~74.2~~ 69.8	~~2684.8~~ 2561.8	~~1.73~~ 1.73	~~0.10~~ 0.10	~~7.9~~ 8.0	~~14.5~~ 13.6	~~500.7~~ 501.7	~~499.7~~ 500.7
81	~~591.6~~ 571.8	514.6	513.6	434.6	79.0	~~75.1~~ 55.2	53.3	~~53.0~~ 49.9	2104.4	~~4758.0~~ 3536.0	1.76	0.44	~~6.5~~ 5.4	~~72.5~~ 73.6	~~73.4~~ 68.7	~~2661.4~~ 2527.7	~~1.73~~ 1.74	~~0.10~~ 0.10	~~7.9~~ 8.0	~~14.3~~ 13.4	~~500.2~~ 501.2	~~499.2~~ 500.2
82	~~608.2~~ 581.0	518.9	517.9	435.2	82.7	~~87.3~~ 60.1	53.9	~~54.8~~ 50.6	2228.8	~~5564.5~~ 3824.9	1.75	0.44	~~7.2~~ 5.7	~~75.6~~ 77.0	~~75.9~~ 70.6	~~2868.5~~ 2718.0	~~1.72~~ 1.73	~~0.10~~ 0.10	~~8.2~~ 8.4	~~15.4~~ 14.1	~~503.5~~ 504.8	~~502.5~~ 503.8
83	~~583.5~~ 562.7	516.0	515.0	435.8	79.3	~~65.5~~ 44.6	53.6	~~51.5~~ 47.7	2123.8	~~4155.5~~ 2908.2	1.76	0.44	~~5.9~~ 4.7	~~73.3~~ 74.5	~~71.3~~ 65.9	~~2614.9~~ 2455.3	~~1.73~~ 1.74	~~0.10~~ 0.10	~~8.0~~ 8.1	~~13.9~~ 12.8	~~502.1~~ 503.2	~~501.1~~ 502.2
84	~~565.1~~ 544.5	513.5	512.5	435.7	76.8	~~49.6~~ 29.0	53.0	~~48.8~~ 45.7	2034.1	~~3198.8~~ 2106.0	1.76	0.44	~~5.0~~ 3.8	~~71.7~~ 73.0	~~66.7~~ 61.1	~~2393.9~~ 2228.7	~~1.74~~ 1.75	~~0.10~~ 0.11	~~7.8~~ 8.0	~~12.8~~ 11.7	~~500.7~~ 501.8	~~499.7~~ 500.8
85	~~512.3~~ 507.6	501.0	500.0	434.4	65.6	~~9.3~~ 4.5	51.5	~~43.2~~ 42.4	1690.5	~~1181.6~~ 972.8	1.78	0.44	~~2.4~~ 2.1	~~63.2~~ 63.6	~~53.9~~ 52.4	~~1703.2~~ 1665.4	~~1.78~~ 1.78	~~0.11~~ 0.11	~~6.9~~ 7.0	~~9.4~~ 9.1	~~491.7~~ 492.0	~~490.7~~ 491.0
86	~~582.1~~ 562.6	513.6	512.6	433.9	78.7	~~66.5~~ 47.0	53.3	~~51.5~~ 48.4	2096.3	~~4206.2~~ 3056.2	1.76	0.44	~~6.0~~ 4.9	~~72.7~~ 73.8	~~71.6~~ 66.4	~~2600.0~~ 2450.8	~~1.73~~ 1.74	~~0.10~~ 0.10	~~7.9~~ 8.0	~~13.9~~ 12.9	~~499.7~~ 500.7	~~498.7~~ 499.7
87	~~562.7~~ 545.0	512.9	511.9	434.4	77.5	~~47.8~~ 30.1	53.3	~~48.4~~ 45.7	2064.8	~~3095.0~~ 2157.0	1.76	0.44	~~4.9~~ 3.8	~~72.6~~ 73.6	~~66.4~~ 61.4	~~2410.9~~ 2259.8	~~1.74~~ 1.75	~~0.10~~ 0.10	~~7.9~~ 8.0	~~12.8~~ 11.9	~~500.1~~ 501.0	~~499.1~~ 500.0
88	~~539.8~~ 527.2	508.6	507.6	434.6	73.0	~~29.2~~ 16.6	52.4	~~45.7~~ 44.0	1911.9	~~2115.4~~ 1507.7	1.77	0.44	~~3.8~~ 2.9	~~69.2~~ 70.0	~~60.6~~ 57.1	~~2095.1~~ 2000.8	~~1.76~~ 1.76	~~0.11~~ 0.11	~~7.6~~ 7.7	~~11.3~~ 10.6	~~497.3~~ 498.0	~~496.3~~ 497.0
89	~~515.2~~ 509.7	501.8	500.8	434.0	66.7	~~11.5~~ 5.9	51.5	~~43.4~~ 42.7	1719.3	~~1277.6~~ 1031.5	1.78	0.44	~~2.6~~ 2.2	~~64.2~~ 64.6	~~54.8~~ 53.0	~~1757.5~~ 1711.0	~~1.77~~ 1.78	~~0.11~~ 0.11	~~7.0~~ 7.1	~~9.6~~ 9.3	~~492.1~~ 492.5	~~491.1~~ 491.5
90	~~540.6~~ 527.4	509.1	508.1	433.0	75.0	~~29.5~~ 16.3	53.0	~~45.7~~ 44.0	1988.6	~~2129.9~~ 1496.7	1.76	0.44	~~3.8~~ 2.9	~~71.3~~ 72.1	~~60.8~~ 57.1	~~2166.7~~ 2060.8	~~1.75~~ 1.76	~~0.11~~ 0.11	~~7.8~~ 7.9	~~11.6~~ 10.8	~~497.5~~ 498.3	~~496.5~~ 497.3
91	~~520.0~~ 513.0	503.1	502.1	433.5	68.6	~~14.9~~ 8.0	51.8	~~43.7~~ 43.0	1777.0	~~1430.9~~ 1122.4	1.77	0.44	~~2.8~~ 2.3	~~65.8~~ 66.3	~~56.0~~ 53.9	~~1840.6~~ 1785.3	~~1.77~~ 1.77	~~0.11~~ 0.11	~~7.2~~ 7.3	~~10.0~~ 9.6	~~493.1~~ 493.5	~~492.1~~ 492.5
92	~~553.3~~ 548.1	508.5	507.5	435.4	72.0	~~42.9~~ 37.6	52.4	~~47.3~~ 46.7	1887.7	~~2808.2~~ 2536.6	1.77	0.44	~~4.6~~ 4.3	~~67.5~~ 67.8	~~64.4~~ 62.8	~~2172.1~~ 2129.0	~~1.75~~ 1.76	~~0.11~~ 0.11	~~7.4~~ 7.4	~~11.9~~ 11.7	~~496.5~~ 496.8	~~495.5~~ 495.8
93	~~549.9~~ 543.1	507.9	506.9	434.8	72.2	~~40.0~~ 33.1	52.4	~~46.9~~ 46.2	1890.7	~~2656.5~~ 2310.4	1.77	0.44	~~4.4~~ 4.0	~~67.8~~ 68.2	~~63.4~~ 61.4	~~2149.6~~ 2091.5	~~1.76~~ 1.76	~~0.11~~ 0.11	~~7.4~~ 7.5	~~11.8~~ 11.4	~~496.1~~ 496.5	~~495.1~~ 495.5
94	~~546.5~~ 536.8	507.4	506.4	434.1	72.2	~~37.2~~ 27.4	52.4	~~46.7~~ 45.4	1892.4	~~2515.1~~ 2027.4	1.77	0.44	~~4.2~~ 3.6	~~68.0~~ 68.6	~~62.5~~ 60.0	~~2123.9~~ 2057.2	~~1.76~~ 1.76	~~0.11~~ 0.11	~~7.4~~ 7.5	~~11.7~~ 11.1	~~495.7~~ 496.2	~~494.7~~ 495.2
95	~~541.9~~ 532.1	506.6	505.6	433.4	72.3	~~33.3~~ 23.5	52.4	~~46.2~~ 44.9	1893.4	~~2317.2~~ 1834.8	1.77	0.44	~~4.0~~ 3.4	~~68.3~~ 68.9	~~61.4~~ 58.9	~~2094.4~~ 2026.4	~~1.76~~ 1.76	~~0.11~~ 0.11	~~7.5~~ 7.5	~~11.5~~ 10.9	~~495.2~~ 495.7	~~494.2~~ 494.7
96	~~535.9~~ 527.4	505.7	504.7	432.5	72.1	~~28.2~~ 19.7	52.4	~~45.4~~ 44.4	1889.9	~~2063.5~~ 1656.3	1.77	0.44	~~3.7~~ 3.1	~~68.4~~ 69.0	~~60.0~~ 57.7	~~2052.9~~ 1990.1	~~1.76~~ 1.76	~~0.11~~ 0.11	~~7.5~~ 7.5	~~11.2~~ 10.7	~~494.5~~ 495.0	~~493.5~~ 494.0
97	~~513.4~~ 508.3	501.7	500.7	431.8	68.9	~~9.6~~ 4.6	51.8	~~43.2~~ 42.4	1786.0	~~1195.7~~ 973.8	1.77	0.44	~~2.5~~ 2.1	~~66.5~~ 66.9	~~54.5~~ 53.0	~~1811.1~~ 1771.7	~~1.77~~ 1.77	~~0.11~~ 0.11	~~7.3~~ 7.3	~~9.7~~ 9.4	~~492.0~~ 492.3	~~491.0~~ 491.3
98	~~515.3~~ 509.7	501.8	500.8	432.1	68.7	~~11.5~~ 5.8	51.8	~~43.4~~ 42.7	1780.9	~~1279.6~~ 1029.8	1.77	0.44	~~2.6~~ 2.2	~~66.2~~ 66.6	~~55.1~~ 53.3	~~1821.8~~ 1773.8	~~1.77~~ 1.77	~~0.11~~ 0.11	~~7.3~~ 7.3	~~9.8~~ 9.5	~~492.0~~ 492.4	~~491.0~~ 491.4

Prep By: MDM
Date: 2/19/2016

CAMELOT LANDFILL
1339-351-11-02
APPENDIX IIIJ-B
OVERLINER SYSTEM SETTLEMENT SUMMARY

Chkd By: _____
Date: _____

Evaluation Point	Top of Waste Elevation (ft-msl)		Initial Top of Overliner Elevation (ft-msl)	Initial Top of Waste Below Overliner Elevation (ft-msl)	Bottom of Waste Elevation (ft-msl)	H_o (ft)	T_{waste} (ft)		γ_{mswb} (pcf)	γ_{mswa} (pcf)		σ'_o (psf)	$\Delta\sigma$ (psf)		e_o	C_c	S_p (ft)		H'_o (ft)	γ'_{mswb} (pcf)		σ''_o (psf)		e'_o		α		S_c (ft)		Total Settlement (ft)		Post-Settlement Top of Overliner Elevation (ft-msl)		Post-Settlement Top of Waste Below Overliner Elevation (ft-msl)	
99	~~516.0~~	510.1	502.1	501.1	432.6	68.6	~~11.9~~	6.0	51.8	~~43.4~~	42.7	1776.1	~~1296.3~~	1037.7	1.77	0.44	~~2.6~~	2.2	~~65.9~~	66.4	~~55.1~~	53.3	~~1816.0~~	1768.6	~~1.77~~	1.77	~~0.11~~	0.11	~~7.2~~	7.3	~~9.8~~	9.5	~~492.3~~	492.6	~~491.3~~	491.6
100	~~511.3~~	514.6	502.1	501.1	434.3	66.8	~~7.2~~	10.4	51.5	~~43.0~~	43.2	1721.6	~~1089.7~~	1231.6	1.78	0.44	~~2.3~~	2.5	~~64.6~~	64.3	~~53.3~~	54.5	~~1720.3~~	1752.4	~~1.78~~	1.77	~~0.11~~	0.11	~~7.1~~	7.1	~~9.4~~	9.6	~~492.8~~	492.6	~~491.8~~	491.6
101	~~513.7~~	514.5	502.6	501.6	433.8	67.8	~~9.1~~	9.9	51.8	~~43.2~~	43.2	1756.0	~~1171.7~~	1206.5	1.77	0.44	~~2.4~~	2.5	~~65.4~~	65.3	~~54.2~~	54.5	~~1771.1~~	1779.3	~~1.77~~	1.77	~~0.11~~	0.11	~~7.2~~	7.2	~~9.6~~	9.6	~~493.0~~	493.0	~~492.0~~	492.0
102	~~515.0~~	511.7	501.5	500.5	433.2	67.3	~~11.4~~	8.1	51.8	~~43.4~~	43.0	1744.4	~~1276.7~~	1129.5	1.77	0.44	~~2.6~~	2.3	~~64.8~~	65.0	~~54.8~~	53.9	~~1773.8~~	1751.3	~~1.77~~	1.77	~~0.11~~	0.11	~~7.1~~	7.1	~~9.7~~	9.5	~~491.9~~	492.1	~~490.9~~	491.1
103	~~514.0~~	509.8	501.2	500.2	432.6	67.6	~~10.8~~	6.6	51.8	~~43.2~~	42.7	1752.4	~~1247.0~~	1062.4	1.77	0.44	~~2.5~~	2.2	~~65.1~~	65.4	~~54.5~~	53.3	~~1773.8~~	1743.2	~~1.77~~	1.77	~~0.11~~	0.11	~~7.1~~	7.2	~~9.7~~	9.4	~~491.5~~	491.8	~~490.5~~	490.8
104	~~512.0~~	508.2	500.8	499.8	431.9	67.9	~~9.2~~	5.5	51.8	~~43.2~~	42.7	1758.9	~~1178.9~~	1013.2	1.77	0.44	~~2.4~~	2.1	~~65.5~~	65.7	~~54.2~~	53.0	~~1773.9~~	1742.3	~~1.77~~	1.77	~~0.11~~	0.11	~~7.2~~	7.2	~~9.6~~	9.4	~~491.2~~	491.4	~~490.2~~	490.4
105	~~510.2~~	506.1	500.5	499.5	431.6	67.9	~~7.7~~	3.6	51.8	~~43.0~~	42.4	1759.3	~~1112.3~~	934.2	1.77	0.44	~~2.3~~	2.0	~~65.6~~	65.9	~~53.9~~	52.7	~~1767.5~~	1736.5	~~1.77~~	1.78	~~0.11~~	0.11	~~7.2~~	7.2	~~9.5~~	9.2	~~491.0~~	491.3	~~490.0~~	490.3
S1	~~680.2~~	606.3	522.9	521.9	440.9	81.0	~~155.3~~	81.4	53.6	~~64.7~~	53.9	2170.0	~~10823.7~~	5164.1	1.75	0.44	~~10.0~~	6.8	~~71.0~~	74.2	~~80.9~~	74.7	~~2871.2~~	2771.5	~~1.72~~	1.72	~~0.10~~	0.10	~~7.7~~	8.1	~~17.7~~	14.9	~~505.2~~	508.0	~~504.2~~	507.0
S2	511.2		498.4	497.4	435.6	61.8	10.8		50.9	43.2		1572.6	1245.6		1.78	0.45	2.5		59.3		53.6		1587.8		1.78		0.11		6.5		9.0		489.4		488.4	
S3	~~673.0~~	606.0	523.0	522.0	439.8	82.2	~~148.0~~	81.1	53.9	~~63.4~~	53.9	2213.5	~~10170.1~~	5148.3	1.75	0.44	~~9.8~~	6.8	~~72.4~~	75.3	~~80.8~~	74.9	~~2923.1~~	2822.0	~~1.72~~	1.72	~~0.10~~	0.10	~~7.8~~	8.2	~~17.6~~	15.0	~~505.3~~	508.0	~~504.3~~	507.0
S4	~~508.3~~	504.4	496.1	495.1	436.7	58.4	~~10.2~~	6.3	50.3	~~43.2~~	42.7	1468.1	~~1220.4~~	1047.1	1.79	0.45	~~2.5~~	2.2	~~56.0~~	56.2	~~53.0~~	51.8	~~1482.9~~	1456.8	~~1.79~~	1.79	~~0.11~~	0.11	~~6.2~~	6.2	~~8.6~~	8.4	~~487.5~~	487.8	~~486.5~~	486.8
S5	~~634.0~~	600.1	519.8	518.8	439.4	79.4	~~112.2~~	78.4	53.6	~~58.3~~	53.3	2127.7	~~7320.7~~	4956.9	1.76	0.44	~~8.2~~	6.6	~~71.2~~	72.8	~~79.0~~	74.2	~~2811.6~~	2700.1	~~1.72~~	1.73	~~0.10~~	0.10	~~7.7~~	7.9	~~15.9~~	14.5	~~503.8~~	505.2	~~502.8~~	504.2
S6	~~512.9~~	507.7	497.2	496.2	437.3	59.0	~~13.7~~	8.4	50.3	~~43.7~~	43.0	1481.4	~~1377.0~~	1142.4	1.79	0.45	~~2.7~~	2.3	~~56.3~~	56.6	~~54.2~~	52.7	~~1524.0~~	1491.6	~~1.79~~	1.79	~~0.11~~	0.11	~~6.2~~	6.2	~~8.9~~	8.6	~~488.4~~	488.7	~~487.4~~	487.7
S7	~~657.5~~	604.2	521.7	520.7	437.2	83.5	~~133.8~~	80.5	54.2	~~61.4~~	53.6	2263.3	~~8992.0~~	5093.8	1.75	0.44	~~9.3~~	6.8	~~74.3~~	76.7	~~80.4~~	74.9	~~2985.1~~	2874.8	~~1.71~~	1.72	~~0.10~~	0.10	~~8.0~~	8.3	~~17.3~~	15.1	~~504.4~~	506.6	~~503.4~~	505.6
S8	~~511.3~~	515.1	502.4	501.4	435.5	65.9	~~6.9~~	10.7	51.5	~~42.7~~	43.2	1697.8	~~1073.8~~	1244.5	1.78	0.44	~~2.2~~	2.5	~~63.7~~	63.4	~~53.3~~	54.2	~~1696.6~~	1717.5	~~1.78~~	1.78	~~0.11~~	0.11	~~7.0~~	7.0	~~9.2~~	9.5	~~493.1~~	492.9	~~492.1~~	491.9
S9	~~641.4~~	600.0	520.4	519.4	435.8	83.6	~~119.0~~	77.6	54.2	~~59.1~~	53.3	2265.5	~~7818.0~~	4915.9	1.75	0.44	~~8.6~~	6.7	~~75.0~~	77.0	~~79.6~~	74.4	~~2984.6~~	2861.7	~~1.71~~	1.72	~~0.10~~	0.10	~~8.1~~	8.3	~~16.8~~	15.0	~~503.6~~	505.4	~~502.6~~	504.4
S10	~~513.4~~	509.8	501.1	500.1	433.4	66.7	~~10.4~~	6.7	51.5	~~43.2~~	42.7	1717.9	~~1227.4~~	1068.2	1.78	0.44	~~2.5~~	2.2	~~64.2~~	64.4	~~54.2~~	53.3	~~1739.1~~	1717.5	~~1.78~~	1.78	~~0.11~~	0.11	~~7.0~~	7.1	~~9.5~~	9.3	~~491.5~~	491.8	~~490.5~~	490.8
S11	~~701.3~~	612.1	508.0	507.0	439.8	67.2	~~191.3~~	102.1	51.8	~~69.8~~	56.9	1741.0	~~14125.7~~	6586.9	1.77	0.44	~~10.3~~	7.3	~~56.9~~	59.9	~~81.4~~	77.0	~~2315.5~~	2306.0	~~1.75~~	1.75	~~0.10~~	0.10	~~6.2~~	6.5	~~16.5~~	13.8	~~491.5~~	494.2	~~490.5~~	493.2
S12	~~583.5~~	562.7	516.0	515.0	435.8	79.3	~~65.5~~	44.6	53.6	~~51.5~~	47.7	2123.8	~~4155.5~~	2908.2	1.76	0.44	~~5.9~~	4.7	~~73.3~~	74.5	~~71.3~~	65.9	~~2614.9~~	2455.3	~~1.73~~	1.74	~~0.10~~	0.10	~~8.0~~	8.1	~~13.9~~	12.8	~~502.1~~	503.2	~~501.1~~	502.2
S13	~~516.8~~	510.7	502.1	501.1	434.7	66.4	~~12.8~~	6.7	51.5	~~43.4~~	42.7	1709.1	~~1334.8~~	1064.8	1.78	0.44	~~2.7~~	2.2	~~63.7~~	64.1	~~55.1~~	53.3	~~1753.8~~	1708.6	~~1.77~~	1.78	~~0.11~~	0.11	~~7.0~~	7.0	~~9.6~~	9.3	~~492.4~~	492.8	~~491.4~~	491.8
S14	~~620.7~~	591.3	508.0	507.0	439.3	67.7	~~110.7~~	81.3	51.8	~~58.0~~	53.9	1754.7	~~7201.8~~	5160.0	1.77	0.44	~~7.7~~	6.4	~~60.1~~	61.3	~~78.1~~	73.6	~~2345.8~~	2254.9	~~1.75~~	1.75	~~0.10~~	0.10	~~6.6~~	6.7	~~14.2~~	13.1	~~493.8~~	494.9	~~492.8~~	493.9
S15	~~638.5~~	600.6	461.8	460.8	455.2	5.7	~~174.6~~	136.7	42.7	~~67.3~~	61.6	121.3	~~12537.7~~	9205.4	1.85	0.46	~~1.9~~	1.7	~~3.8~~	3.9	~~80.6~~	77.9	~~153.8~~	153.5	~~1.85~~	1.85	~~0.11~~	0.11	~~0.4~~	0.4	~~2.3~~	2.2	~~459.6~~	459.7	~~458.6~~	458.7



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- 3H:1V SLOPE (TYPICAL)
- EXISTING SLURRY WALL
- 71 — SETTLEMENT EVALUATION POINT
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

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- ☐ FOR INFORMATION PURPOSES ONLY
- ☒ FOR PERMITTING PURPOSES ONLY
- ☐ ISSUED FOR CONSTRUCTION
- ☐ CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-13 EVAL PTS.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OVERLINER SETTLEMENT
EVALUATION POINTS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

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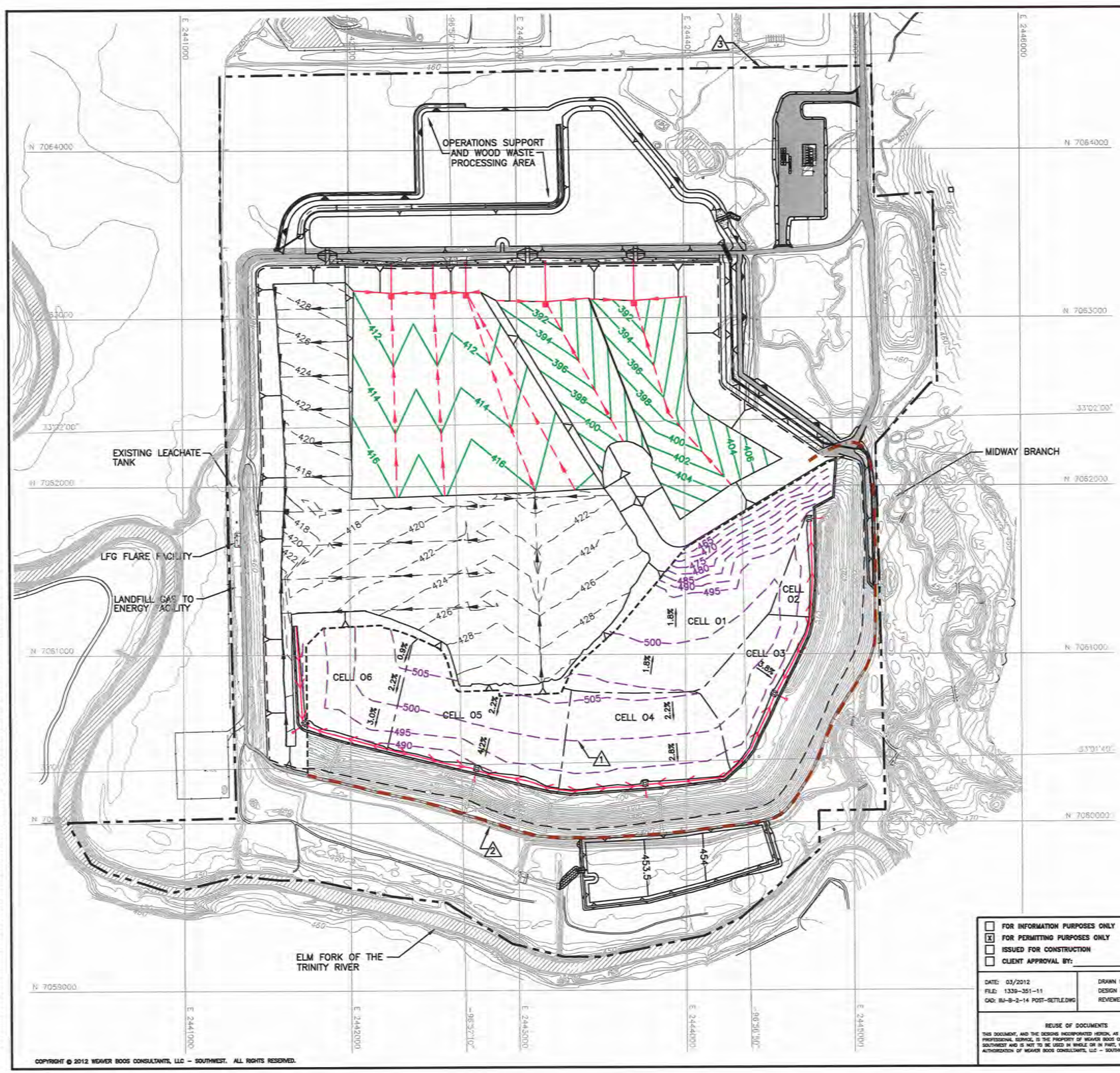

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE–SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS–BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 1 — 500 — OVERLINER POST SETTLEMENT CONTOURS
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- 3H:1V SLOPE (TYPICAL)
- 2 — EXISTING SLURRY WALL
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. UPDATED POST–SETTLEMENT CONTOURS.
2. REVISED SLURRY WALL TO EXISTING LOCATION.
3. UPDATED PERMIT BOUNDARY INFORMATION.

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339–351–11
CAD: IIIJ–B–2–14 POST–SETTLE.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT POST–SETTLEMENT OVERLINER MAP

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F–3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735–9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIJ–B–2–14

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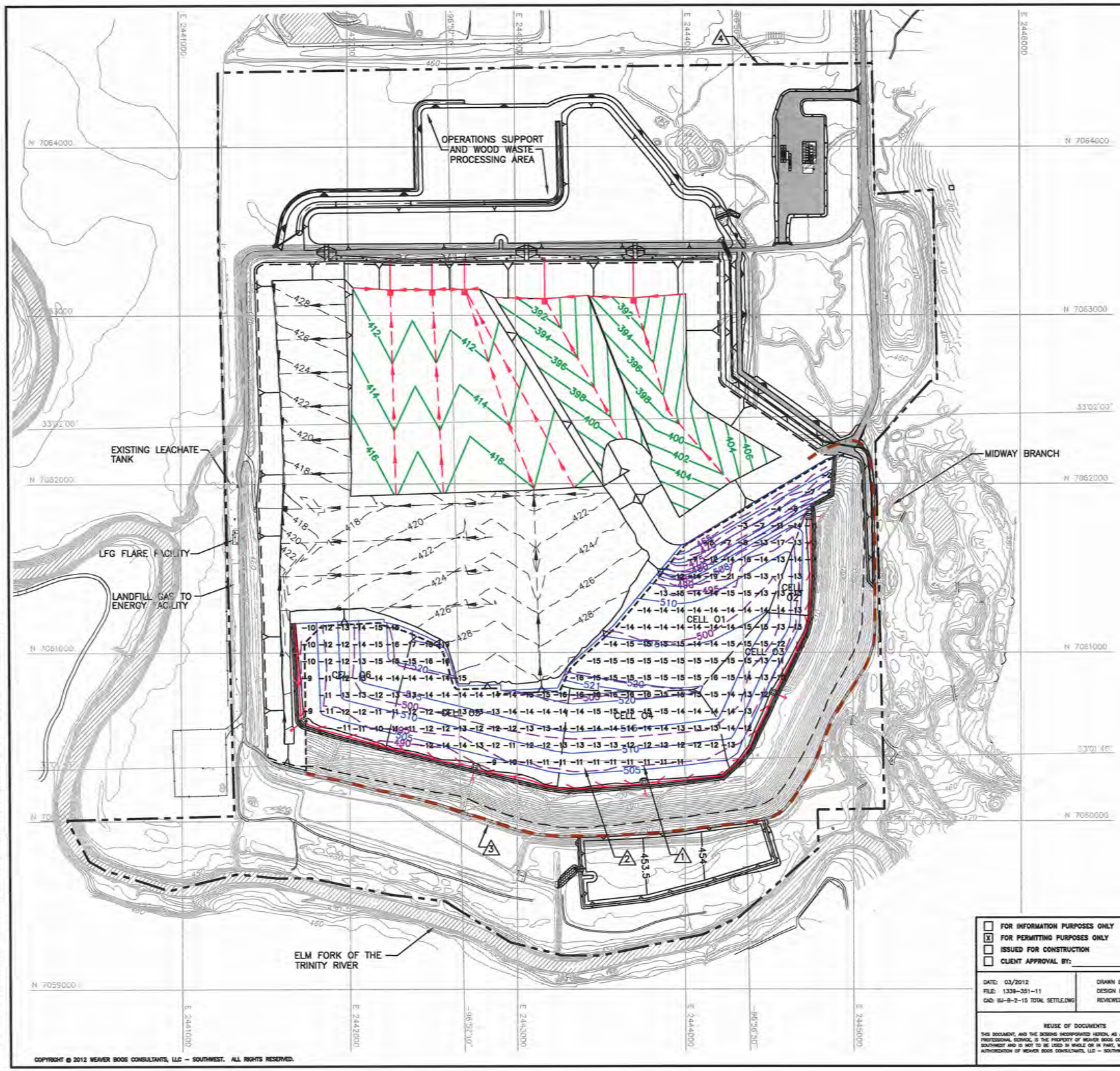

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 1 — 500 — OVERLINER POST SETTLEMENT CONTOURS
- 520 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- Y Y Y — 3H:1V SLOPE (TYPICAL)
- 3 — EXISTING SLURRY WALL
- 2 — 10 — TOTAL SETTLEMENT (FT)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. UPDATED POST-SETTLEMENT CONTOURS.
2. UPDATED TOTAL SETTLEMENT TICK MARKS.
3. REVISED SLURRY WALL TO EXISTING LOCATION.
4. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
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- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-15 TOTAL SETTLE.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER TOTAL SETTLEMENT

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
DRIFFTH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIJ-B-2-15

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIJ\IIIJ-B\IIIJ-B-2-15 TOTAL SETTLEMENT.dwg, sfordi, 1:2

Prep By: MDM
Date: 2/19/2016

CAMELOT LANDFILL
1339-351-11-02
APPENDIX IIIJ-B
OVERLINER SYSTEM TRENCH PIPE SETTLEMENT SUMMARY

Chkd By : _____
Date: _____

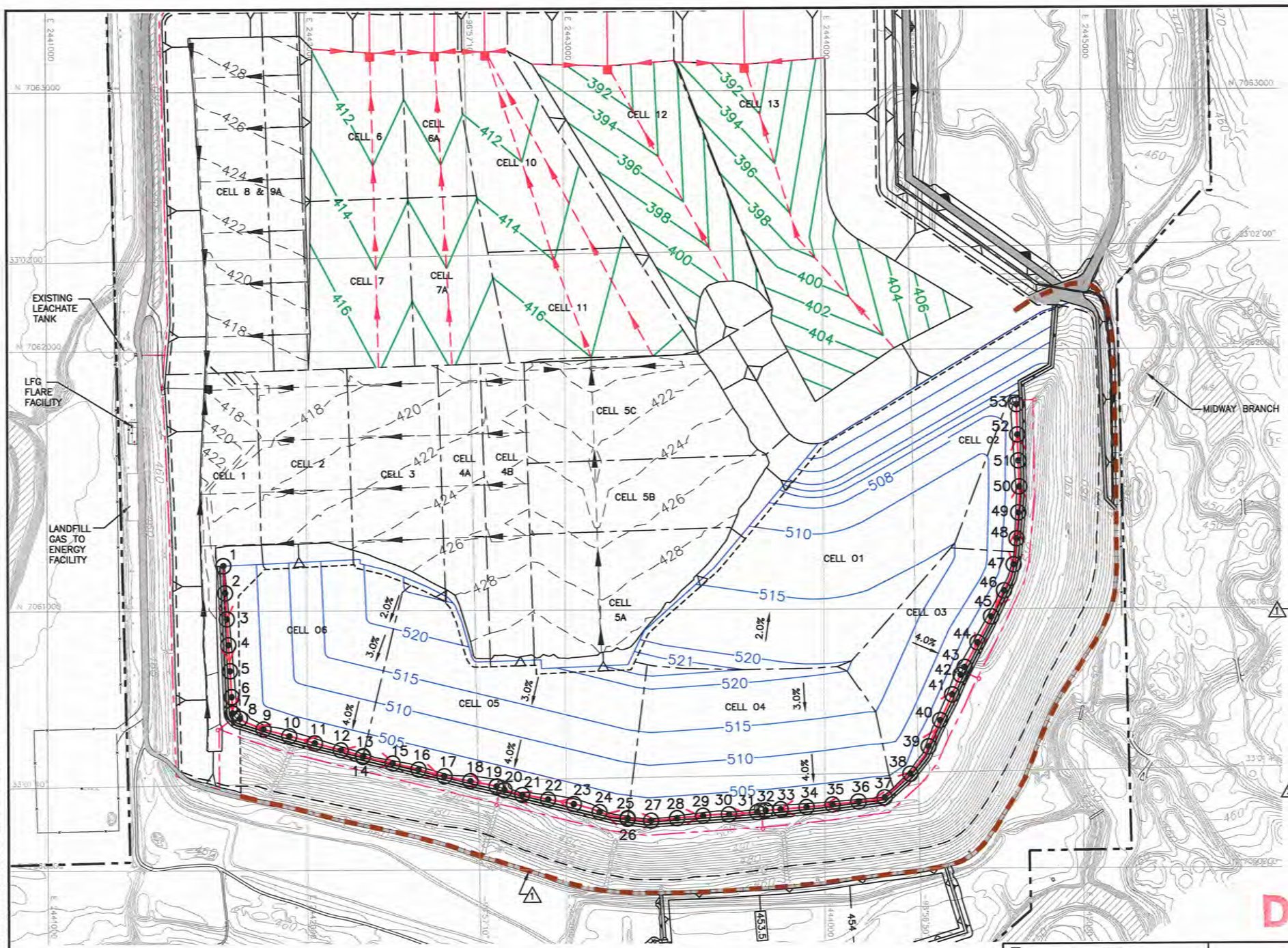
Evaluation Point	Top of Waste Elevation (ft-msl)	Initial Top of Overliner Elevation (in Trench) (ft-msl)	Initial Top of Waste Below Overliner Elevation (in Trench) (ft-msl)	Bottom of Waste Elevation (ft-msl)	H_o (ft)	T_{waste} (ft)	γ_{mswb} (pcf)	γ_{mswa} (pcf)	σ'_o (psf)	$\Delta\sigma$ (psf)	e_o	C_c	S_p (ft)	H'_o (ft)	γ'_{mswb} (pcf)	σ''_o (psf)	e'_o	α	S_c (ft)	Total Settlement (ft)	Post-Settlement Top of Overliner Elevation (in Trench) (ft-msl)	Post-Settlement Top of Waste Below Overliner Elevation (in Trench) (ft-msl)
1	508.6	496.8	495.8	431.9	63.9	8.8	51.2	43.0	1636.0	1158.3	1.8	0.45	2.4	61.5	50.9	1566.0	1.8	0.11	6.8	9.1	487.6	486.6
2	509.5	496.1	495.1	433.1	62.0	10.4	50.9	43.2	1579.3	1230.3	1.8	0.45	2.5	59.5	50.6	1507.1	1.8	0.11	6.5	9.0	487.1	486.1
3	510.5	495.5	494.5	433.9	60.6	12.0	50.6	43.4	1535.1	1301.3	1.8	0.45	2.6	58.0	50.3	1458.8	1.8	0.11	6.4	9.0	486.5	485.5
4	511.5	494.9	493.9	434.5	59.5	13.6	50.6	43.7	1505.1	1373.4	1.8	0.45	2.7	56.8	49.9	1416.1	1.8	0.11	6.2	8.9	486.0	485.0
5	512.5	494.3	493.3	434.8	58.5	15.2	50.3	44.0	1471.3	1446.4	1.8	0.45	2.8	55.8	49.9	1390.8	1.8	0.11	6.1	8.9	485.4	484.4
6	513.5	493.7	492.7	435.1	57.6	16.7	50.3	44.0	1448.1	1515.8	1.8	0.45	2.9	54.8	49.5	1355.6	1.8	0.11	6.0	8.9	484.8	483.8
7	510.7	493.1	492.1	435.9	56.2	14.6	49.9	43.7	1401.9	1418.6	1.8	0.45	2.7	53.5	49.5	1323.7	1.8	0.11	5.9	8.6	484.5	483.5
8	~~509.5~~ 505.6	490.8	489.8	440.5	49.3	~~15.7~~ 11.7	48.8	~~44.0~~ 43.4	1203.6	~~1470.2~~ 1290.0	1.8	0.45	~~2.7~~ 2.5	~~46.6~~ 46.8	48.0	~~1119.2~~ 1125.0	1.8	0.11	~~5.1~~ 5.2	~~7.9~~ 7.7	~~482.9~~ 483.1	~~481.9~~ 482.1
9	~~505.2~~ 501.6	491.6	490.6	436.8	53.7	~~10.7~~ 7.1	49.5	~~43.2~~ 43.0	1330.7	~~1240.4~~ 1082.9	1.8	0.45	~~2.5~~ 2.2	~~51.3~~ 51.5	49.1	~~1260.1~~ 1266.0	1.8	0.11	~~5.7~~ 5.7	~~8.1~~ 7.9	~~483.4~~ 483.6	~~482.4~~ 482.6
10	~~508.4~~ 503.3	492.3	491.3	437.1	54.2	~~13.1~~ 8.0	49.5	~~43.7~~ 43.0	1341.0	~~1354.7~~ 1124.4	1.8	0.45	~~2.6~~ 2.3	~~51.5~~ 51.9	49.1	~~1266.2~~ 1274.5	1.8	0.11	~~5.7~~ 5.7	~~8.3~~ 8.0	~~483.9~~ 484.2	~~482.9~~ 483.2
11	~~508.2~~ 503.1	492.9	491.9	437.7	54.2	~~12.3~~ 7.2	49.5	~~43.4~~ 43.0	1342.7	~~1315.5~~ 1090.2	1.8	0.45	~~2.6~~ 2.2	~~51.6~~ 52.0	49.1	~~1269.2~~ 1277.4	1.8	0.11	~~5.7~~ 5.7	~~8.3~~ 8.0	~~484.6~~ 484.9	~~483.6~~ 483.9
12	~~507.3~~ 502.9	493.5	492.5	437.2	55.3	~~10.8~~ 6.4	49.9	~~43.2~~ 42.7	1379.1	~~1245.8~~ 1052.9	1.8	0.45	~~2.5~~ 2.2	~~52.8~~ 53.1	~~49.1~~ 49.5	~~1297.7~~ 1314.8	1.8	0.11	~~5.8~~ 5.9	~~8.3~~ 8.0	~~485.2~~ 485.5	~~484.2~~ 484.5
13	~~505.0~~ 501.9	494.0	493.0	436.6	56.4	~~8.0~~ 4.9	49.9	~~43.0~~ 42.4	1407.1	~~1122.2~~ 986.6	1.8	0.45	~~2.3~~ 2.1	~~54.1~~ 54.3	49.5	~~1339.6~~ 1345.0	1.8	0.11	~~6.0~~ 6.0	~~8.3~~ 8.1	~~485.8~~ 486.0	~~484.8~~ 485.0
14	~~505.9~~ 502.5	493.0	492.0	436.6	55.4	~~9.8~~ 6.4	49.9	~~43.2~~ 42.7	1382.2	~~1205.0~~ 1054.9	1.8	0.45	~~2.4~~ 2.2	~~53.0~~ 53.2	~~49.1~~ 49.5	~~1302.2~~ 1317.7	1.8	0.11	~~5.8~~ 5.9	~~8.3~~ 8.1	~~484.8~~ 485.0	~~483.8~~ 484.0
15	~~504.6~~ 502.1	492.3	491.3	435.9	55.4	~~9.2~~ 6.8	49.9	~~43.2~~ 42.7	1381.8	~~1178.3~~ 1070.6	1.8	0.45	~~2.4~~ 2.2	~~53.0~~ 53.2	49.5	~~1312.6~~ 1316.7	1.8	0.11	~~5.8~~ 5.9	~~8.2~~ 8.1	~~484.1~~ 484.3	~~483.1~~ 483.3
16	~~504.2~~ 501.8	491.7	490.7	435.7	55.0	~~9.5~~ 7.1	49.5	~~43.2~~ 43.0	1361.4	~~1188.5~~ 1084.0	1.8	0.45	~~2.4~~ 2.2	~~52.6~~ 52.7	49.1	~~1292.1~~ 1296.0	1.8	0.11	~~5.8~~ 5.8	~~8.2~~ 8.1	~~483.5~~ 483.7	~~482.5~~ 482.7
17	~~502.4~~ 501.0	491.0	490.0	436.0	54.0	~~8.4~~ 7.0	49.5	~~43.0~~ 42.7	1337.2	~~1141.2~~ 1077.0	1.8	0.45	~~2.3~~ 2.2	~~51.7~~ 51.8	49.1	~~1270.1~~ 1272.5	1.8	0.11	~~5.7~~ 5.7	~~8.0~~ 7.9	~~483.0~~ 483.1	~~482.0~~ 482.1
18	~~505.4~~ 502.0	490.4	489.4	436.2	53.2	~~12.0~~ 8.6	49.5	~~43.4~~ 43.0	1317.9	~~1301.6~~ 1149.2	1.8	0.45	~~2.5~~ 2.3	~~50.7~~ 50.9	48.8	~~1236.0~~ 1241.4	1.8	0.11	~~5.6~~ 5.6	~~8.1~~ 7.9	~~482.3~~ 482.5	~~481.3~~ 481.5
19	~~506.7~~ 503.1	489.8	488.8	436.2	52.6	~~13.9~~ 10.3	49.1	~~43.7~~ 43.2	1291.8	~~1386.3~~ 1224.4	1.8	0.45	~~2.7~~ 2.4	~~49.9~~ 50.1	48.8	~~1216.9~~ 1222.4	1.8	0.11	~~5.5~~ 5.5	~~8.2~~ 8.0	~~481.6~~ 481.8	~~480.6~~ 480.8
20	~~504.9~~ 501.8	492.0	491.0	436.2	54.8	~~9.9~~ 6.8	49.5	~~43.2~~ 42.7	1356.8	~~1206.4~~ 1069.8	1.8	0.45	~~2.4~~ 2.2	~~52.4~~ 52.6	49.1	~~1286.9~~ 1292.1	1.8	0.11	~~5.8~~ 5.8	~~8.2~~ 8.0	~~483.8~~ 484.0	~~482.8~~ 483.0
21	~~504.5~~ 502.2	493.1	492.1	436.1	55.9	~~8.4~~ 6.1	49.9	~~43.0~~ 42.7	1395.6	~~1139.7~~ 1039.4	1.8	0.45	~~2.3~~ 2.2	~~53.6~~ 53.8	49.5	~~1327.6~~ 1331.5	1.8	0.11	~~5.9~~ 5.9	~~8.2~~ 8.1	~~484.8~~ 485.0	~~483.8~~ 484.0
22	~~509.9~~ 506.1	494.6	493.6	436.0	57.6	~~12.3~~ 8.5	50.3	~~43.4~~ 43.0	1447.3	~~1314.7~~ 1143.6	1.8	0.45	~~2.6~~ 2.3	~~55.0~~ 55.3	49.9	~~1372.0~~ 1378.4	1.8	0.11	~~6.1~~ 6.1	~~8.6~~ 8.4	~~486.0~~ 486.2	~~485.0~~ 485.2
23	~~512.4~~ 510.0	496.2	495.2	435.6	59.6	~~13.2~~ 10.8	50.6	~~43.7~~ 43.2	1508.3	~~1357.1~~ 1248.1	1.8	0.45	~~2.7~~ 2.5	~~56.9~~ 57.1	~~49.9~~ 50.3	~~1419.9~~ 1434.5	1.8	0.11	~~6.3~~ 6.3	~~8.9~~ 8.8	~~487.3~~ 487.4	~~486.3~~ 486.4
24	~~510.7~~ 511.6	497.8	496.8	435.1	61.7	~~9.9~~ 10.8	50.9	~~43.2~~ 43.2	1571.2	~~1207.2~~ 1248.3	1.8	0.45	~~2.4~~ 2.5	~~59.3~~ 59.2	50.6	~~1500.1~~ 1498.5	1.8	0.11	~~6.5~~ 6.5	~~9.0~~ 9.0	~~488.8~~ 488.8	~~487.8~~ 487.8
25	~~509.9~~ 514.7	499.5	498.5	434.6	63.9	~~7.4~~ 12.2	51.2	~~43.0~~ 43.4	1636.9	~~1097.8~~ 1309.1	1.8	0.45	~~2.3~~ 2.6	~~61.6~~ 61.3	50.9	~~1569.4~~ 1560.9	1.8	0.11	~~6.8~~ 6.7	~~9.1~~ 9.3	~~490.4~~ 490.2	~~489.4~~ 489.2
26	~~509.1~~ 513.9	500.5	499.5	434.5	65.0	~~5.6~~ 10.4	51.2	~~42.7~~ 43.2	1663.6	~~1020.2~~ 1230.2	1.8	0.44	~~2.2~~ 2.5	~~62.8~~ 62.5	50.9	~~1599.0~~ 1590.3	1.8	0.11	~~6.9~~ 6.9	~~9.1~~ 9.4	~~491.4~~ 491.1	~~490.4~~ 490.1
27	~~509.7~~ 513.3	499.9	498.9	434.2	64.7	~~6.8~~ 10.3	51.2	~~42.7~~ 43.2	1656.9	~~1068.3~~ 1226.1	1.8	0.44	~~2.2~~ 2.5	~~62.5~~ 62.2	50.9	~~1590.4~~ 1583.9	1.8	0.11	~~6.9~~ 6.8	~~9.1~~ 9.3	~~490.8~~ 490.6	~~489.8~~ 489.6
28	~~510.1~~ 513.1	499.3	498.3	434.0	64.3	~~7.8~~ 10.7	51.2	~~43.0~~ 43.2	1647.3	~~1115.5~~ 1243.5	1.8	0.44	~~2.3~~ 2.5	~~62.0~~ 61.8	50.9	~~1578.9~~ 1573.8	1.8	0.11	~~6.8~~ 6.8	~~9.1~~ 9.3	~~490.2~~ 490.0	~~489.2~~ 489.0
29	~~510.5~~ 511.5	498.7	497.7	433.7	64.0	~~8.8~~ 9.7	51.2	~~43.0~~ 43.2	1639.4	~~1158.1~~ 1199.7	1.8	0.44	~~2.4~~ 2.4	~~61.6~~ 61.6	50.9	~~1569.3~~ 1567.7	1.8	0.11	~~6.8~~ 6.8	~~9.2~~ 9.2	~~489.6~~ 489.5	~~488.6~~ 488.5
30	~~510.3~~ 509.7	498.1	497.1	433.4	63.8	~~9.2~~ 8.6	51.2	~~43.2~~ 43.0	1632.7	~~1176.6~~ 1147.3	1.8	0.45	~~2.4~~ 2.4	~~61.3~~ 61.4	50.9	~~1562.1~~ 1563.2	1.8	0.11	~~6.7~~ 6.7	~~9.1~~ 9.1	~~489.0~~ 489.0	~~488.0~~ 488.0
31	~~510.4~~ 507.9	497.5	496.5	433.0	63.4	~~9.9~~ 7.5	51.2	~~43.2~~ 43.0	1624.8	~~1208.8~~ 1100.5	1.8	0.45	~~2.5~~ 2.3	~~61.0~~ 61.2	~~50.6~~ 50.9	~~1543.9~~ 1557.4	1.8	0.11	~~6.7~~ 6.7	~~9.2~~ 9.0	~~488.3~~ 488.5	~~487.3~~ 487.5
32	~~511.6~~ 508.5	495.9	494.9	433.0	61.9	~~12.7~~ 9.6	50.9	~~43.4~~ 43.2	1577.0	~~1330.0~~ 1196.1	1.8	0.45	~~2.6~~ 2.4	~~59.3~~ 59.5	50.6	~~1501.2~~ 1506.3	1.8	0.11	~~6.5~~ 6.5	~~9.2~~ 9.0	~~486.8~~ 486.9	~~485.8~~ 485.9
33	~~511.3~~ 508.0	496.3	495.3	432.8	62.5	~~12.1~~ 8.8	50.9	~~43.4~~ 43.0	1590.2	~~1304.9~~ 1157.1	1.8	0.45	~~2.6~~ 2.4	~~59.8~~ 60.1	50.6	~~1515.1~~ 1520.8	1.8	0.11	~~6.6~~ 6.6	~~9.2~~ 9.0	~~487.1~~ 487.3	~~486.1~~ 486.3
34	~~510.7~~ 507.2	496.9	495.9	432.5	63.4	~~10.9~~ 7.3	51.2	~~43.2~~ 43.0	1623.8	~~1249.2~~ 1094.7	1.8	0.45	~~2.5~~ 2.3	~~60.9~~ 61.1	~~50.6~~ 50.9	~~1541.3~~ 1556.6	1.8	0.11	~~6.7~~ 6.7	~~9.2~~ 9.0	~~487.7~~ 487.9	~~486.7~~ 486.9
35	~~510.5~~ 506.7	497.5	496.5	432.1	64.3	~~10.0~~ 6.3	51.2	~~43.2~~ 42.7	1647.6	~~1211.0~~ 1047.6	1.8	0.44	~~2.5~~ 2.2	~~61.9~~ 62.1	50.9	~~1575.3~~ 1582.0	1.8	0.11	~~6.8~~ 6.8	~~9.3~~ 9.0	~~488.2~~ 488.5	~~487.2~~ 487.5
36	~~509.9~~ 506.5	498.1	497.1	431.8	65.2	~~8.8~~ 5.4	51.5	~~43.0~~ 42.7	1680.5	~~1157.5~~ 1012.4	1.8	0.44	~~2.4~~ 2.1	~~62.9~~ 63.1	~~50.9~~ 51.2	~~1600.7~~ 1616.1	1.8	0.11	~~6.9~~ 6.9	~~9.3~~ 9.1	~~488.8~~ 489.0	~~487.8~~ 488.0
37	~~509.9~~ 505.8	498.7	497.7	431.6	66.1	~~8.2~~ 4.1	51.5	~~43.0~~ 42.4	1703.2	~~1132.2~~ 954.6	1.8	0.44	~~2.3~~ 2.0	~~63.8~~ 64.1	51.2	~~1633.5~~ 1641.1	1.8	0.11	~~7.0~~ 7.0	~~9.3~~ 9.1	~~489.3~~ 489.6	~~488.3~~ 488.6
38	~~510.5~~ 506.3	498.5	497.5	431.7	65.8	~~9.0~~ 4.8	51.5	~~43.0~~ 42.4	1694.0	~~1165.7~~ 983.3	1.8	0.44	~~2.4~~ 2.1	~~63.4~~ 63.7	51.2	~~1623.0~~ 1630.7	1.8	0.11	~~7.0~~ 7.0	~~9.4~~ 9.1	~~489.1~~ 489.4	~~488.1~~ 488.4

Prep By: MDM
Date: 2/19/2016

CAMELOT LANDFILL
1339-351-11-02
APPENDIX IIIJ-B
OVERLINER SYSTEM TRENCH PIPE SETTLEMENT SUMMARY

Chkd By : _____
Date: _____

Evaluation Point	Top of Waste Elevation (ft-msl)	Initial Top of Overliner Elevation (in Trench) (ft-msl)	Initial Top of Waste Below Overliner Elevation (in Trench) (ft-msl)	Bottom of Waste Elevation (ft-msl)	H_o (ft)	T_{waste} (ft)	γ_{mswb} (pcf)	γ_{mswa} (pcf)	σ'_o (psf)	$\Delta\sigma$ (psf)	e_o	C_c	S_p (ft)	H'_o (ft)	γ'_{mswb} (pcf)	σ''_o (psf)	e'_o	α	S_c (ft)	Total Settlement (ft)	Post-Settlement Top of Overliner Elevation (in Trench) (ft-msl)	Post-Settlement Top of Waste Below Overliner Elevation (in Trench) (ft-msl)
39	~~511.1~~ 506.7	497.7	496.7	432.0	64.7	~~10.4~~ 6.0	51.2	~~43.2~~ 42.7	1656.4	~~1229.4~~ 1037.0	1.8	0.44	~~2.5~~ 2.2	~~62.2~~ 62.5	50.9	~~1583.3~~ 1591.2	1.8	0.11	~~6.8~~ 6.9	~~9.3~~ 9.1	~~488.4~~ 488.6	~~487.4~~ 487.6
40	~~511.7~~ 507.1	497.0	496.0	432.5	63.5	~~11.6~~ 7.1	51.2	~~43.4~~ 43.0	1627.4	~~1285.1~~ 1084.0	1.8	0.45	~~2.6~~ 2.3	~~61.0~~ 61.3	~~50.6~~ 50.9	~~1543.5~~ 1560.6	1.8	0.11	~~6.7~~ 6.7	~~9.3~~ 9.0	~~487.8~~ 488.0	~~486.8~~ 487.0
41	~~512.2~~ 507.5	496.4	495.4	432.9	62.5	~~12.9~~ 8.1	50.9	~~43.4~~ 43.0	1590.9	~~1338.4~~ 1129.4	1.8	0.45	~~2.7~~ 2.3	~~59.8~~ 60.1	50.6	~~1514.5~~ 1522.6	1.8	0.11	~~6.6~~ 6.6	~~9.2~~ 8.9	~~487.1~~ 487.4	~~486.1~~ 486.4
42	~~512.4~~ 507.7	495.9	494.9	433.2	61.6	~~13.5~~ 8.8	50.9	~~43.7~~ 43.0	1569.5	~~1370.9~~ 1156.8	1.8	0.45	~~2.7~~ 2.4	~~58.9~~ 59.3	~~50.3~~ 50.6	~~1481.3~~ 1500.4	1.8	0.11	~~6.5~~ 6.5	~~9.2~~ 8.9	~~486.7~~ 487.0	~~485.7~~ 486.0
43	~~512.3~~ 507.6	496.1	495.1	433.3	61.7	~~13.2~~ 8.5	50.9	~~43.7~~ 43.0	1571.8	~~1358.7~~ 1146.1	1.8	0.45	~~2.7~~ 2.4	~~59.1~~ 59.4	50.6	~~1494.9~~ 1503.1	1.8	0.11	~~6.5~~ 6.5	~~9.2~~ 8.9	~~486.9~~ 487.2	~~485.9~~ 486.2
44	~~511.9~~ 507.3	496.7	495.7	433.7	62.0	~~12.2~~ 7.6	50.9	~~43.4~~ 43.0	1579.9	~~1311.1~~ 1106.4	1.8	0.45	~~2.6~~ 2.3	~~59.4~~ 59.8	50.6	~~1504.6~~ 1512.7	1.8	0.11	~~6.5~~ 6.6	~~9.1~~ 8.9	~~487.6~~ 487.8	~~486.6~~ 486.8
45	~~511.4~~ 506.9	497.4	496.4	433.9	62.5	~~11.0~~ 6.5	50.9	~~43.2~~ 42.7	1590.2	~~1255.4~~ 1059.1	1.8	0.45	~~2.5~~ 2.2	~~59.9~~ 60.2	50.6	~~1517.0~~ 1524.8	1.8	0.11	~~6.6~~ 6.6	~~9.1~~ 8.8	~~488.3~~ 488.5	~~487.3~~ 487.5
46	~~510.8~~ 506.5	498.1	497.1	434.1	62.9	~~9.8~~ 5.5	50.9	~~43.2~~ 42.7	1601.7	~~1201.5~~ 1013.2	1.8	0.45	~~2.4~~ 2.1	~~60.5~~ 60.8	50.6	~~1530.4~~ 1538.1	1.8	0.11	~~6.6~~ 6.7	~~9.1~~ 8.8	~~489.0~~ 489.2	~~488.0~~ 488.2
47	~~510.2~~ 506.1	498.7	497.7	434.4	63.3	~~8.5~~ 4.4	51.2	~~43.0~~ 42.4	1621.8	~~1146.9~~ 967.5	1.8	0.45	~~2.4~~ 2.1	~~61.0~~ 61.3	~~50.6~~ 50.9	~~1543.5~~ 1560.0	1.8	0.11	~~6.7~~ 6.7	~~9.1~~ 8.8	~~489.6~~ 489.9	~~488.6~~ 488.9
48	~~510.3~~ 506.1	498.7	497.7	434.8	62.9	~~8.6~~ 4.4	50.9	~~43.0~~ 42.4	1602.0	~~1148.5~~ 968.9	1.8	0.45	~~2.4~~ 2.1	~~60.5~~ 60.8	50.6	~~1532.8~~ 1540.3	1.8	0.11	~~6.7~~ 6.7	~~9.0~~ 8.8	~~489.7~~ 489.9	~~488.7~~ 488.9
49	~~510.8~~ 506.5	498.1	497.1	435.1	61.9	~~9.7~~ 5.4	50.9	~~43.2~~ 42.7	1577.1	~~1199.0~~ 1011.1	1.8	0.45	~~2.4~~ 2.1	~~59.5~~ 59.8	50.6	~~1506.3~~ 1513.9	1.8	0.11	~~6.5~~ 6.6	~~9.0~~ 8.7	~~489.1~~ 489.4	~~488.1~~ 488.4
50	~~511.3~~ 506.9	497.5	496.5	435.6	60.9	~~10.8~~ 6.4	50.6	~~43.2~~ 42.7	1541.6	~~1247.3~~ 1052.2	1.8	0.45	~~2.5~~ 2.2	~~58.4~~ 58.7	50.3	~~1467.2~~ 1474.9	1.8	0.11	~~6.4~~ 6.5	~~8.9~~ 8.7	~~488.5~~ 488.8	~~487.5~~ 487.8
51	~~511.8~~ 507.2	496.9	495.9	436.1	59.8	~~11.9~~ 7.3	50.6	~~43.4~~ 43.0	1514.4	~~1298.1~~ 1095.1	1.8	0.45	~~2.6~~ 2.3	~~57.2~~ 57.6	50.3	~~1438.5~~ 1446.4	1.8	0.11	~~6.3~~ 6.3	~~8.9~~ 8.6	~~488.0~~ 488.3	~~487.0~~ 487.3
52	~~512.3~~ 507.6	496.3	495.3	436.5	58.8	~~13.0~~ 8.3	50.3	~~43.7~~ 43.0	1477.6	~~1349.9~~ 1136.3	1.8	0.45	~~2.7~~ 2.3	~~56.1~~ 56.5	49.9	~~1400.4~~ 1408.4	1.8	0.11	~~6.2~~ 6.2	~~8.8~~ 8.6	~~487.4~~ 487.7	~~486.4~~ 486.7
53	~~512.9~~ 508.0	495.6	494.6	437.0	57.5	~~14.4~~ 9.4	50.3	~~43.7~~ 43.2	1445.8	~~1407.4~~ 1187.5	1.8	0.45	~~2.7~~ 2.4	~~54.8~~ 55.1	~~49.5~~ 49.9	~~1357.0~~ 1375.2	1.8	0.11	~~6.0~~ 6.1	~~8.8~~ 8.5	~~486.8~~ 487.1	~~485.8~~ 486.1
Bottom Cell O2 Sump	~~514.3~~ 509.3	493.3	492.3	437.2	55.1	~~18.0~~ 13.0	49.9	~~44.2~~ 43.4	1375.4	~~1577.1~~ 1343.8	1.8	0.45	~~2.9~~ 2.6	~~52.2~~ 52.5	49.1	~~1282.9~~ 1290.6	1.8	0.11	~~5.8~~ 5.8	~~8.7~~ 8.4	~~484.6~~ 484.9	~~483.6~~ 483.9
Bottom Cell O3 Sump	~~515.3~~ 509.5	493.6	492.6	433.4	59.2	~~18.7~~ 12.9	50.6	~~44.2~~ 43.4	1499.6	~~1604.9~~ 1338.3	1.8	0.45	~~3.0~~ 2.6	~~56.2~~ 56.6	49.9	~~1402.9~~ 1412.1	1.8	0.11	~~6.2~~ 6.2	~~9.2~~ 8.9	~~484.4~~ 484.7	~~483.4~~ 483.7
Bottom Cell O4 Sump	~~513.3~~ 510.1	493.6	492.6	433.1	59.5	~~16.7~~ 13.5	50.6	~~44.0~~ 43.7	1506.5	~~1512.4~~ 1369.2	1.8	0.45	~~2.9~~ 2.7	~~56.6~~ 56.8	49.9	~~1412.6~~ 1417.6	1.8	0.11	~~6.2~~ 6.3	~~9.1~~ 8.9	~~484.5~~ 484.7	~~483.5~~ 483.7
Bottom Cell O5 Sump	~~508.7~~ 504.2	487.6	486.6	436.2	50.4	~~18.1~~ 13.6	48.8	~~44.2~~ 43.7	1228.2	~~1579.3~~ 1374.7	1.8	0.45	~~2.9~~ 2.6	~~47.5~~ 47.7	48.4	~~1148.6~~ 1155.0	1.8	0.11	~~5.2~~ 5.3	~~8.1~~ 7.9	~~479.5~~ 479.7	~~478.5~~ 478.7
Bottom Cell O6 Sump	~~512.0~~ 507.2	488.5	487.5	438.5	49.0	~~20.5~~ 15.7	48.8	~~44.4~~ 44.0	1195.1	~~1692.0~~ 1472.2	1.8	0.45	~~3.0~~ 2.7	~~46.0~~ 46.3	48.0	~~1104.4~~ 1110.9	1.8	0.11	~~5.1~~ 5.1	~~8.1~~ 7.9	~~480.4~~ 480.6	~~479.4~~ 479.6



0 200 400
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- CELL BOUNDARY
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- 3H:1V SLOPE (TYPICAL)
- EXISTING SLURRY WALL
- 40 — OVERLINER PIPE EVALUATION POINT
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-18 PIPE PTS.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OVERLINER PIPE EVALUATION POINTS

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIJ-B-2-18

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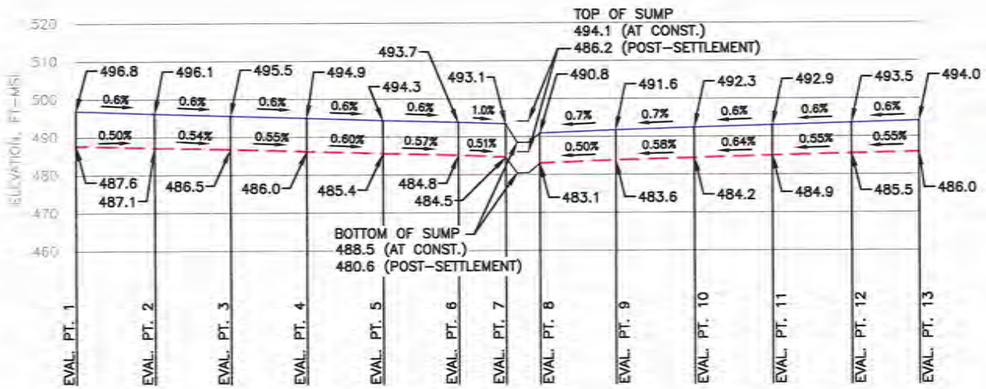
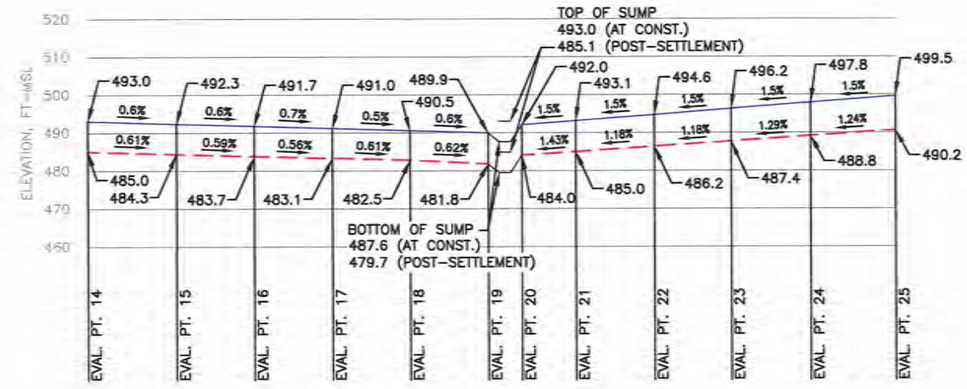
O:\1339\351\EXPANSION 2009\PART III-SD\IIIJ\IIIJ-B\IIIJ-B-2-18 PIPE EVAL PTS.dwg, sfor4, 1:2



1 CELL 01 PIPE PROFILE

0 100 200 HORIZONTAL
SCALE IN FEET
0 20 40 VERTICAL
SCALE IN FEET



1 CELL 02 PIPE PROFILE

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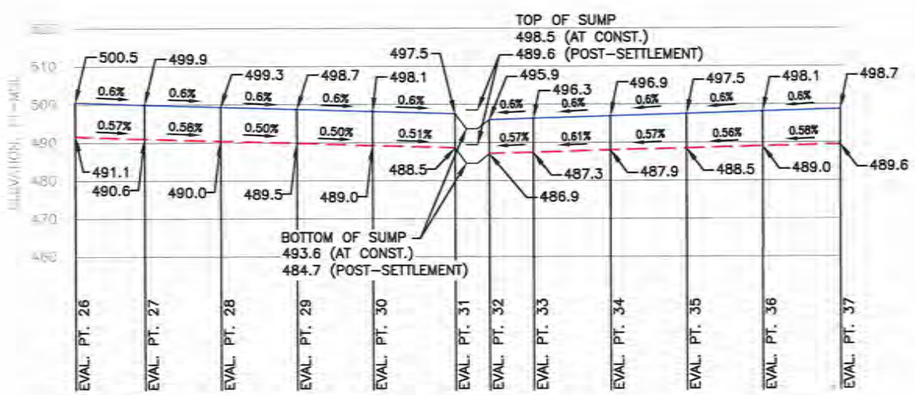
SCALE IN FEET
0 20 40 VERTICAL
SCALE IN FEET



1 CELL 03 PIPE PROFILE

0 100 200 HORIZONTAL
SCALE IN FEET
0 20 40 VERTICAL
SCALE IN FEET

1 INDICATES REVISION
(SEE LIST OF REVISIONS)

LIST OF REVISIONS:
1. UPDATED PIPE PROFILES.

LEGEND

AT CONSTRUCTION GRADE

AFTER SETTLEMENT GRADE

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-19 PIPE PROFILE.DWG

DRAWN BY: VRS
DESIGN BY: MDM
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CITY OF FARMERS BRANCH

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MAJOR PERMIT AMENDMENT OVERLINER PIPE PROFILE

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SHEET IIIJ-B-2-19

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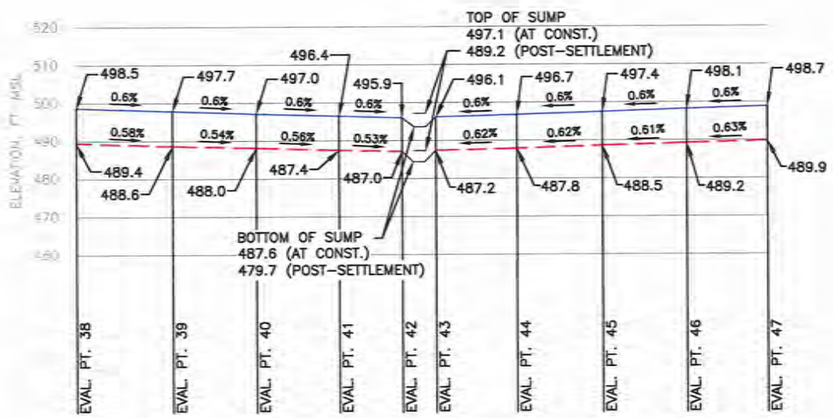
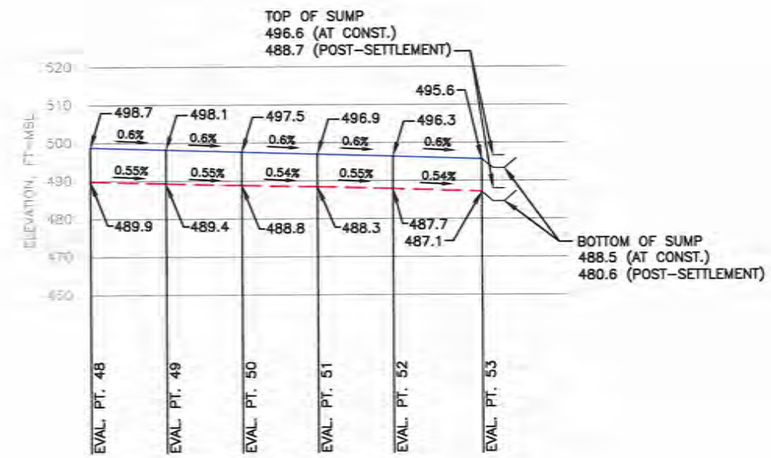
O:\1339\351\EXPANSION 2009\PART III-SDP\IIIJ\IIIJ-B\IIIJ-B-2-19 PIPE PROFILE.dwg, sford, 1:2



1 CELL 05 PIPE PROFILE

0 100 200 HORIZONTAL
SCALE IN FEET

0 20 40 VERTICAL
SCALE IN FEET



1 CELL 06 PIPE PROFILE

0 100 200 HORIZONTAL
SCALE IN FEET

0 20 40 VERTICAL
SCALE IN FEET

1 INDICATES REVISION
(SEE LIST OF REVISIONS)

LIST OF REVISIONS:
1. UPDATED PIPE PROFILES.

DRAFT

LEGEND

AT CONSTRUCTION GRADE

AFTER SETTLEMENT GRADE

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DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-20 PIPE PROFILE.DWG

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CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT OVERLINER PIPE PROFILE

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DENTON COUNTY, TEXAS

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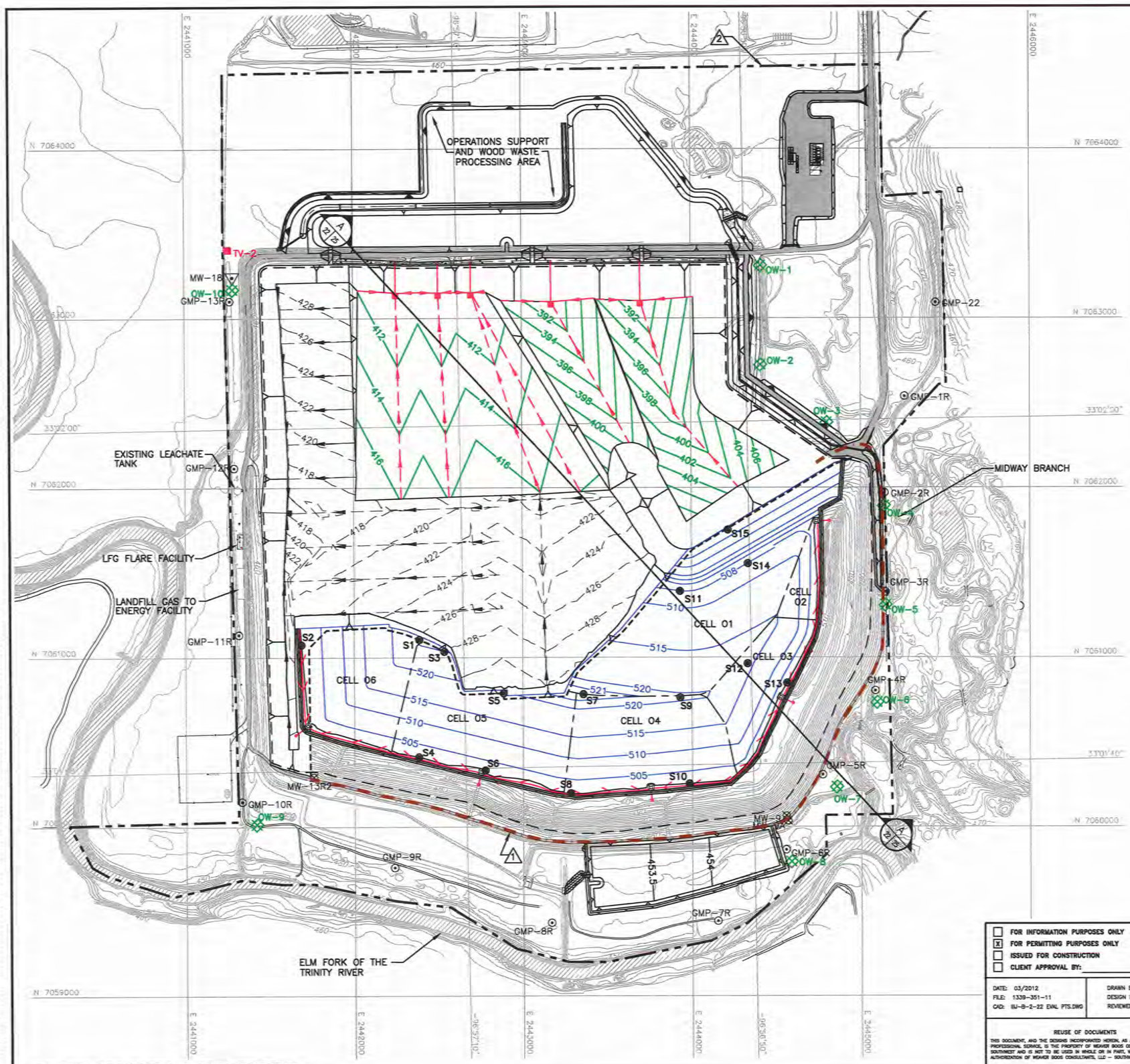
CAMELOT LANDFILL
1339-351-11-02
APPENDIX IIIJ-B
OVERLINER SYSTEM PERCENT STRAIN SUMMARY

Evalution Point[1]		Initial Top of Overliner Elevation (ft-msl)		Post-Settlement Top of Overliner Elevation (ft-msl)				Plan View Distance (ft)	L_o (ft)	L_f (ft)		Strain (%)	
A	B	A	B	A		B							
S1	S2	522.9	498.4	~~505.2~~	508.0	489.4		696.8	697.19	~~696.94~~	697.01	~~-0.036~~	-0.026
S3	S4	523.0	496.1	~~505.3~~	508.0	~~487.5~~	487.8	640.2	640.77	~~640.46~~	640.53	~~-0.049~~	-0.038
S5	S6	519.8	497.2	~~503.8~~	505.2	~~488.4~~	488.7	468.2	468.70	~~468.42~~	468.45	~~-0.061~~	-0.053
S7	S8	521.7	502.4	~~504.4~~	506.6	~~493.1~~	492.9	589.3	589.57	~~589.36~~	589.41	~~-0.036~~	-0.027
S9	S10	520.4	501.1	~~503.6~~	505.4	~~491.5~~	491.8	511.8	512.16	~~511.94~~	511.98	~~-0.043~~	-0.036
S9	S11	520.4	508.0	~~503.6~~	505.4	~~491.5~~	494.2	627.5	627.59	~~627.59~~	627.57	~~-0.001~~	-0.004
S12	S13	516.0	502.1	~~502.1~~	503.2	~~492.4~~	492.8	259.8	260.16	~~259.96~~	259.99	~~-0.075~~	-0.064
S14	S15	508.0	461.8	~~493.8~~	494.9	~~459.6~~	459.7	230.8	235.36	~~233.31~~	233.46	~~-0.869~~	-0.808

[1] Refer to Sheet IIIJ-B-2-22 for evaluation point locations.



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE
- LIMITS OF PRE-SUBTITLE D WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 398 — PROPOSED EXCAVATION CONTOUR
- PROPOSED LEACHATE LINE
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE RISER
- 422 — AS-BUILT TOP OF SUBTITLE D CLAY LINER
- EXISTING LEACHATE LINE
- EXISTING LEACHATE COLLECTION SUMP
- EXISTING LEACHATE RISER
- 515 — PROPOSED TOP OF OVERLINER CONTOUR
- PROPOSED OVERLINER LEACHATE LINE
- PROPOSED OVERLINER LEACHATE COLLECTION SUMP
- 3H:1V SLOPE (TYPICAL)
- 1 — EXISTING SLURRY WALL
- S12 — STRAIN/SLOPE EVALUATION POINT
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED PERMIT BOUNDARY INFORMATION.

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- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
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DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-22 EVAL PTS.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
OVERLINER STRAIN/SLOPE EVALUATION POINTS
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIJ\IIIJ-B\IIIJ-B-2-22 STRAIN_SLOPE EVAL PTS.dwg, sfor4, 1:2

OVERLINER

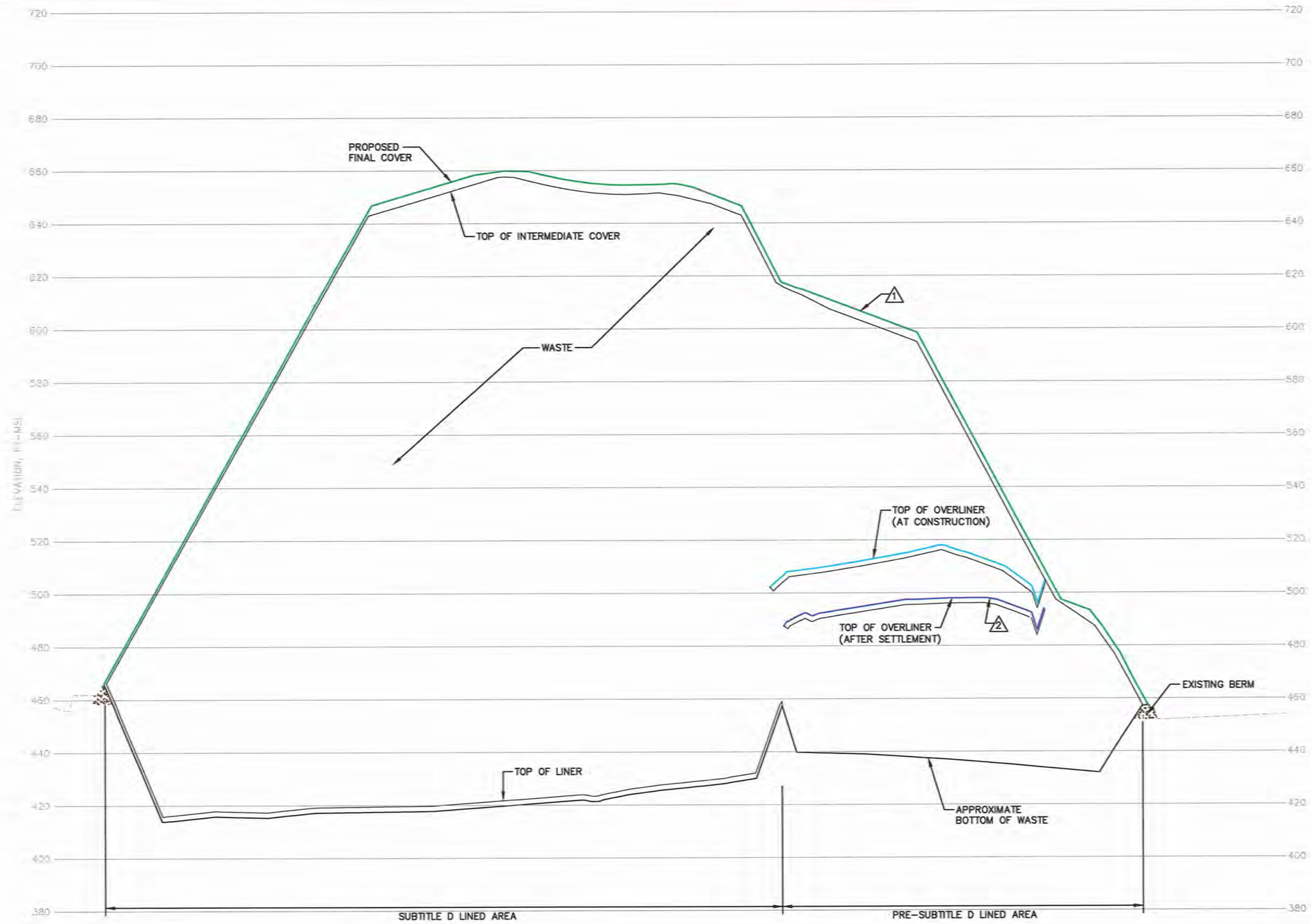
Evalution Point[1]		Initial Top of Overliner Elevation (ft-msl)		Post-Settlement Top of Overliner Elevation (ft-msl)				Plan View Distance (ft)	Initial Slope (%)	Post-Settlement Slope (%)	
A	B	A	B	A		B					
S1	S2	522.9	498.4	~~505.2~~	508.0	489.4		696.8	3.5	~~2.27~~	2.68
S3	S4	523.0	496.1	~~505.3~~	508.0	~~487.5~~	487.8	640.2	4.2	~~2.78~~	3.16
S5	S6	519.8	497.2	~~503.8~~	505.2	~~488.4~~	488.7	468.2	4.8	~~3.31~~	3.54
S7	S8	521.7	502.4	~~504.4~~	506.6	~~493.1~~	492.9	589.3	3.3	~~1.91~~	2.32
S9	S10	520.4	501.1	~~503.6~~	505.4	~~491.5~~	491.8	511.8	3.8	~~2.36~~	2.66
S9	S11	520.4	508.0	~~503.6~~	505.4	~~491.5~~	494.2	627.5	2.0	~~1.94~~	1.79
S12	S13	516.0	502.1	~~502.1~~	503.2	~~492.4~~	492.8	259.8	5.4	~~3.73~~	4.00
S14	S15	508.0	461.8	~~493.8~~	494.9	~~459.6~~	459.7	230.8	20.0	~~14.83~~	15.25

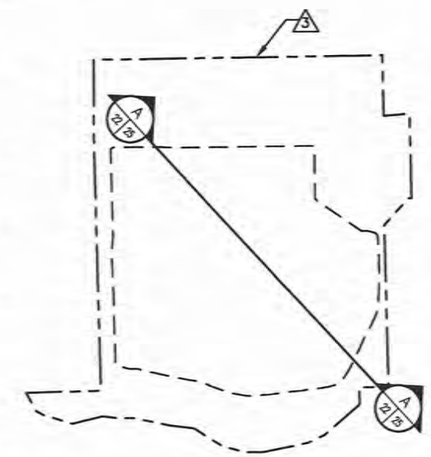
[1] Refer to Sheet IIIJ-B-2-22 for evaluation point locations.

OVERLINER TRENCH PIPE

Evalution Point[1]		Initial Top of Overliner Elevation (in Trench) (ft-msl)		Post-Settlement Top of Overliner Elevation (in Trench) (ft-msl)				Plan View Distance (ft)	Initial Slope (%)	Post-Settlement Slope (%)	
A	B	A	B	A		B					
1	2	496.8	496.1	487.6		487.1		105.0	0.6	0.50	
2	3	496.1	495.5	487.1		486.5		100.2	0.6	0.54	
3	4	495.5	494.9	486.5		486.0		100.2	0.6	0.55	
4	5	494.9	494.3	486.0		485.4		100.2	0.6	0.60	
5	6	494.3	493.7	485.4		484.8		100.2	0.6	0.57	
6	7	493.7	493.1	484.8		484.5		62.9	1.0	0.51	
13	12	494.0	493.5	~~485.8~~	486.0	~~485.2~~	485.5	89.2	0.6	~~0.63~~	0.55
12	11	493.5	492.9	~~485.2~~	485.5	~~484.6~~	484.9	104.4	0.6	~~0.58~~	0.55
11	10	492.9	492.3	~~484.6~~	484.9	~~483.9~~	484.2	102.9	0.6	~~0.64~~	0.64
10	9	492.3	491.6	~~483.9~~	484.2	~~483.4~~	483.6	103.5	0.7	~~0.50~~	0.58
9	8	491.6	490.8	~~483.4~~	483.6	~~482.9~~	483.1	100.9	0.7	~~0.50~~	0.50
14	15	493.0	492.3	~~484.8~~	485.0	~~484.1~~	484.3	117.5	0.6	~~0.56~~	0.61
15	16	492.3	491.7	~~484.1~~	484.3	~~483.5~~	483.7	102.9	0.6	~~0.58~~	0.59
16	17	491.7	491.0	~~483.5~~	483.7	~~483.0~~	483.1	103.4	0.7	~~0.50~~	0.56
17	18	491.0	490.4	~~483.0~~	483.1	~~482.3~~	482.5	101.9	0.6	~~0.71~~	0.61
18	19	490.4	489.8	~~482.3~~	482.5	~~481.6~~	481.8	103.2	0.6	~~0.63~~	0.62
25	24	499.5	497.8	~~490.4~~	490.2	~~488.8~~	488.8	111.9	1.5	~~1.46~~	1.24
24	23	497.8	496.2	~~488.8~~	488.8	~~487.3~~	487.4	104.9	1.5	~~1.48~~	1.29
23	22	496.2	494.6	~~487.3~~	487.4	~~486.0~~	486.2	101.6	1.5	~~1.26~~	1.18
22	21	494.6	493.1	~~486.0~~	486.2	~~484.8~~	485.0	103.9	1.5	~~1.09~~	1.18
21	20	493.1	492.0	~~484.8~~	485.0	~~483.8~~	484.0	70.9	1.5	~~1.49~~	1.43
26	27	500.5	499.9	~~491.4~~	491.1	~~490.8~~	490.6	91.7	0.6	~~0.66~~	0.57
27	28	499.9	499.3	~~490.8~~	490.6	~~490.2~~	490.0	100.4	0.6	~~0.62~~	0.58
28	29	499.3	498.7	~~490.2~~	490.0	~~489.6~~	489.5	100.4	0.6	~~0.62~~	0.50
29	30	498.7	498.1	~~489.6~~	489.5	~~489.0~~	489.0	100.2	0.6	~~0.59~~	0.50
30	31	498.1	497.5	~~489.0~~	489.0	~~488.3~~	488.5	109.7	0.6	~~0.61~~	0.51
37	36	498.7	498.1	~~489.3~~	489.6	~~488.8~~	489.0	102.7	0.6	~~0.53~~	0.58
36	35	498.1	497.5	~~488.8~~	489.0	~~488.2~~	488.5	100.6	0.6	~~0.58~~	0.56
35	34	497.5	496.9	~~488.2~~	488.5	~~487.7~~	487.9	100.5	0.6	~~0.55~~	0.57
34	33	496.9	496.3	~~487.7~~	487.9	~~487.1~~	487.3	100.3	0.6	~~0.59~~	0.61
33	32	496.3	495.9	~~487.1~~	487.3	~~486.8~~	486.9	58.2	0.6	~~0.54~~	0.57
38	39	498.5	497.7	~~489.1~~	489.4	~~488.4~~	488.6	127.9	0.6	~~0.59~~	0.58
39	40	497.7	497.0	~~488.4~~	488.6	~~487.8~~	488.0	110.9	0.6	~~0.55~~	0.54
40	41	497.0	496.4	~~487.8~~	488.0	~~487.1~~	487.4	109.5	0.6	~~0.56~~	0.56
41	42	496.4	495.9	~~487.1~~	487.4	~~486.7~~	487.0	82.8	0.6	~~0.54~~	0.53
47	46	498.7	498.1	~~489.6~~	489.9	~~489.0~~	489.2	107.4	0.6	~~0.64~~	0.63
46	45	498.1	497.4	~~489.0~~	489.2	~~488.3~~	488.5	111.7	0.6	~~0.62~~	0.61
45	44	497.4	496.7	~~488.3~~	488.5	~~487.6~~	487.8	113.1	0.6	~~0.63~~	0.62
44	43	496.7	496.1	~~487.6~~	487.8	~~486.9~~	487.2	106.8	0.6	~~0.62~~	0.62
48	49	498.7	498.1	~~489.7~~	489.9	~~489.1~~	489.4	100.3	0.6	~~0.56~~	0.55
49	50	498.1	497.5	~~489.1~~	489.4	~~488.5~~	488.8	100.2	0.6	~~0.55~~	0.55
50	51	497.5	496.9	~~488.5~~	488.8	~~488.0~~	488.3	100.0	0.6	~~0.54~~	0.54
51	52	496.9	496.3	~~488.0~~	488.3	~~487.4~~	487.7	100.0	0.6	~~0.56~~	0.55
52	53	496.3	495.6	~~487.4~~	487.7	~~486.8~~	487.1	116.9	0.6	~~0.54~~	0.54

[1] Refer to Sheet IIIJ-B-2-18 for evaluation point locations.





KEY MAP
(NTS)

DRAFT

1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:
1. UPDATED FINAL COVER.
2. UPDATED POST SETTLEMENT OVERLINER.
3. UPDATED PERMIT BOUNDARY INFORMATION.

TYPICAL SECTION A 22 25

0 200 400
SCALE IN FEET (HORIZONTAL)

0 20 40
SCALE IN FEET (VERTICAL)

- ☐ FOR INFORMATION PURPOSES ONLY
- ☒ FOR PERMITTING PURPOSES ONLY
- ☐ ISSUED FOR CONSTRUCTION
- ☐ CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-2-25_TYP SEC.DWG

DRAWN BY: VRS
DESIGN BY: TR
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
TYPICAL SECTION

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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NAPERVILLE, IL
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GRIFFITH, IN
SOUTH BEND, IN
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SHEET IIIJ-B-2-25

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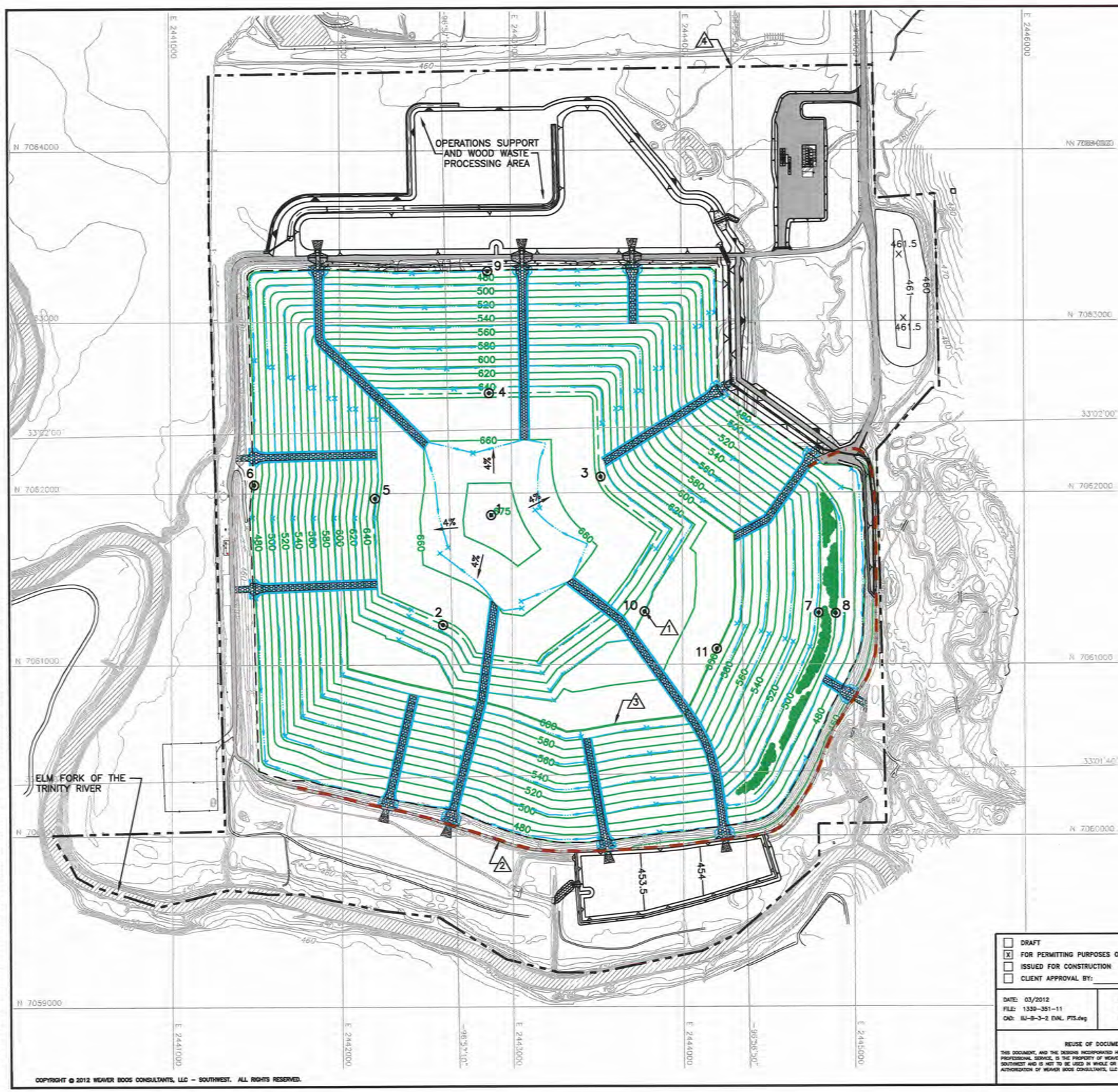
APPENDIX IIIJ-B-3

FINAL COVER SYSTEM SETTLEMENT AND STRAIN ANALYSES

Includes pages IIIJ-B-3-1 through IIIJ-B-3-11



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- PROPOSED FINAL COVER CONTOUR
- REGRADED BUFFER ZONE AREA
- PROPOSED LETDOWN STRUCTURE
- DRAINAGE SWALE
- EXISTING SLURRY WALL
- SETTLEMENT EVALUATION POINT
- INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. REVISED EVALUATION POINT LOCATIONS.
2. REVISED SLURRY WALL TO EXISTING LOCATION.
3. REVISED FINAL COVER CONTOURS.
4. UPDATED PERMIT BOUNDARY INFORMATION.

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DATE: 03/2012
FILE: 1339-351-11
CAD: IIIJ-B-3-2 EVAL. PTS.dwg

DRAWN BY: VRS
DESIGN BY: MDM
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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT FINAL COVER SETTLEMENT EVALUATION POINTS

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DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

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Parameters:

γ_{cov} = 120 pcf
T_c = 3.5 feet
γ_{msw} = varies (see note below)

Note: γ_{msw} is selected based on the waste thicknesses below the final cover system using the Unit Weight Profile for Waste/Daily Cover within an MSW Landfill chart from Ref. 4.

The settlement points analyzed are shown on Sheet IIIJ-B-3-2. An example calculation of the estimated primary settlement is shown below for Evaluation Points 1 and 2. The estimated primary settlement for all evaluation points is shown on Sheets IIIJ-B-3-10.

At Evaluation Point 1

Top of Waste Elevation (ft-msl)= ~~721.5~~ 671.5
Bottom of Waste Elevation (ft-msl)= ~~426.5~~ 423.2

H_o = ~~295.0~~ 248.3 ft
γ_{msw} = ~~79~~ 76 pcf

$\sigma'_o = 0.5\ \gamma_{msw} H_o$
σ'_o = ~~11652.5~~ 9435.4 psf
σ'_o = ~~557.9~~ 451.8 kPa

$e_o = 1.86 - 0.00102\ \sigma'_o$
e_o = ~~1.3~~ 1.4

$C_c = 0.35\ e_o$
C_c = ~~0.45~~ 0.49

$\Delta\sigma$ = 420.0 psf

$$\cancel{S_p = \frac{295.0 \times 0.45}{1 + 1.3} \log \frac{11652.5 + 420.0}{11652.5}}$$

$$S_p = \frac{248.3 \times 0.49}{1 + 1.4} \log \frac{9435.4 + 420.0}{9435.4}$$

S_p = ~~0.9~~ 1.0 ft

At Evaluation Point 2

Top of Waste Elevation (ft-msl)=	697.5		645.5
Bottom of Waste Elevation (ft-msl)=	433.5		428.2
H_o =	~~264.0~~	217.3	ft
γ_{msw} =	~~77~~	73	pcf

$\sigma'_o = 0.5\ \gamma_{msw}\ H_o$

σ'_o =	~~10164.0~~	7931.5	psf
σ'_o =	~~486.7~~	379.8	kPa

$e_o = 1.86 - 0.00102\ \sigma'_o$

e_o =	~~1.4~~	1.5

$C_c = 0.35\ e_o$

C_c =	~~0.48~~	0.52

$\Delta\sigma$ = 420.0 psf

$$\cancel{S_p = \frac{264.0 \times 0.48}{1 + 1.4} \log \frac{10164.0 + 420.0}{10164.0}}$$

$$S_p = \frac{271.3 \times 0.52}{1 + 1.5} \log \frac{7931.5 + 420.0}{7931.5}$$

S_p =	~~0.9~~	1.0	ft

B) Estimate secondary settlement of waste below the final cover system.

Secondary consolidation continues at substantial rates for periods of time well beyond primary settlement. It is a combination of mechanical secondary compression, physico-chemical reaction, and bio-chemical decay. The settlement-log time relationship is similar to secondary compression of soils and can be expressed by:

$$S_c = \frac{H'_o\,\alpha}{1 + e'_o} \log (t_2/t_1)$$ (Ref. 2, p. 451)

Parameters:

S_c = secondary settlement, ft
α = secondary compression index
e'_o = void ratio of the waste layer below the final cover after primary settlement has occurred due to the final cover
H'_o = waste thickness below the final cover system after settlement, ft
t_1 = starting time of secondary settlement in years
t_2 = time at which settlement is determined in years

For this site assume: α = 0.06 x e'_o (Ref. 1, p. 210)

As reported by Sowers (Ref. 1), the secondary compression index is used to estimate waste decomposition. The secondary compression index ranges from $\alpha = 0.03e'_o$ to $\alpha = 0.09e'_o$ for conditions that are unfavorable and favorable to decay, respectively. An average secondary compression index value was chosen because it is consistent with the types of waste accepted in the past. It is also representative of the minimal amount of settlement the site has experienced.

The void ratio of the waste below the final cover at closure is a function of the overburden pressure caused by placement of the final cover system. The void ratio is calculated for each settlement evaluation point using the following equation.

$$e'_o = 1.86 - 0.00102\,\sigma''_o$$ (Ref. 5, p. 590)

where: σ''_o = overburden pressure in kPa

$\sigma''_o = 0.5\,\gamma'_{msw}\,H'_o$
γ'_{msw} = unit weight of waste below the final cover after primary settlement has occurred, pcf

For this site, the void ratio after primary settlement for the waste/cover soils below the final cover system varies between ~~1.3~~ **1.4** to 1.9. Therefore, the secondary compression index will range between 0.08 to 0.11. Most literature sources report the secondary compression index in terms of the "modified secondary compression index" (Refs. 2, 6). The modified secondary compression index is defined by the following.

$$C'_\alpha = \frac{\alpha}{1 + e'_o}$$

The secondary compression index calculated for this site translates to a modified secondary compression index of 0.03 to 0.04 (for a void ratio of 1.3 to 1.9). These values are consistent with reported values for the modified secondary compression index which vary from 0.03 to 0.1 (Refs. 2, 6).

Time frame used for this analysis:

$t_1 =$	0.083	years
$t_2 =$	30.0	years (postclosure period)

An example calculation of the estimated secondary settlement using the above secondary settlement period is shown below for Evaluation Points 1 and 2. The estimated secondary settlement for all evaluation points is shown on Sheet IIIJ-B-3-10.

At Evaluation Point 1:

$H'_o = H_o - S_p$

$H_o' =$ ~~294.1~~ 247.3 ft

$\sigma''_o = 0.5\ \gamma'_{msw}\ H'_o$

$\gamma'_{msw} =$ ~~79.0~~ 76.0 pcf

$\sigma''_o =$ ~~11617.2~~ 9399.0 psf

$\sigma''_o =$ ~~556.2~~ 450.0 kPa

$e'_o = 1.86 - 0.00102\ \sigma''_o$

$e'_o =$ ~~1.3~~ 1.4

$\alpha = 0.06\ e'_o$

$\alpha =$ ~~0.08~~ 0.08

$$S_c = \frac{H'_o\ \alpha}{1 + e'_o} \log (t_2/t_1)$$

$$\cancel{S_e = \frac{294.1 \times 0.08}{1 + 1.3} \log (30/0.083)}$$

$$S_c = \frac{247.3 \times 0.08}{1 + 1.4} \log (30/0.083)$$

$S_c =$ ~~25.5~~ 22.2 ft

At Evaluation Point 2:

$H'_o = H_o - S_p$

$H_o' =$ ~~263.1~~ 216.3 ft

$\sigma''_o = 0.5\ \gamma'_{msw}\ H'_o$

$\gamma'_{msw} =$ ~~77.0~~ 73.0 pcf

$\sigma''_o =$ ~~10127.9~~ 7894.4 psf

$\sigma''_o =$ ~~484.9~~ 378.0 kPa

$e'_o = 1.86 - 0.00102\ \sigma''_o$

$e'_o =$ ~~1.4~~ 1.5

$\alpha = 0.06\ e'_o$

$\alpha =$ ~~0.08~~ 0.09

$$S_c = \frac{H'_o\ \alpha}{1 + e'_o} \log (t_2/t_1)$$

$$\cancel{S_e = \frac{263.1 \times 0.08}{1+1.4} \log (30.0/0.083)}$$

$$S_c = \frac{216.3 \times 0.09}{1+1.5} \log (30/0.083)$$

$S_c =$ ~~23.3~~ 19.8 ft

C) Estimate total settlement of waste below the final cover system.

Total settlement is the combination of primary and secondary settlement. An example calculation of the estimated total settlement is shown below for Evaluation Points 1 and 2. The estimated total settlement for all evaluation points is shown on page IIIJ-B-3-10.

At Evaluation Point 1:
Thickness of waste column, ft = ~~295.0~~ **248.3**

Primary Settlement =	~~0.9~~	1.0	ft
Secondary Settlement =	~~25.5~~	22.2	ft
Total Settlement =	~~26.3~~	23.1	ft

At Evaluation Point 2:
Thickness of waste column, ft= ~~264.0~~ **217.3**

Primary Settlement =	~~0.9~~	1.0	ft
Secondary Settlement =	~~23.3~~	19.8	ft
Total Settlement =	~~24.2~~	20.8	ft

D) Verify that strain induced on the geocomposite due to settlement is within acceptable limits.

Determine the post-settlement slope of the final cover system and verify the strain induced on the geocomposite due to settlement is within acceptable limits.

$$\text{Strain} = \frac{L_f - L_o}{L_o} x100$$ (Reference 2, Page 472)

L_f= Final distance between evaluation points after total settlement (ft)
L_o = Initial distance between evaluation points before total settlement (ft)

An example calculation of the estimated strain is shown below for Evaluation Points 1 and 2. The estimated strain for all evaluation points is shown on page IIIJ-B-3-11.

Evaluation Point 1. to Evaluation Point 2:

Initial Distance:		
Evaluation Point 1 Elev. =	~~725.0~~	675.0 ft-msl
Evaluation Point 2 Elev. =	~~701.0~~	649.0 ft-msl
Plan View Distance=	~~612.8~~	700.6 ft
L_o=	~~613.3~~	701.1 ft
Total Settlement:		
Total Settlement Point 1=	~~26.3~~	23.1 ft
Total Settlement Point 2=	~~24.2~~	20.8 ft
Final Distance (after settlement):		
Evaluation Point 1 Elev. =	~~698.7~~	651.9 ft-msl
Evaluation Point 2 Elev. =	~~676.8~~	628.2 ft-msl
Plan View Distance=	~~612.8~~	700.6 ft
L_f=	~~613.2~~	701.0 ft
Strain=	**~~-0.013%~~**	**-0.012%**

Conclusion:

Strain is acceptable.

- Compacted clay component of final cover has the smallest average allowable tensile strain value which is 0.5 percent (Reference 2, Page 469).
- The allowable tensile strain for an HDPE geomembrane is 25 percent (Reference 2, page 94).
- The allowable tensile strain for a drainage geocomposite is more than 20 percent for the geotextile (reference 3, page 112) and 200 percent for the geonet (reference 3, page 400).
- The calculated strain values are all less than zero; therefore the system will be stable.

Prep By: MDM
Date: 2/25/2016

CAMELOT LANDFILL
1339-351-11
APPENDIX IIIJ-B
FINAL COVER SETTLEMENT SUMMARY

Chkd By: CAM
Date: 2/26/2016

FINAL COVER EVALUATION

Evaluation Point[1]	Initial Top of Final Cover Elevation (ft-msl)	Initial Top of Waste Elevation (ft-msl)	Bottom of Waste Elevation (ft-msl)	H_o (ft)	γ_{msw} (pcf)	σ'_o (psf)	$\Delta\sigma$ (psf)	e_o	C_c	S_p (ft)	H'_o (ft)	γ'_{msw} (pcf)	σ''_o (psf)	e'_o	α	S_c (ft)	Total Settlement (ft)	Post-Settlement Top of Final Cover Elevation (ft-msl)
1	~~725.0~~ 675.0	~~721.5~~ 671.5	~~426.5~~ 423.2	~~295.0~~ 248.3	~~79~~ 76	~~11,653~~ 9,435	420.0	~~1.3~~ 1.4	~~0.45~~ 0.49	~~0.9~~ 1.0	~~294.1~~ 247.3	~~79~~ 76	~~11,617~~ 9,399	~~1.3~~ 1.4	~~0.08~~ 0.08	~~25.5~~ 22.2	~~26.3~~ 23.1	~~698.7~~ 651.9
2	~~701.0~~ 649.0	~~697.5~~ 645.5	~~433.5~~ 428.2	~~264.0~~ 217.3	~~77~~ 73	~~10,164~~ 7,931	420.0	~~1.4~~ 1.5	~~0.48~~ 0.52	~~0.9~~ 1.0	~~263.1~~ 216.3	~~77~~ 73	~~10,128~~ 7,894	~~1.4~~ 1.5	~~0.08~~ 0.09	~~23.3~~ 19.8	~~24.2~~ 20.8	~~676.8~~ 628.2
3	~~701.0~~ 649.0	~~697.5~~ 645.5	~~423.0~~ 408.4	~~274.5~~ 237.1	~~78~~ 75	~~10,706~~ 8,891	420.0	~~1.3~~ 1.4	~~0.47~~ 0.50	~~0.9~~ 1.0	~~273.6~~ 236.1	~~78~~ 75	~~10,670~~ 8,855	~~1.3~~ 1.4	~~0.08~~ 0.09	~~24.0~~ 21.3	~~25.0~~ 22.3	~~676.0~~ 626.7
4	~~470.0~~ 649.0	~~466.5~~ 645.5	~~466.5~~ 416.8	~~0.0~~ 228.7	~~42~~ 74	~~0~~ 8,462	420.0	~~1.9~~ 1.4	~~0.65~~ 0.51	~~0.0~~ 1.0	~~0.0~~ 227.7	~~42~~ 74	~~0~~ 8,425	~~1.9~~ 1.4	~~0.11~~ 0.09	~~0.0~~ 20.7	~~0.0~~ 21.7	~~470.0~~ 627.3
5	~~701.0~~ 649.0	~~697.5~~ 645.5	~~425.5~~ 420.3	~~272.0~~ 225.2	~~78~~ 74	~~10,608~~ 8,332	420.0	~~1.3~~ 1.5	~~0.47~~ 0.51	~~0.9~~ 1.0	~~271.1~~ 224.2	~~77~~ 74	~~10,437~~ 8,296	~~1.4~~ 1.5	~~0.08~~ 0.09	~~23.9~~ 20.4	~~24.8~~ 21.4	~~676.2~~ 627.6
6	~~462.6~~ 470.0	~~459.1~~ 466.5	~~459.1~~ 456.7	~~0.0~~ 9.8	~~42~~ 43	~~0~~ 211	420.0	~~1.9~~ 1.8	~~0.65~~ 0.65	~~0.0~~ 1.1	~~0.0~~ 8.7	~~42~~ 43	~~0~~ 188	~~1.9~~ 1.9	~~0.11~~ 0.11	~~0.0~~ 0.9	~~0.0~~ 1.9	~~462.6~~ 468.1
7	~~504.0~~ 500.0	~~500.5~~ 496.5	~~437.0~~ 437.0	~~63.5~~ 59.5	~~51~~ 51	~~1,619~~ 1,517	420.0	~~1.8~~ 1.8	~~0.62~~ 0.63	~~1.4~~ 1.4	~~62.1~~ 58.1	~~51~~ 50	~~1,583~~ 1,452	~~1.8~~ 1.8	~~0.11~~ 0.11	~~6.1~~ 5.7	~~7.5~~ 7.1	~~496.5~~ 492.9
8	~~500.0~~ 496.0	~~496.5~~ 492.5	~~436.0~~ 436.0	~~60.5~~ 56.5	~~51~~ 50	~~1,543~~ 1,413	420.0	~~1.8~~ 1.8	~~0.62~~ 0.63	~~1.4~~ 1.4	~~59.1~~ 55.1	~~51~~ 50	~~1,507~~ 1,377	~~1.8~~ 1.8	~~0.11~~ 0.11	~~5.8~~ 5.4	~~7.2~~ 6.9	~~492.8~~ 489.1
9	470.0	466.5	461.5	5.0	43	108	420.0	1.9	0.65	0.8	4.2	42	89	1.9	0.11	0.4	1.2	468.8
10	620.0	616.5	444.6	171.9	67	5,759	420.0	1.6	0.55	1.1	170.8	67	5,721	1.6	0.09	16.1	17.2	602.8
11	600.0	596.5	441.8	154.7	64	4,950	420.0	1.6	0.57	1.2	153.5	64	4,913	1.6	0.10	14.6	15.8	584.2

[1] Refer to Sheet IIIJ-B-3-2 for Evaluation Point locations.

Prep By: MDM
Date: 2/25/2016

Chkd By: CAM
Date: 2/26/16

CAMELOT LANDFILL
1339-351-11
APPENDIX IIIJ-B
FINAL COVER SYSTEM STRAIN SUMMARY

FINAL COVER EVALUATION

Evalution Point[1]		Initial Top of Final Cover Elevation (ft-msl)		Post-Settlement Top of Final Cover Elevation (ft-msl)		Plan View Distance (ft)	L_o (ft)	L_f (ft)	Initial Slope (ft/ft)	Post-Settlement Slope (ft/ft)	Strain (%)
A	B	A	B	A	B						
1	2	~~725.0~~ 675.0	~~701.0~~ 649.0	~~698.7~~ 651.9	~~676.8~~ 628.2	~~612.8~~ 700.6	~~613.3~~ 701.1	~~613.2~~ 701.0	0.04	~~0.036~~ 0.034	~~-0.013~~ -0.012
1	3	~~725.0~~ 675.0	~~701.0~~ 649.0	~~698.7~~ 651.9	~~676.0~~ 626.7	~~613.6~~ 680.6	~~614.1~~ 681.1	~~614.0~~ 681.1	0.04	~~0.037~~ 0.037	~~-0.009~~ -0.005
1	4	675.0	649.0	651.9	627.3	711.4	711.9	711.8	0.04	0.035	-0.007
1	5	~~725.0~~ 675.0	~~701.0~~ 649.0	~~698.7~~ 651.9	~~676.2~~ 627.6	~~609.5~~ 677.3	~~610.0~~ 677.8	~~609.9~~ 677.7	0.04	~~0.037~~ 0.036	~~-0.010~~ -0.009
~~2~~	4	~~701.0~~	~~470.0~~	~~676.8~~	~~470.0~~	~~930.7~~	~~958.9~~	~~953.4~~	~~0.25~~	~~0.222~~	~~-0.579~~
4	9	649.0	470.0	627.3	468.8	713.2	735.3	730.6	0.25	0.222	-0.641
5	6	~~701.0~~ 649.0	~~462.6~~ 470.0	~~676.2~~ 627.6	~~462.6~~ 468.1	~~951.7~~ 712.2	~~981.1~~ 734.3	~~975.4~~ 729.9	0.25	~~0.224~~ 0.224	~~-0.585~~ -0.613
7	8	~~504.0~~ 500.0	~~500.0~~ 496.0	~~496.5~~ 492.9	~~492.8~~ 489.1	~~100.0~~ 100.0	~~100.1~~ 100.1	~~100.1~~ 100.1	0.04	~~0.037~~ 0.037	~~-0.011~~ -0.011
10	11	620.0	600.0	602.8	584.2	475.0	475.4	475.4	0.04	0.039	-0.012

[1] Refer to Sheet IIIJ-B-3-2 for Evaluation Point locations.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

VOLUME 6 OF 6

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014
Revised October 2014

Revised August 2016

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8-5-16

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Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Boulevard, Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B

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CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIK
CLOSURE PLAN

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised April 2014
Revised June 2014
Revised October 2014

Revised August 2016

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6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9970

Project No. 1339-351-11-02-6B.10

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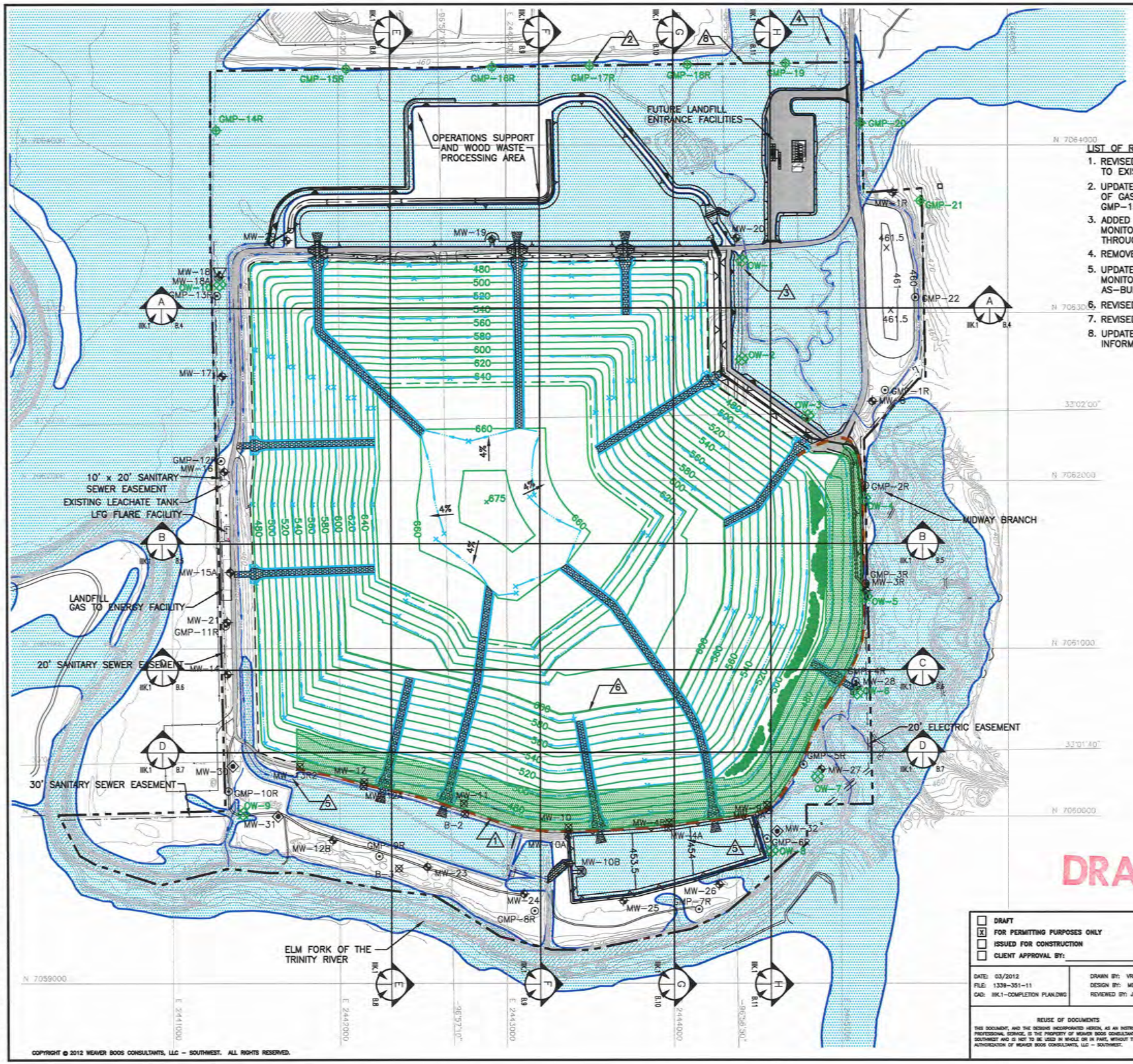

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOUR
- FINAL COVER CONTOUR
- REGRADED BUFFER ZONE AREA
- DRAINAGE LETDOWN
- DRAINAGE SWALE
- EASEMENT BOUNDARY
- MW-8 EXISTING GROUNDWATER MONITORING WELL
- MW-30 PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R EXISTING LANDFILL GAS MONITORING PROBE
- GMP-20 PROPOSED LANDFILL GAS MONITORING PROBE
- MW-12 OBSERVATION/MONITORING WELL
- OW-1 PROPOSED WOODBINE MONITOR WELL
- 100-YEAR FLOODPLAIN (SEE NOTE 9)
- CONSTRUCTED FINAL COVER
- LANDSCAPE BENCH
- INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. REVISED SLURRY WALL TO EXISTING LOCATION.
2. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
3. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
4. REMOVED EASEMENTS.
5. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
6. REVISED FINAL COVER CONTOURS.
7. REVISED NOTE 5.
8. UPDATED PERMIT BOUNDARY INFORMATION.

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. REFER TO APPENDIX IIIF FOR POST DEVELOPMENT DRAINAGE INFORMATION.
4. FINAL COVER DETAILS ARE PROVIDED IN APPENDIX IIIA-A-LINER, OVERLINER AND FINAL COVER SYSTEM DETAILS
5. MAXIMUM FINAL COVER ELEVATION: 675 FT-MSL. MAXIMUM WASTE ELEVATION: 671.5 FT-MSL.
6. REFER TO APPENDIX IIIA-B FOR TYPICAL CROSS SECTION INFORMATION.
7. AS RAINFALL CONTACTS THE FINAL COVER SYSTEM IT WILL SHEET FLOW TO DRAINAGE SWALES CONSTRUCTED ON THE TOP DECK AND SIDE SLOPES OF THE LANDFILL. THE SWALES DIRECT THE STORMWATER TO DRAINAGE LETDOWN STRUCTURES ON THE SIDE SLOPES. THE LETDOWN STRUCTURES DIRECT THE STORMWATER TO THE PERIMETER CHANNEL/DETENTION POND SYSTEM BEFORE IT IS DISCHARGED FROM THE SITE.
8. REFER TO APPENDIX IIII FOR DETAILS OF THE LANDFILL GAS MANAGEMENT PLAN.
9. FLOODPLAIN INFORMATION IS INCLUDED IN APPENDIX IIIO.

DRAFT

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIK.1-COMPLETION PLAN.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
PROPOSED LANDFILL COMPLETION PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIK.1

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIK\IIIK.1-COMPLETION PLAN.dwg, jwilson, 1:2

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- PERMITTED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- SUBTITLE D CELL BOUNDARY
- MW-8 — PERMITTED GROUNDWATER MONITORING WELL
- GMP-1 — PERMITTED GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL
- 2 OW-1 — PROPOSED WOODBINE MONITOR WELL
- FILL AREA REQUIRING CLOSURE
- CONSTRUCTED FINAL COVER
- EXISTING WASTE TO BE RELOCATED
- SIDEWALL LINER TO BE CONSTRUCTED. GENERAL FILL WILL BE PLACED ABOVE LINER AS NEEDED TO SUPPORT FINAL COVER SYSTEM AND PROVIDE BALLAST.
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. AREA EAST OF DISPOSAL AREA WILL BE REGRADED TO PROVIDE FOR POSITIVE DRAINAGE.

LIST OF REVISIONS:

1. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

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☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIK.2-AREA REQ. COVER.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
3	10/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT LARGEST AREA TO REQUIRE FINAL COVER

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

FIGURE IIIK.2

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIK\IIIK.2-LARGEST AREA REQ FC.dwg, sford, 1:2

2 FINAL COVER SYSTEM

2.1 Introduction

The final cover system for the Camelot Landfill has been developed to incorporate the requirements of Title 30 TAC §330.457(f)(4). The rules state that within 180 days following the initiation of closure activities as specified in Title 30 TAC §330.457(f)(3) the owner shall complete the installation of a final cover system designed and constructed to minimize infiltration and erosion. Such a system will include installation of a final cover system and a stormwater runoff control system. The stormwater runoff controls are addressed in Appendix IIIF – Surface Water Drainage Plan. The final cover system design is discussed below and is also detailed in Appendix IIIA-A. Cross-sections are provided in Appendix IIIA-B.

2.2 Final Cover System Design

The final cover system will consist of the existing alternative soil final cover that was approved by the TCEQ in August 2011 and a composite final cover for the rest of the site. The final cover system will provide a low maintenance cover, protect against erosion, reduce rainfall percolation through the cover system and subsequently minimize leachate generation within the landfill. As depicted on Figure IIIK.1 (and Drawing A.3 – Landfill Completion Plan in Appendix IIIA-A), a maximum slope of 4 percent is provided for the top slopes and 4H:1V and 5H:1V sideslopes are provided to minimize erosion and facilitate drainage of the landfill. A summary of the components of both final cover systems is provided below.

Subtitle D Composite Final Cover System

- An erosion layer consisting of a 24-inch-thick earthen material capable of sustaining vegetative growth. The vegetation will consist of native or introduced grasses, as well as a mixture of Bermuda, vetch, rye, wheat grass, wild flowers, and other flowering plants capable of providing 90 percent coverage over the cover system.
- A drainage geocomposite drainage layer (250-mil-thick geonet with 6 oz/sy geotextile(s) heat bonded to the top for top slopes and heat bonded to both sides for side slopes).
- A 40-mil, smooth (topslope) and textured (sideslope), linear low-density polyethylene (LLDPE), or other equivalent material.

- Excavations will be filled with suitable material, and the site will be graded to promote runoff and prevent ponding. A sidewall composite liner system is needed to provide an at-grade tie-in location for the final cover system.
- The final cover system will be constructed according to specifications.
- The top of the landfill will be regraded and reshaped as needed to provide the proper slope for positive drainage.
- Any required ballast evaluation reports will be submitted to TCEQ for approval.
- As noted above (first bullet), a revised final closure plan will be developed and submitted to the TCEQ for approval.
- Following application of final cover, the site will be vegetated with appropriate grasses to minimize erosion. The established grasses will provide a minimum of 90 percent coverage of the final cover system. Other vegetative material may also be included as part of the vegetative cover.
- A surface water management system will be constructed to minimize erosion.
- A closure certification will be prepared by an independent licensed professional engineer and submitted to TCEQ for approval.
- All proper notices and documentation will be filed with the appropriate agencies.

3.2.1 Estimate of Largest Active Disposal Area

Consistent with Title 30 TAC §330.503(a), the largest area that could be open within the next year is shown on Figure IIIK.2 and is 181.1 acres. Consistent with this rule and TCEQ guidelines for financial assurance to complete closure and postclosure activities, financial assurance will be posted for the 181.1-acre area as discussed in Appendix IIIM – Closure and Postclosure Care Cost Estimates. The entire ~~469.62~~ 459.76-acre site will also need to be administratively closed.

Supporting calculations are presented in Appendix IIIM – Closure and Postclosure Care Cost Estimates.

3.2.2 Estimate of Maximum Inventory of Waste Ever On Site

The estimated total capacity of waste (defined as waste and daily cover) ever on site over the active life of the facility is approximately ~~60.60~~ 53.20 million cubic yards. The site life calculations (Appendix IIIN) show that approximately ~~45,243,000~~ 37,843,000 cubic yards of airspace remain (using the August 28, 2010 topographic map). Supporting calculations are included in the Site Development Plan, Appendix IIIN – Site Life Calculations.

3.3 Citizens Convenience Center Closure

The Citizens Convenience Center will likely operate throughout the active life of the facility. During closure of the site, the Citizens Convenience Center will be decommissioned. Closure activity will include a general cleanup of the area. All roll-offs will be emptied at the landfill working face and removed from the site.

5 CLOSURE COST ESTIMATE

A detailed written cost estimate, in current dollars, showing the cost of hiring a third party to close the largest area of the landfill ever requiring a final cover at any time during the active life of the unit is provided in Part III, Appendix IIIM – Closure and Postclosure Care Cost Estimates. The closure estimate is ~~$17,745,493~~ $18,246,734.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIL
POSTCLOSURE CARE PLAN

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised April 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9970

WBC Project No.1339-351-11-02-6B.11

This document is intended for permitting purposes only.

3 PERSON RESPONSIBLE FOR CONDUCTING POSTCLOSURE ACTIVITIES

At the time of development of this document, the following person is responsible for the management of this landfill:

~~Gary Greer,~~ Charles S. Cox, Interim City Manager
City of Farmers Branch
13000 William Dodson Parkway
Farmers Branch, TX 75243
972-247-3131

Daily operational activities are directed by:

Shane Davis, Environmental Services and Solid Waste ~~Administrator~~ Manager
City of Farmers Branch
13000 William Dodson
Farmers Branch, TX 75234
972-919-2614

The person responsible for conducting postclosure activities is subject to change. However, as part of the closure notification to TCEQ, as required by Title 30 TAC §330.463(b)(3)(B), City of Farmers Branch will notify the TCEQ regarding the responsible person.

5 POSTCLOSURE COST ESTIMATE

A detailed written cost estimate, in current dollars, of the cost of hiring a third party to conduct postclosure care activities for the municipal solid waste unit, in accordance with the Postclosure Care Plan, is provided in Appendix IIIM – Cost Estimate for Closure and Postclosure Care. The estimated postclosure care cost is ~~$10,327,160~~ $10,779,593.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIM
CLOSURE AND POSTCLOSURE CARE COST ESTIMATES

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised January 2014
Revised March 2014
Revised April 2014
Revised June 2014
Revised October 2014

Revised August 2016

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Fort Worth, Texas 76109
817-735-9970

WBC Project No.1339-351-11-02-6B.12

This document is intended for permitting purposes only.

LIST OF REVISIONS:

1. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED PERMIT BOUNDARY INFORMATION.

LEGEND

- PERMIT BOUNDARY
- PERMITTED LIMITS OF WASTE
- PROPOSED LIMITS OF WASTE
- STATE PLANE COORDINATE SYSTEM
- EXISTING CONTOUR
- SUBTITLE D CELL BOUNDARY
- MW-8 PERMITTED GROUNDWATER MONITORING WELL
- GMP-1 PERMITTED GAS MONITORING PROBE
- MW-12 OBSERVATION/MONITORING WELL
- OW-1 PROPOSED WOODBINE MONITOR WELL
- EXISTING LFG EXTRACTION WELL
- PROPOSED LFG EXTRACTION WELL
- PRE-SUBTITLE D AREA LEACHATE REMOVAL WELL
- FILL AREA REQUIRING CLOSURE
- CONSTRUCTED FINAL COVER
- EXISTING WASTE TO BE RELOCATED
- SIDEWALL LINER TO BE CONSTRUCTED. GENERAL FILL WILL BE PLACED ABOVE LINER AS NEEDED TO SUPPORT FINAL COVER SYSTEM AND PROVIDE BALLAST.
- INDICATES REVISION (SEE LIST OF REVISIONS)

LFG EXTRACTION WELL SUMMARY

ITEM	QUANTITY
EXISTING LFG EXTRACTION WELLS (AS OF APRIL 2014)	107
NUMBER OF EXISTING LFG WELLS IN THE PRE-SUBTITLE D AREA	77
NUMBER OF EXISTING LFG WELLS IN THE SUBTITLE D AREA	30
NUMBER OF DEDICATED LEACHATE REMOVAL WELLS IN THE PRE-SUBTITLE D AREA	10
NUMBER OF EXISTING WELLS IN THE CONSTRUCTED FINAL COVER AREA	23

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.
3. AREA EAST OF DISPOSAL AREA WILL BE REGRADED TO PROVIDE FOR POSITIVE DRAINAGE.

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- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IIIM.1-AREA REQ. COVER.DWG

DRAWN BY: VRS
DESIGN BY: MDM
REVIEWED BY: JPY

REUSE OF DOCUMENTS
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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
3	10/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT LARGEST AREA TO REQUIRE FINAL COVER

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLUMBUS, OH DENVER, CO
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FIGURE IIIM.1

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TABLE IIIM-1
CAMELOT LANDFILL - CLOSURE COST ESTIMATE

Area to be Administratively Closed	~~469.6~~ 459.8 ac	Infiltration Layer Thickness	1.5 ft
Area Requiring Final Cover	181.1 ac	Erosion Layer Thickness	2.0 ft
Composite Topslope Area	98.3 ac		
Composite Sideslope Area	82.8 ac		

Description	Quantity	Unit[1]	Unit Cost[2]	Total Cost	Comments
1.0 ENGINEERING					
1.1 Topographic Survey	1	LS	$ 7,581	$ 7,581	Includes a third party aerial topographic survey of the permit boundary area to determine existing grade.
1.2 Boundary Survey	1	LS	$ 9,904	$ 9,904	Includes a third party ground survey and metes and bounds description of the permit boundary area. A detailed metes and bounds description is included in Parts I/II-Section 13. This information will only need to be verified.
1.3 Site Evaluation	181.1	AC	$ 409	$ 74,064	Includes the costs for a third party consultant preliminary engineering report that will detail the findings of the status of the site and closure recommendations.
1.4 Development of Plans	181.1	AC	$ 378	$ 68,450	Includes third party preparation of final cover design and construction plans including specifications (includes grading, drainage, and revegetation).
1.5 Closure Inspection and Testing	181.1	AC	$ 8,000	$ 1,448,675	Includes third party inspection during closure construction, thickness and permeability verifications, survey, and preparation of closure report.
1.6 Groundwater Monitor Well Consultant Cost	1	LS	$ 25,000	$ 25,000	The existing groundwater monitoring system is adequate. A cost is provided in the event revisions to the plan are needed. This is a contingency estimate given that there should be no cost associated with this item.
1.7 TPDES and other Permits	1	LS	$ 11,609	$ 11,609	Includes obtaining compliance with applicable federal and state requirements for proper closure.
ENGINEERING TOTAL				$ 1,645,283	
2.0 CONSTRUCTION					
2.1 Subtitle D Final Cover System					
2.1.1 Infiltration Layer	438,224	CY	$ 3.78	$ 1,656,488	Includes excavation, hauling, and construction of a 1.5-foot thick clay material infiltration layer over the Subtitle D area (e.g., 181.1 acres (7,888,019 ft^2) x 1.5 ft = 11,832,029 ft^3 or 438,224 cy).
2.1.2 Erosion Layer	584,299	CY	$ 2.35	$ 1,373,103	Includes excavation, hauling, and construction of a 2-foot thick earthen material erosion layer over the Subtitle D area (e.g., 181.1 acres (7,888,019 ft^2) x 2 ft = 15,776,038 ft^3 or 584,299 cy).
2.1.3 Flexible Membrane Cover					
2.1.3.1 Smooth (Topslopes)	4,281,698	SF	$ 0.28	$ 1,198,875	Includes purchasing, hauling, and installation of a 40-mil LLDPE geomembrane over the Subtitle D area. This area includes 98.3 acres (4,281,698 ft^2) on the topslope and 82.8 acres (3,606,340 ft^2) on the sideslope.
2.1.3.2 Textured (Sideslopes)	3,606,340	SF	$ 0.34	$ 1,226,156	
2.1.4 Drainage Geocomposite (includ. piping)					
2.1.4.1 Single-Sided (Topslopes)	4,281,698	SF	$ 0.18	$ 770,706	Includes purchasing, hauling, and installation of a drainage geocomposite drainage layer over the Subtitle D area. This area includes 98.3 acres (4,281,698 ft^2) on the topslope and 82.8 acres (3,606,340 ft^2) on the sideslope.
2.1.4.2 Double-Sided (Sideslopes)	3,606,340	SF	$ 0.46	$ 1,658,916	
2.1.5 Landscape Bench Vegetation	4	AC	$ 5,000	$ 20,000	Includes the installation of vegetation on the landscape bench.
2.2 Wells	90	WELLS	$ 12,773	$ 1,149,570	Includes installation of wells over entire closure area. The 90 extraction wells include 80 future LFG extraction wells and 10 pre-Subtitle D area leachate removal wells. Refer to Figure III I-E-1 and III I-E-2 in Appendix III I for existing and proposed extraction wells. It is assumed that the 107 existing LFG wells will continue to be used.
2.3 Completion of Existing Gas System	181.1	AC	$ 860	$ 155,733	Includes raising existing LFG extraction wells and existing piping network over the area requiring final cover. This estimate is based on completion of the existing gas system for the entire 181.1 acre area requiring final cover which is conservative given that a portion of this area will receive a new LFG system as there will be no existing system to lift above final cover.
2.4 Revegetation	181.1	AC	$ ~~1,164~~ 1,500	$ ~~210,782~~ 271,627	Includes vegetation of completed cover and general fill via seeding and application of fertilizer over the area requiring final cover.
2.5 Site Grading and Drainage	181.1	AC	$ 1,164	$ 210,782	Includes site grading and the construction of drainage structures, including perimeter channels and erosion control structures over the area requiring final cover.

TABLE IIIM-1 (Continued)
CAMELOT LANDFILL - CLOSURE COST ESTIMATE

Description	Quantity	Unit[1]		Unit Cost[2]		Total Cost	Comments
2.0 CONSTRUCTION CONTINUED							
2.6 Site Fencing and Security							Includes construction of 3,820 feet of proposed barbed wire perimeter fencing at the permit boundary and repair of 3,420 feet of existing fence (20% of existing fencing) at the permit boundary. This also includes installing 5,400 ft of fence to replace the natural barrier on the south portion of the site if it is determined that the natural barrier's effectiveness has diminished. This cost also includes the replacement of all the proposed "no trespassing" signs on the southern portion of the site (in areas with natural barriers).
2.6.1 Construction of proposed fence	9,220	LF	$	2.80	$	**25,816**	
2.6.2 Repair of existing fence	3,420	LF	$	1.00	$	**3,420**	
2.6.3 Installation of signs	15	SIGNS	$	300.00	$	**4,500**	
2.7 Leachate Collection System	1	LS	$	100,000	$	**100,000**	Includes any leachate collection system improvements that may be required.
2.8 Landfill Gas Monitoring System							
2.8.1 Abandonment of Existing Probes	6	PROBES	$	1,000	$	**6,000**	Includes the cost to complete the abandonment of 6 existing probes and the installation of 8 new probes. Includes abandonment of 6 probes, installation of 8 probes, installation report, and ground survey.
2.8.2 Installation of New Probes	8	PROBES	$	2,000	$	**16,000**	
2.8.3 Installation Report and Ground Survey	1	LS	$	3,000	$	**3,000**	
2.9 Citizens Convenience Center	1	LS	$	5,000	$	**5,000**	Includes the cost to remove roll-off containers and general clean-up of area.
2.10 Waste Relocation	230,000	CY	$	5.00	$	**1,150,000**	Includes cost to relocate waste in Historic Fill and Inactive MSW Unit Areas. The amount of waste in these areas was estimated using AutoCAD to be 45,000 cy in the 2.36-acre Historic Fill area and 185,000 cy in the 5.1-acre Inactive MSW Unit area. Refer to Figure IIIM.1.
2.11 Fill for Inactive MSW Unit	185,000	CY	$	3.00	$	**555,000**	Includes cost to fill Inactive MSW Unit Area once waste is relocated. The amount of waste in the 5.1-acre Inactive MSW area was estimated using AutoCAD to be 185,000 cy. Therefore, to provide a conservative estimate for the amount of soil fill needed to be placed in this area, the same volume was used. Refer to Figure IIIM.1.
2.12 Operations Support and Wood Waste Processing Area	1	LS	$	10,000	$	**10,000**	Includes general clean-up of area.
2.13 FAA Lights	8	LIGHT	$	582	$	**4,656**	Once the top deck of the landfill reaches 200 feet above grade, between 6 to 8 lights will be installed per Advisory Circular AC 70-7460-1K. Refer to Figure I/II-8.2 in Parts I/II.
2.14 Construction of Sidewall Liner System and Grading							Includes (1) construction of sidewall composite liner system (refer to Figure IIIM.1), (2) general fill required to support final cover system and provide ballast for liner system (as needed), and (3) general fill needed to provide positive drainage east of the disposal area.
2.14.1 Composite Sidewall Liner System Construction	250,000	SF	$	0.95	$	**237,500**	
2.14.2 General Fill above liner system area	600,000	CY	$	1.50	$	**900,000**	
2.14.3 General Fill east of disposal area to provide positive drainage	650,000	CY	$	1.50	$	**975,000**	
CONSTRUCTION TOTAL					$	~~13,627,003~~ 13,687,848	
					$		
ENGINEERING & CONSTRUCTION SUBTOTAL					$	~~15,272,286~~ 15,333,130	
3.0 CONTINGENCY		10%			$	~~1,527,229~~ 1,533,313	
4.0 CONTRACT PERFORMANCE BOND		1.5%			$	~~229,084~~ 229,997	
5.0 LEGAL FEES		LS			$	100,000	
6.0 TCEQ ADMINISTRATION OF CONTRACTS		LS			$	50,000	
TOTAL CLOSURE COST					$	~~17,178,599~~ 17,246,440	
INFLATION FACTOR[3]					$	~~1.033~~ 1.058	
~~2014~~2016 TOTAL CLOSURE COST					$	~~17,745,493~~ 18,246,734	

[1]LS = Lump Sum, AC = acres, CY = cubic yards, SF = square feet.

[2]Unit Costs are in ~~2014~~2012 dollars. Unit costs are based on current market conditions, typical engineering costs, and industry standards related to construction and reflect input from The City of Farmers Branch, Republic Services, and Weaver Boos Consultants, LLC-Southwest (refer to Section 2.3 for additional information).

[3]Inflation factor is the product of the inflation factors for each year between 2012 and ~~2014~~2016 as published by TCEQ (1.8, ~~and~~ 1.5, 1.5, and 1.0 for 2012, ~~and~~ 2013, 2014, and 2015 respectively).

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TABLE IIIM-2
CAMELOT LANDFILL - POSTCLOSURE CARE COST ESTIMATE

Area to be Administratively Closed	~~469.6~~ 459.8	ac	Post Closure Care Period	30	yrs
Area with waste in place	198.3	ac	Gas Probes	22	probes
Area with leachate collection system	109.9	ac	Gas Monitoring Events	4	/yr
Groundwater Monitoring Wells	22	wells	GW Monitoring Events	2	/yr

Description	Quantity	Unit[1]	Unit Cost[2]	Annual Cost	Total Cost	Comments
1.0 ENGINEERING						
1.1 Postclosure Care Plan	NA	NA		$ -	$ -	The postclosure care plan is complete. (refer to Appendix IIIL).
1.2 Site Inspection and Recordkeeping (annual)	~~469.6~~ 459.8	AC	$ 23.49	~~$11,000~~ $ 10,800	$ ~~330,000~~ 324,000	Site inspections will identify any potential areas experiencing settlement and erosion over the entire area to be administratively closed. The inspection will also document the condition of the LCS, LFG, groundwater monitoring system, and other landfill systems and structures.
1.3 Correctional Plans and Specifications (annual)	198.3	AC	$ 34.72	$ 6,900	$ 207,000	Includes preparation of plans and specifications to correct problems identified during inspections in area of waste in-place.
1.4 Site Monitoring						
1.4.1 Groundwater Monitoring (semiannual)	22	WELLS	$ 600.00	$ 26,400	$ 792000	The semi-annual cost to complete groundwater monitoring of the 22 wells is $13,200 (22 wells x $600 per well) and the annual cost is $26,400 (2 events x $13,200 per semi-annual event). This cost includes a sampling, testing, and reporting. Refer to Figure IIIM.1 for permitted groundwater monitoring wells.
1.4.2 Gas Monitoring (quarterly)	4	QUARTERS	$ 1,164.00	$ 4,656	$ 139,680	The gas monitoring events include monitoring 22 probes quarterly. The cost for monitoring the probes quarterly is $1,164/quarter. The annual cost is $4,656 (4 events x $1,164/quarterly event). This cost includes sampling, testing, and reporting. Refer to Figure IIIM.1 for permitted gas monitoring probes.
1.4.3 Observation/Monitoring Wells (annual)	~~13~~ 23	WELLS	$ 600.00	~~$7,800~~ $ 13,800	$ ~~234,000~~ 414,000	The annual cost to monitor observation/monitoring wells is ~~$7,800~~$13,800 (~~13~~23 wells x $600 per well). This cost includes a sampling, testing, and reporting for the 13 observation wells on the south portion of the site as well as the 10 Woodbine monitor wells located along the east, southeast, and west perimeter of the landfill. Refer to Figure IIIM.1 for permitted observation/monitoring wells.
ENGINEERING TOTAL					$ ~~1,702,680~~ 1,876,580	
2.0 CONSTRUCTION / MAINTENANCE	198.3	AC	$ 232.79	$ 46,000	$ 1,380,000	Includes correcting problems identified during inspections per correctional plans and specifications in the area of waste in-place. Also includes ongoing site maintenance, cover and drainage maintenance, annual seeding and mowing, and plugging of probes and wells at the end of the postclosure period.
2.1 Landscape Bench Performance Verification	1	LS	$ 30,000		$ 30,000	Includes removing all trees in two 20-foot-long test areas, excavating down to the geocomposite, and inspecting for root penetration into the bottom geocomposite. This inspection will be performed in year 25 of the postclosure period. Cost includes replacing the removed vegetation. Refer to Section 2.1.1 in Appendix IIIL for verification procedures.
2.2 Maintenance of Signs & Fencing	1	LS	$ 5,000		$ 5,000	Includes continued maintenance and/or replacement of existing no trespassing signs on the southern portion of the site (in areas with natural barriers). This cost also includes the installation of 5,400 ft of fence if the no trespassing signs are insufficient in discouraging unauthorized entry or uncontrolled disposal of solid or hazardous materials.
3.0 LEACHATE						
3.1 Leachate Disposal	109,790	GALLONS	$ 0.09	$ 9,881	$ 296,433	Includes the transportation of leachate to a permitted POTW. Refer to Appendix IIIC-E of Appendix IIIC for more information regarding the yearly leachate generation rate for the currently constructed area during the postclosure period. The leachate quantity was conservatively estimated based on the estimated actual leachate generation rate in the first 10 years of the postclosure period (e.g., 999 gal/acre/yr x 109.9 acres = 109,790 gallons/yr).

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TABLE IIIM-2 (Continued)
CAMELOT LANDFILL - POSTCLOSURE CARE COST ESTIMATE

Description	Quantity	Unit[1]	Unit Cost[2]	Annual Cost	Total Cost	Comments
3.2 Leachate Removal from the pre-Subtitle D Area						
3.2.1 Leachate/Condensate Removal from LFG Extraction Wells[3]	77	WELLS	$ 800.00	$ 61,600	$ 1,848,000	Includes the cost to monitor the leachate/condensate level in the extraction wells located in the pre-Subtitle D area and to discharge of extracted leachate/condensate. Refer to Figure III I-E-1 in Appendix III I for existing extraction wells in the pre-Subtitle D Area.
3.2.2 Leachate Disposal from Dedicated Leachate Removal Wells	30,000	GALLONS	$ 0.09	$ 2,700	$ 81,000	Includes the cost to monitor the leachate/condensate level in the leachate removal wells located in the pre-Subtitle D area and to dispose of extracted leachate/condensate. Refer to Drawing A.12a and A.22 in Appendix IIIA-A for leachate wells in the pre-Subtitle D Area. The leachate quantity was conservatively estimated assuming each of the 10 wells will produce 3,000 gallons/well/year during the postclosure period. The quantity of leachate generated will be updated on an annual basis using actual leachate generation rates that will be determined after installation of the wells. Refer to footnote 4 for additional information.
3.2.3 Maintaining and Monitoring of pre-Subtitle D Area Leachate Removal System	1	LS	$ 50,000	$ 50,000	$ 1,500,000	
3.2.4 Pre-Subtitle D Leachate Removal Well Decommissioning	10	WELLS	$ 5,000	$ 50,000	$ 50,000	Includes the cost to excavate around the well, cut and cap the well, backfill with general fill, and replace final cover over the disturbed area.
3.3 Decommission Leachate Storage Tanks/Pipes	1	LS			$ 50,000	Includes the cost to discharge of remaining leachate, cleanup site, demolish tank, and dispose of debris.
4.0 LFG SYSTEM MAINTENANCE	1	LS (see below)			$ 2,099,842	Includes operations and maintenance of the LFG system. Refer to the figure shown below and Section 3.2 in Appendix IIIM for additional information regarding how the LFG System Maintenance costs are estimated. Refer to Figure III I-E-2 in Appendix III I for existing and proposed extraction wells (Total = 176 wells).
SUBTOTAL					$ ~~9,042,955~~ 9,216,955	
5.0 CONTINGENCY		10%			$ ~~904,296~~ 921,696	
6.0 TCEQ ADMINISTRATION OF CONTRACTS		LS			$ 50,000	
TOTAL POSTCLOSURE CARE COST					$ ~~9,997,251~~ 10,188,651	
INFLATION FACTOR[5]					~~1.033~~ 1.058	
~~2014~~2016 TOTAL CLOSURE COST					$ ~~10,327,150~~ 10,779,593	

[1]NA = Not Applicable, YR = Year, LS = Lump Sum, AC = acres.

[2]Unit Costs are in ~~2014~~2012 dollars. Unit costs are based on current market conditions, typical engineering costs, and industry standards related to construction and reflect input from The City of Farmers Branch, Republic Services, and Weaver Boos Consultants, LLC-Southwest (refer to Section 3.3 for additional information).

[3]Annual cost ($61,600) includes $693 for leachate disposal (assumes 500 gallons/well generation rate and assumes 20 percent of the 77 wells will produce leachate per year - disposal rate is $0.09/gallon).

[4]The cost for these items includes the cost to monitor the leachate/condensate level in the leachate removal wells located in the pre Subtitle D area and to dispose of extracted leachate condensate. The leachate quantity was conservatively estimated assuming each well will produce 3,000 gallons/well/year during the postclosure period (3,000 gallons/well x 10 wells = 30,000 gallons). The quantity of leachate generated will be updated on an annual basis using actual leachate/gas condensate removal rates that will be determined after installation of the wells. This initial estimate of leachate generation was conservatively estimated based on leachate/gas condensate removal rates from existing LFG extraction wells. In 2013 and 2014 about 62 LFG extraction wells in the pre-Subtitle D area were evaluated. Only 15 of these wells had enough leachate to pump from the well. The leachate removal volume varied from 50 gallons to 750 gallons from the wells that contained leachate or gas condensate (prior to this effort, no leachate had been removed from the wells which have been in-place between 4 and 9 years). The average leachate removal volume from the 62 wells was 28 gallons/well. Based on this information, the initial estimate of 3,000 gallons/year for each of the pre-Subtitle D leachate removal wells represents a conservative estimate. As noted above, this estimate will be updated to reflect actual removal rates one year after the leachate removal wells are installed.

[5]Inflation factor is the product of the inflation factors for each year between 2012 and ~~2014~~2016 as published by TCEQ (1.8, ~~and~~ 1.5, 1.5, and 1.0 for 2012, ~~and~~ 2013, 2014, and 2015 respectively).

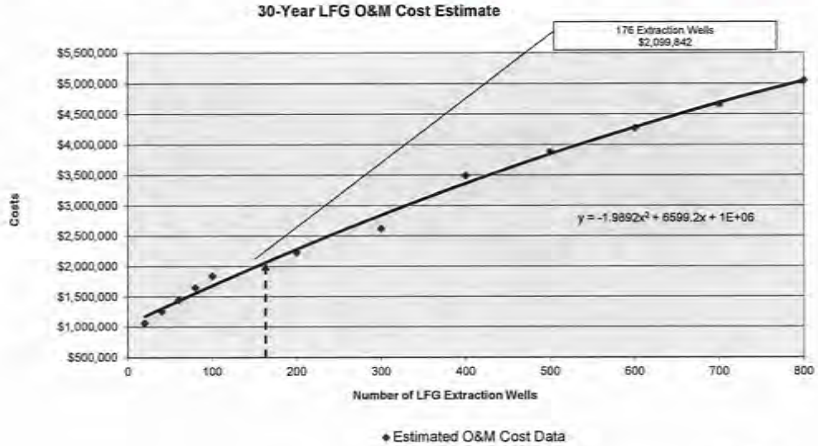

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TABLE IIIM-3
CAMELOT LANDFILL - CORRECTIVE ACTION COST

Description		Quantity	Unit[1]	Unit Cost[2]		Total Cost		Comments
1.0	**MONITORING / O & M**							
	1.1 Monitoring of detection wells that are in assessment monitoring states (e.g., MW-1R, MW-9, MW-13R, MW-14, MW-26, MW-27, and MW-28)	8	YR	$8,400	$		134,400	The semi-annual cost to complete groundwater monitoring of the 7 wells is $4,200 (7 wells x $600 per well) and the annual cost is $8,400 (2 events x $4,200 per semi-annual event). This cost includes a sampling and testing.
	1.2 Monitoring of observation wells that will continue to be monitored during the Corrective Action Plan (e.g. MW-4R, MW-4A, MW-9, MW-9A, MW-10, MW-10A, MW-10B, MW-11, MW-12, MW-12A, MW-13R2, B-2, B-3)	8	YR	$7,800	$		62,400	The annual cost to complete groundwater monitoring of the 13 wells is $7,800 (13 wells x $600 per well). This cost includes a sampling and testing.
	1.3 Reporting (semi-annual)	8	YR	$8,000	$		64,000	Includes preparation and submittal of semi-annual report.
	1.4 Maintanence (e.g., maintaining grounds, mowing, minor repairs, etc)	8	YR	$1,000			8,000	Includes mowing around the detection and observation wells and incidental repairs.
MONITORING / O&M TOTAL					$		**268,800**	
~~2.0~~	**CONSTRUCTION**							
	2.1 ~~Construction of Slurry Wall~~	~~163,185~~	~~SQ FT~~	~~$13.11~~	$		~~2,139,355~~	~~Includes mobilization, demobilization, reporting, quality control testing, installation of 163,185 SF of bentonite slurry wall, installation of 5,605 LF of clay cap, permitting, re-establishment of vegetation on disturbed areas, and 3rd party CQA services. Slurry wall area of 163, 185 SF estimated using the slurry wall profile shown on Part III, Appendix IIIA-A, Drawings A.17 and A.18. Square footage area includes 3-ft key into the unweathered shale.~~
~~CONSTRUCTION TOTAL~~					$		**~~2,139,355~~**	
~~3.0~~ 2.0	**LFG SYSTEM MAINTENANCE**	**1**	**LS**	**(See Sheet IIIM-9a)**	$		**2,099,842**	
~~4.0~~ 3.0	**CONTINGENCY**	15%			$	**~~635,880~~**	355,296	
SUBTOTAL					$	**~~4,239,197~~**	2,368,642	
~~5.0~~ 4.0	**TCEQ ADMINISTRATION OF CONTRACTS**	LS			$		**50,000**	
TOTAL CORRECTIVE ACTION COST					$	**~~4,925,077~~**	2,773,938	
INFLATION FACTOR[3]					$	**~~1.033~~**	1.058	
~~2014~~2016 TOTAL CLOSURE COST					$	**~~5,087,604~~**	2,934,627	

[1]YR = Year, LS = Lump Sum.

[2]Annual Costs are in ~~2014~~2012 dollars. Unit costs are based on current market conditions and reflect input from The City of Farmers Branch, Republic Services, and Weaver Boos Consultants, LLC-Southwest.

[3]Inflation factor is the sum of the inflation factors for each year between 2012 and ~~2014~~2016 as published by TCEQ (1.8, ~~and~~ 1.5, 1.5, and 1.0 for 2012, ~~and~~ 2013, 2014, and 2015 respectively).

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CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIN
SITE LIFE CALCULATIONS

Prepared for

City of Farmers Branch

March 2012

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

6-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by:

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Fort Worth, TX 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B.13

This document is intended for permitting purposes only.

After 2020, the waste inflow rate is assumed to increase consistent with the projected growth rate for the facility's general service area. Using this methodology, the expected maximum annual waste acceptance rate is ~~1,515,604~~ 1,450,712 tons per year (~~5,299~~ 5,072 tons per day based on a 286-day operating schedule). The above projections are based on current market conditions and may vary as market conditions change. Over the life of the facility, the expected average daily volume of incoming waste is projected to be approximately ~~3,753~~ 3,358 tons per day (1~~,073,358~~ 960,388 tons per year based on a 286-day operating schedule).

Site life calculations based on the City of Farmers Branch projections are shown on pages IIIN-4 through IIIN-6.

1.1.2 Solid Waste Generation Information Using Historical Data

This estimate is based on historical waste inflow data. For example, in 2010 the City reported in the Texas Commission on Environmental quality (TCEQ) Municipal Solid Waste (MSW) Annual Report that the site accepted 291,352 tons per year or 1,068 tons per day based on a 286-day operating schedule. As noted on page IIIN-8, this value was then increased based on the estimated population growth rates to develop the waste inflow rate over the life of the site.

The waste inflow rate is assumed to increase consistent with the projected growth rate for the facility's general service area from 2010 through 2079, which for this analysis is assumed to be Denton, Collin, Dallas, and Tarrant counties. Using this methodology, the expected maximum annual waste acceptance rate is ~~668,216~~ 592,454 tons per year (~~2,336~~ 2,072 tons per day based on a 286-day operating schedule). Over the life of the facility, the expected average daily volume of incoming waste is projected to be approximately ~~1,650~~ 1,546 tons per day (~~471,900~~ 442,156 tons per year based on a 286-day operating schedule). Supplementary calculations are included on pages IIIN-7 through IIIN-10.

1.2 Population Equivalent

1.2.1 City of Farmers Branch Projections

Using the average waste inflow rate of 1,073,358 960,388 tons per year discussed in Section 1.1.1 (an average daily volume of 3,753 3,358 tons per day based on a 286-day operating schedule) and assuming 5 pounds of waste is generated per capita per day, the population equivalent is:

$$\frac{(\cancel{1{,}073{,}358}\ 960{,}388 \text{ tons per year}) \times (2{,}000 \text{ pounds/ton})}{(5 \text{ pounds/person/day}) \times (365 \text{ days/year})} = \cancel{1{,}176{,}283}\ 1{,}052{,}480 \text{ persons}$$

1.2.2 Historical Data

Using the average waste inflow rate of ~~471,900~~ 442,156 tons per year discussed in Section 1.1.2 (an average daily volume of ~~1,650~~ 1,546 tons per day based on a 286-day operating schedule) and assuming 5 pounds of waste is generated per capita per day, the population equivalent is:

$$\frac{(\cancel{471{,}900}\ 442{,}156 \text{ tons per year}) \times (2{,}000 \text{ pounds/ton})}{(5 \text{ pounds/person/day}) \times (365 \text{ days/year})} = \cancel{517{,}151}\ 484{,}555 \text{ persons}$$

1.3 Landfill Capacity

The estimated total capacity of waste (defined as waste and daily cover) ever on site over the active life of the facility is approximately ~~60.60~~ 53.20 million cubic yards. The total volume available for solid waste and daily cover after August 28, 2010 (date of topographic information) is estimated to be ~~45,243,000~~ 37,843,000 cubic yards using the average end area method. This airspace estimate includes the remaining available volume in the existing permitted area. The current volume of waste (defined as waste and daily cover) in-place as of August 28, 2010, is approximately 15.357 million cubic yards.

1.4 Site Life Calculations

1.4.1 Site Life Information Using City of Farmers Branch Projections

The site life calculations are presented on pages IIIN-4 through IIIN-6. In summary, the site life is projected to be approximately ~~29.3~~ 25.8 years, which would result in the site's closure during the year ~~2039~~ 2035.

1.4.2 Site Life Information Using Historical Data

The site life calculations using historical data are presented on pages IIIN-7 through IIIN-10. For this case, the site life is projected to be approximately ~~66.7~~ 56.1 years, which would result in the site's closure during the year ~~2077~~ 2066.

Required: Determine approximate site life (years) for the site based on the City of Farmers Branch projections. The initial waste stream estimate is 1,068 tons per day with an increase to 1,500 tons/day in 2011. The waste inflow rate is assumed to increase consistent with the facility's general service area. The waste inflow rate is expected to increase by 2,525 tons/day in 2020 due to the anticipated closing of the nearby DFW landfill.

It is assumed the site will operate 286 days per year.

Solution: Determine available landfill tonnage and initial annual waste inflow rate:

Remaining airspace (includes existing permitted site and expansion)[1] =	~~45,243,000~~	**37,843,000**	cy	(as of August 28, 2010)
Percent daily cover =	15	%		(accounts for the use of ADC)
In-place density of waste/cover soils[2] =	~~1,755~~	**1,676**	lb/cy	

[1]The overliner grading layer volume is approximately 80,000 cy; however, to provide for a conservative analysis, this volume is included in the remaining airspace estimate. The volume consumed by the overliner is also included in the remaining airspace estimate.

[2] Refer to page IIIN-12 for additional information regarding the average in-place density of waste.

Estimate the total remaining airspace (tons). To convert the volumetric capacity of the site to a weight based capacity, the average in-place density of the waste/daily cover must first be established. For this calculation, the relevant density is the average density of the waste/cover soils after the waste/cover soils have been subjected to overburden pressure of the completely developed landfill (as opposed to the annual density that is calculated based on the capacity consumed in any given year). The procedure used to calculate the density at the midpoint of the landfilll is listed on Sheet IIIN-12 and is based on a number of in-place density studies (refer to reference 1 listed on Sheet IIIN-12). The estimated in-place density of solid waste/daily cover soils is then further translated into an estimate of the density of the soild waste portion of the landfill capacity, using the following calculation.

Estimate the total remaining airspace (tons).

Estimate density of waste only.

~~(γ_{soil})(15% of 45,243,000 cy) + (γ_{waste})(85% of 45,243,000 cy)= $(\gamma_{soil/waste})$(45,243,000 cy)~~

(γ_{soil})(15% of 37,843,000 cy) + (γ_{waste})(85% of 37,843,000 cy)= $(\gamma_{soil/waste})$(37,843,000 cy)

~~(2,430 lb/cy)(6,786,450cy) + (γ_{waste})(38,456,550 cy) = (1,755 lb/cy)(45,243,000 cy)~~

(2,430 lb/cy)(5,676,450cy) + (γ_{waste})(32,166,550 cy) = (1,676 lb/cy)(37,843,000 cy)

γ_{waste} = ~~1,636~~ **1,543** lb/cy

~~Remaining permitted available airspace = (85% of 45,243,000 cy)*(1,636 lb/cy*1/2000 tons/lb)~~

Remaining permitted available airspace = (85% of 37,843,000 cy)*(1,543 lb/cy*1/2000 tons/lb)

Remaining permitted available airspace = ~~31,455,196~~ **24,815,547** tons

Total remaining capacity (includes existing permitted site and expansion)=	~~31,455,196~~	**24,815,547**	tons

The above capacity for the remaining tons is used to estimate the site life, as shown in the following calculation.

Initial waste stream estimate =	1,068	tons/day
Days of operation per year =	286	days

Initial waste inflow rate =	305,478	tons/year

Assumed growth rates (based on population growth rates):

Growth rate (years 2011-2015)=	8.02%	or annualized growth rate of:	1.56 %
Growth rate (years 2016-2020)=	6.52%	or annualized growth rate of:	1.27 %
Growth rate (years 2021-2025)=	7.63%	or annualized growth rate of:	1.48 %
Growth rate (years 2026-2031)=	5.65%	or annualized growth rate of:	1.10 %
Growth rate (years 2031-close)=	5.65%	or annualized growth rate of:	1.10 %

The growth rate estimates from 2011 to 2030 were obtained from NCTCOG, North Central Texas 2030 Demographic Forecast. Growth rate estimates for 2031 to the closure of the landfill are assumed to be consistent with the population projections from 2026 to 2030.

The following table calculates the waste stream growth (assuming the growth rates described above) and the projected cumulative airspace consumed.

	Year	Waste Inflow (tons/year)	Tonnage Consumed (tons)	
August 28	2010	305,478	104,616	125 days
	2011	429,000	533,616	
	2012	435,692	969,308	
	2013	442,489	1,411,797	
	2014	449,392	1,861,189	
	2015	456,403	2,317,592	
	2016	462,199	2,779,791	
	2017	468,069	3,247,860	
	2018	474,013	3,721,873	
	2019	480,033	4,201,906	
	2020	1,208,280	5,410,186	
	2021	1,226,162	6,636,348	
	2022	1,244,309	7,880,657	
	2023	1,262,725	9,143,382	
	2024	1,281,414	10,424,796	
	2025	1,300,378	11,725,174	
	2026	1,314,683	13,039,857	
	2027	1,329,144	14,369,001	
	2028	1,343,765	15,712,766	
	2029	1,358,546	17,071,312	
	2030	1,373,490	18,444,802	
	2031	1,388,598	19,833,400	
	2032	1,403,873	21,237,273	
	2033	1,419,316	22,656,589	
	2034	1,434,928	24,091,517	
	2035	~~1,450,712~~ **724,030**	~~25,542,230~~ **24,815,547**	**182 days**
	~~2036~~	~~1,466,670~~	~~27,008,900~~	
	~~2037~~	~~1,482,804~~	~~28,491,703~~	
	~~2038~~	~~1,499,114~~	~~29,990,818~~	
	~~2039~~	~~1,464,378~~	~~31,455,196~~	~~353 days~~

Available tonnage is consumed during year	~~2039~~	**2035**	
Site life is projected to be approximately	~~29.3~~	**25.8**	years

Weaver Boos Consultants, LLC-Southwest
Rev. 10, 2/10/2016

Summary of waste tonnage information:

Initial inflow =	1,068 tons/day

$$\text{Maximum inflow} = \frac{\text{Tonnage accepted during full year of operation } (\cancel{1{,}515{,}604}\ \mathbf{1{,}450{,}712} \text{ tons})^{1}}{286 \text{ days of operation per year}}$$

[1] ~~1,515,604~~ **1,450,712** tons represents the calculated total tonnage for the full year of ~~2039~~ **2035**, the year in which the maximum waste inflow occurs.

Projected maximum waste inflow rate:

Maximum inflow =	~~5,299~~	**5,072**	tons/day

$$\text{Average inflow} = \frac{\text{Maximum waste accepted}}{\text{Site Life}}$$

Projected average waste inflow rate:

$$\frac{\cancel{31{,}455{,}196}\quad \mathbf{24{,}815{,}547} \text{ tons}}{\cancel{29.3}\quad \mathbf{25.8} \text{ years} \quad * \quad 286 \text{ days / year}}$$

Average inflow =	~~3,753~~	**3,358**	tons/day

Required: Determine approximate site life (years) for the site based on the historical data obtained from the TCEQ FY 2009 MSW Annual Report. The initial waste stream estimate is 1,068 tons/day. For this estimate, it is assumed the site will operate 286 days per year.

Solution: Determine available landfill tonnage and initial annual waste inflow rate:

Remaining airspace (includes existing permitted site and expansion)[1]= ~~45,243,000~~ **37,843,000** cy (as of August 28, 2010)
Percent daily cover = 15 % (accounts for the use of ADC)
In-place density of waste/cover soils[2] = ~~1,755~~ **1,676** lb/cy

[1]The overliner grading layer volume is approximately 80,000 cy; however, to provide for a conservative analysis, this volume is included in the remaining airspace estimate. The volume consumed by the overliner is also included in the remaining airspace estimate.
[2] Refer to page IIIN-12 for additional information regarding the average in-place density of waste.

Estimate the total remaining airspace (tons). To convert the volumetric capacity of the site to a weight based capacity, the average in-place density of the waste/daily cover must first be established. For this calculation, the relevant density is the average density of the waste/cover soils after the waste/cover soils have been subjected to overburden pressure of the completely developed landfill (as opposed to the annual density that is calculated based on the capacity consumed in any given year). The procedure used to calculate the density at the midpoint of the landfilll is listed on Sheet IIIN-12 and is based on a number of in-place density studies (refer to reference 1 listed on Sheet IIIN-12). The estimated in-place density of solid waste/daily cover soils is then further translated into an estimate of the density of the soild waste portion of the landfill capacity, using the following calculation.

Estimate the total remaining airspace (tons).

Estimate density of waste only.

~~(γ_{soil})(15% of 45,243,000 cy) + (γ_{waste})(85% of 45,243,000 cy)= $(\gamma_{soil/waste})$(45,243,000 cy)~~
(γ_{soil})(15% of 37,843,000 cy) + (γ_{waste})(85% of 37,843,000 cy)= $(\gamma_{soil/waste})$(37,843,000 cy)

~~(2,430 lb/cy)(6,786,450cy) + (γ_{waste})(38,456,550 cy) = (1,755 lb/cy)(45,243,000 cy)~~
(2,430 lb/cy)(5,676,450cy) + (γ_{waste})(32,166,550 cy) = (1,676 lb/cy)(37,843,000 cy)

γ_{waste} = ~~1,636~~ **1,543** lb/cy

~~Remaining permitted available airspace = (85% of 45,243,000 cy)*(1,636 lb/cy*1/2000 tons/lb)~~
Remaining permitted available airspace = (85% of 37,843,000 cy)*(1,543 lb/cy*1/2000 tons/lb)

Remaining permitted available airspace = ~~31,455,196~~ **24,815,547** tons

Total remaining capacity (includes existing permitted site and expansion)= ~~31,455,196~~ **24,815,547** tons

The above capacity for the remaining tons is used to estimate the site life, as shown in the following calculation.

Initial waste stream estimate = 1,068 tons/day
Days of operation per year = 286 days

Initial waste inflow rate = 305,448 tons/year

CAMELOT LANDFILL
SITE LIFE CALCULATIONS
1339-351-11

Year	Waste Inflow (tons/year)	Tonnage Consumed (tons)	
2040	445,784	11,456,851	
2041	450,688	11,907,539	
2042	455,645	12,363,184	
2043	460,657	12,823,841	
2044	465,724	13,289,565	
2045	470,847	13,760,413	
2046	476,027	14,236,440	
2047	481,263	14,717,703	
2048	486,557	15,204,260	
2049	491,909	15,696,169	
2050	497,320	16,193,489	
2051	502,791	16,696,279	
2052	508,321	17,204,601	
2053	513,913	17,718,513	
2054	519,566	18,238,079	
2055	525,281	18,763,360	
2056	531,059	19,294,420	
2057	536,901	19,831,320	
2058	542,807	20,374,127	
2059	548,778	20,922,905	
2060	554,814	21,477,719	
2061	560,917	22,038,636	
2062	567,087	22,605,723	
2063	573,325	23,179,048	
2064	579,632	23,758,680	
2065	586,008	24,344,688	
2066	~~592,454~~ **470,860**	~~24,937,142~~ **24,815,547**	**290 days**
~~2067~~	~~598,971~~	~~25,536,112~~	
~~2068~~	~~605,559~~	~~26,141,672~~	
~~2069~~	~~612,221~~	~~26,753,892~~	
~~2070~~	~~618,955~~	~~27,372,847~~	
~~2071~~	~~625,764~~	~~27,998,611~~	
~~2072~~	~~632,647~~	~~28,631,258~~	
~~2073~~	~~639,606~~	~~29,270,864~~	
~~2074~~	~~646,642~~	~~29,917,506~~	
~~2075~~	~~653,755~~	~~30,571,260~~	
~~2076~~	~~660,946~~	~~31,232,206~~	
~~2077~~	~~222,989~~	~~31,455,196~~	~~122 days~~

Available tonnage is consumed during year	~~2077~~	**2066**	
Site life is projected to be approximately	~~66.7~~	**56.1**	years

Summary of waste tonnage information:

Initial inflow =	1,068 tons/day

$$\text{Maximum inflow} = \frac{\text{Tonnage accepted during full year of operation } (\cancel{651{,}662}\ \mathbf{592{,}454}\ \text{tons})^{1}}{\text{286 days of operation per year}}$$

[1] ~~651,662~~ **592,454** tons represents the calculated total tonnage for the full year of ~~2077~~ **2066**, the year in which the maximum waste inflow occurs.

Projected maximum waste inflow rate:

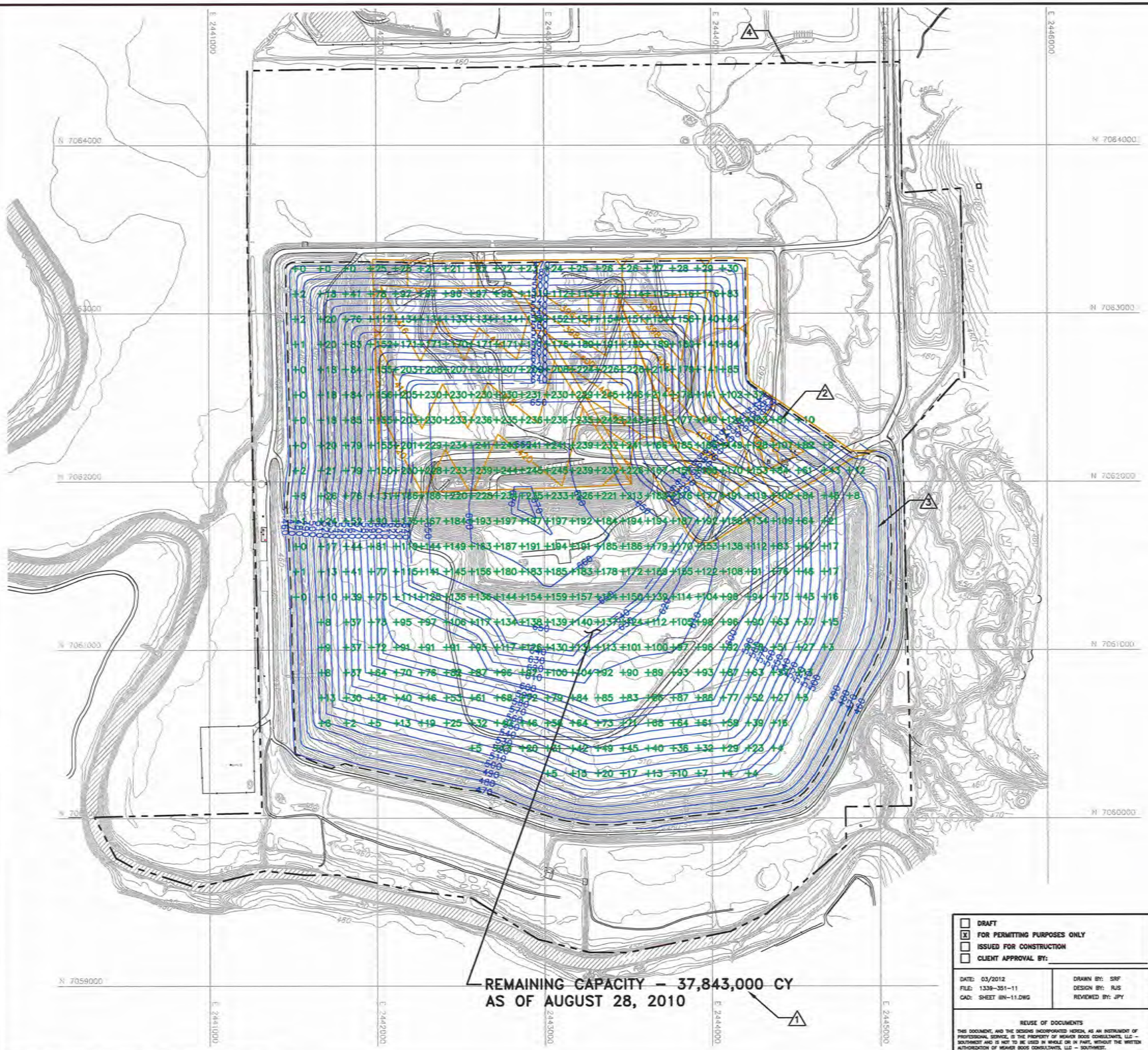
Maximum inflow =	~~2,336~~	**2,072**	tons/day

$$\text{Average inflow} = \frac{\text{Maximum waste accepted}}{\text{Site Life}}$$

Projected average waste inflow rate:

$$\frac{\cancel{31{,}455{,}196}\quad \mathbf{24{,}815{,}547}\ \text{tons}}{\cancel{66.7}\quad \mathbf{56.1}\ \text{years} \ * \ \text{286 days / year}}$$

Average inflow =	~~1,650~~	**1,546**	tons/day



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 394 — FUTURE BOTTOM OF WASTE CONTOUR
- 520 — INTERMEDIATE CONTOUR
- +10 — DEPTH OF REMAINING FILL
- INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. UPDATED REMAINING CAPACITY.
2. UPDATED TICK MARKS.
3. UPDATED INTERMEDIATE CONTOURS.
4. UPDATED PERMIT BOUNDARY INFORMATION.

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- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: SHEET IIIN-11.DWG

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: JPY

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PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT REMAINING CAPACITY

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL NAPERVILLE, IL COLLINSVILLE, IL DENVER, CO
FORT WORTH, TX (817) 735-9770
GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

SHEET IIIN-11

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIN\SHEET IIIN-11.dwg, sford, 1:2

Required: Determine average density for the landfill between the proposed bottom of waste contours and the final cover system.

Method:

1. Determine average thickness of waste throughout the landfill profile.
2. Determine the average density of the fill between the proposed/permitted bottom of waste contours and the bottom of final cover.
3. Determine the total capacity of the site.

References:

1. Acar, Yalcin B.& Daniel, David E., *Geoenvironment 2000 Characterization, Containment, Remediation, and Performance in Environmental Geotechnics,* Volume 2, American Society of Civil Engineers, 1995.

List of Symbols

$D_{avg.}$ = Average Density, lb/yd^3

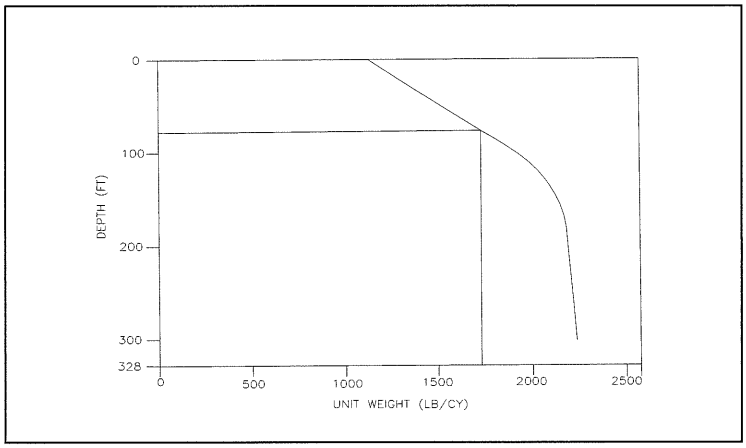
Procedure:

1. Determine average thickness of waste throughout the landfill profile.

   Using the drawing on Sheet IIIN-13, it was determined that the average thickness of waste over the entire site is ~~158~~ **139** feet.

2. Determine the average density of the fill using the Unit Weight Profile for MSW graph shown below. The density estimate is obtained using the average ~~158~~ **139**-foot depth.

UNIT WEIGHT PROFILE FOR WASTE/DAILY COVER WITHIN A MSW LANDFILL[1]



[1] Graph derived from Reference 1

Average Depth = ~~158~~ **139** feet

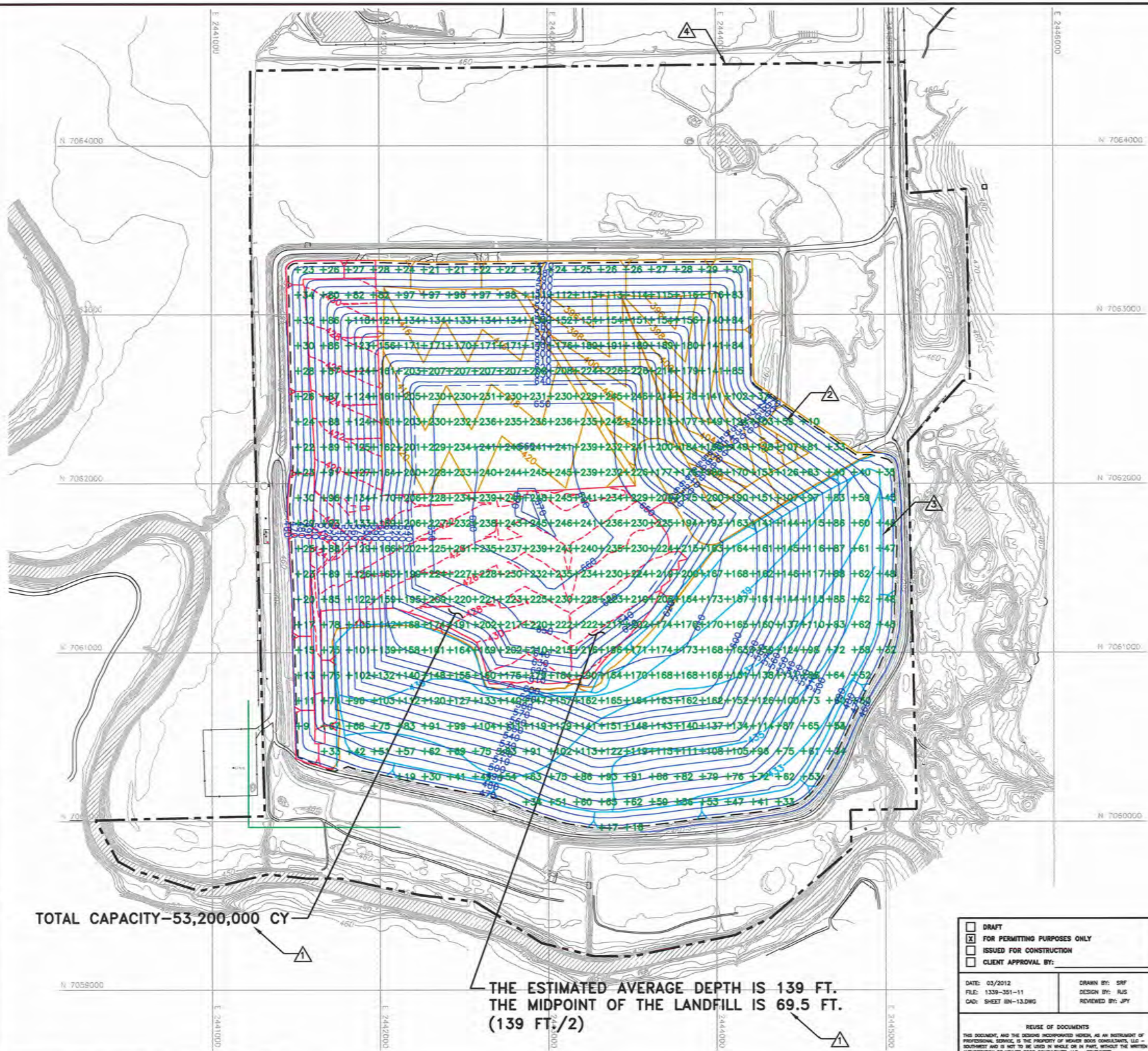
The average density is calculated at the midpoint of the average depth (~~79~~ **69.5** feet) to represent the average density of waste/cover soil within the landfill.

$D_{avg.}$ =	~~1,755~~ **1,676**	lb/yd^3

3. Determine the total capacity of the site.

   Using AutoCAD, a bottom of waste surface and a bottom of final cover (top of intermediate cover) surface are developed for the landfill. The bottom of waste and bottom of final cover surfaces are then compared in AutoCAD using the composite volume calculation method to develop of volume capacity for each unit. Refer to Sheet IIIN-13 for more information.

Total Landfill Capacity = ~~60,600,000~~ **53,200,000** cy



0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- 412 — SUBTITLE D AS–BUILT BOTTOM OF WASTE CONTOUR
- 394 — FUTURE BOTTOM OF WASTE CONTOUR
- 433 — APPROXIMATE BOTTOM OF WASTE CONTOUR IN PRE–SUBTITLE D AREA
- 520 — INTERMEDIATE CONTOUR
- +10 — DEPTH OF WASTE COLUMN
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8–28–2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 83. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PROVIDED BY PEISER SURVEYING CO. DATED AUGUST 2016.

LIST OF REVISIONS:

1. UPDATED REMAINING TOTAL CAPACITY AND AVERAGE DEPTH.
2. UPDATED TICK MARKS.
3. UPDATED INTERMEDIATE CONTOURS.
4. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] DRAFT
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339–351–11
CAD: SHEET IIIN–13.DWG

DRAWN BY: SRF
DESIGN BY: RJS
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT AVERAGE WASTE DEPTH

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F–3727

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SHEET IIIN–13

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O:\1339\351\EXPANSION 2009\PART III-SDP\IIIN\SHEET IIIN-13.dwg, sfor4, 1:2

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN
APPENDIX IIIO
FLOODPLAIN INFORMATION

Prepared for

City of Farmers Branch

March 2012

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

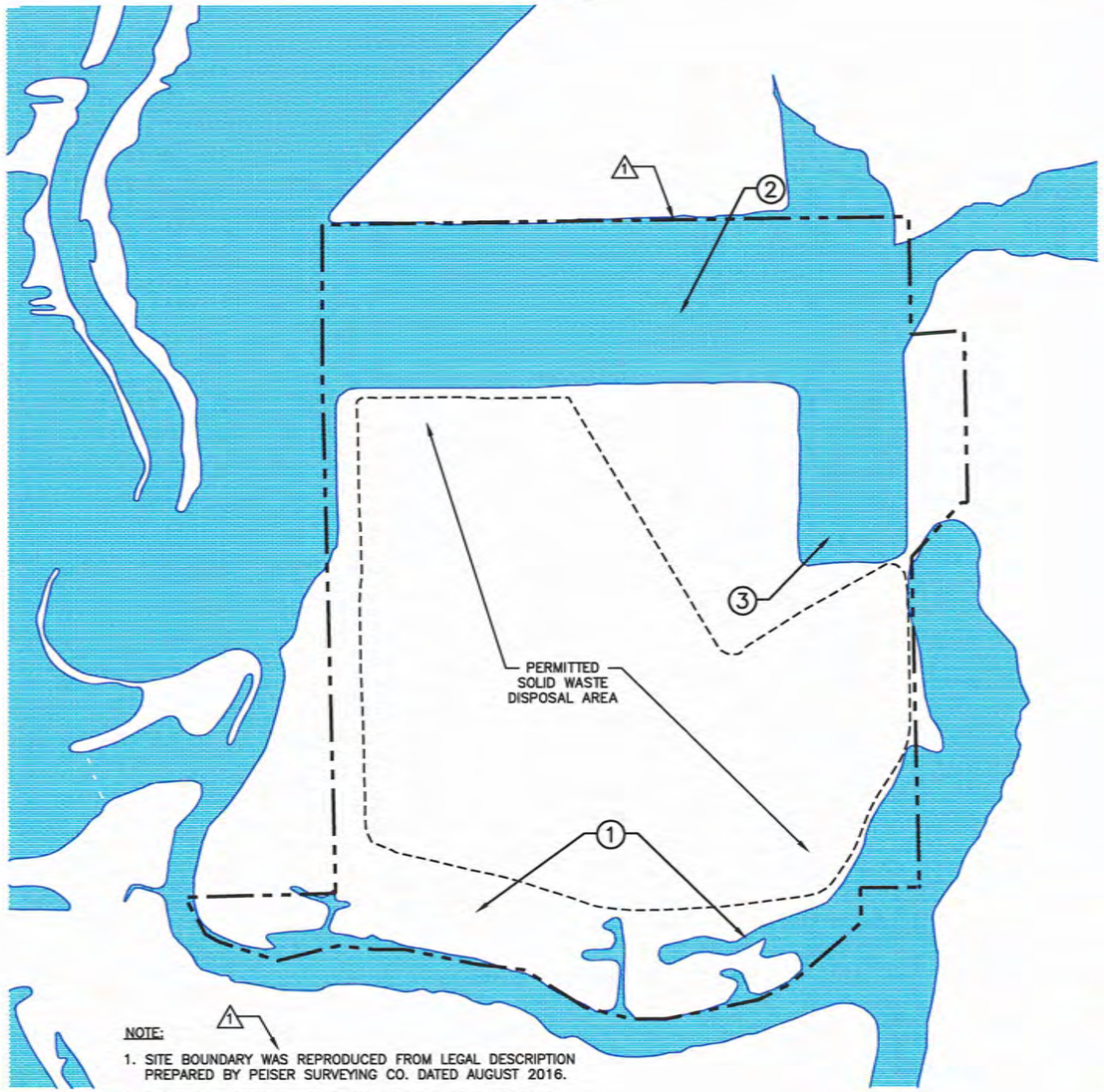
Prepared by:

Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, TX 76109
817-735-9770

WBC Project No. 1339-351-11-02-6B.6

This document is intended for permitting purposes only.

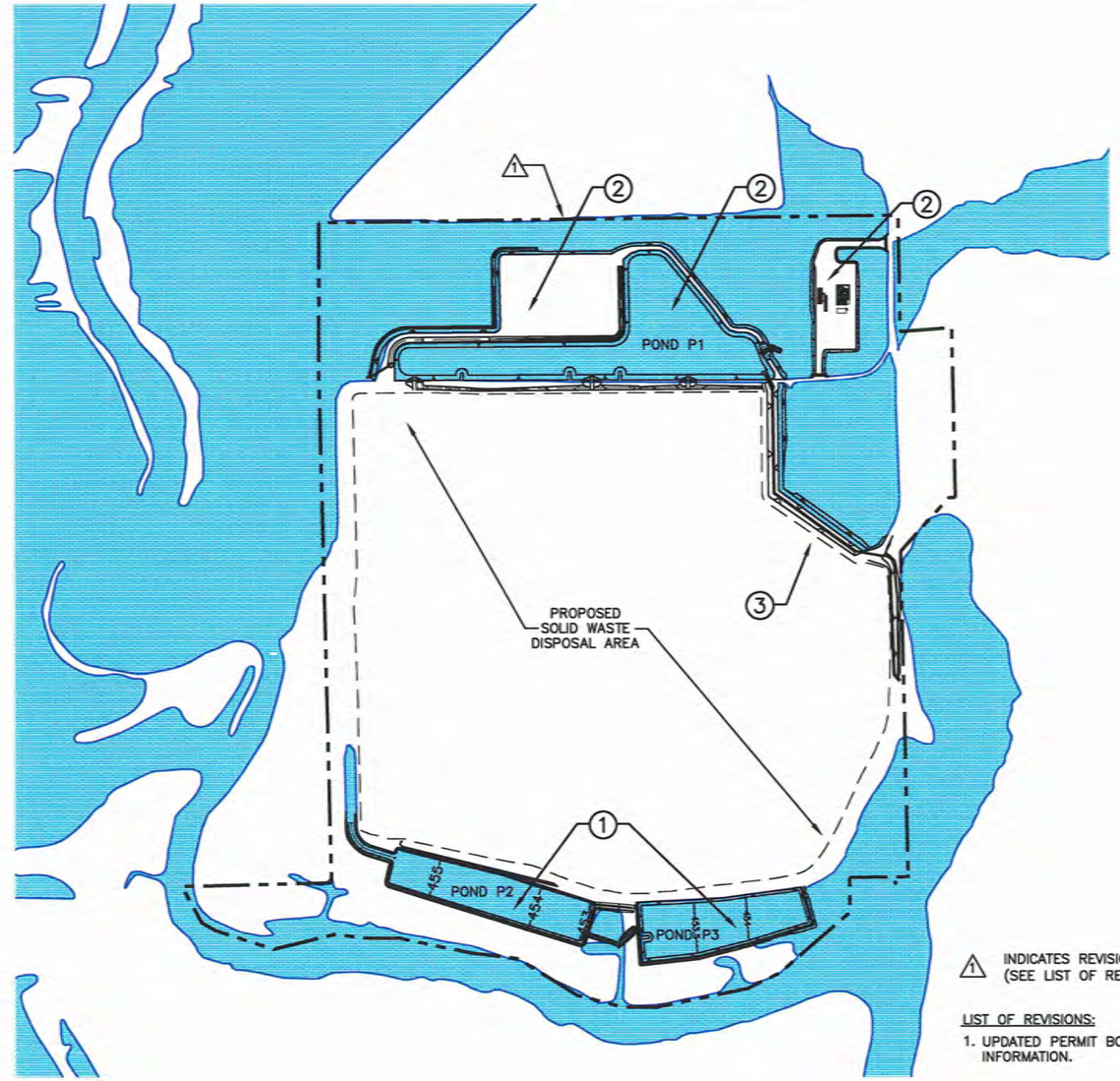
DUPLICATE EFFECTIVE CLOMR CONDITION
(SEE NOTE 2)



NOTE:

1. SITE BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PEISER SURVEYING CO. DATED AUGUST 2016.
2. FLOODPLAIN REPRODUCED FROM FIRM NO. 48121C0565 G, EFFECTIVE DATE APRIL 18, 2011.

POST–DEVELOPMENT CLOMR CONDITION



1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

N

0 500 1000
SCALE IN FEET

LEGEND

- SITE BOUNDARY
- POST–DEVELOPMENT LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- 100–YEAR FLOODPLAIN

DRAFT

CHANGES FROM DUPLICATE EFFECTIVE TO POST–DEVELOPMENT

1. ADDITION OF DETENTION PONDS THE SOUTHWEST POND (POND P2) WAS CONSTRUCTED AS AUTHORIZED BY THE CLOMR APPLICATION (CASE NO. 02–06–1950R APPROVED BY FEMA ON NOVEMBER 18, 2002–REFER TO APPENDIX F FOR ADDITIONAL INFORMATION). THE SOUTHEAST POND (POND P3) WILL FUNCTION SIMILAR TO THE PREVIOUSLY–PERMITTED SOUTHWEST POND.
2. NORTHERN AREA DEVELOPMENT. TO ALLOW FOR THE DEVELOPMENT OF FACILITIES TO SUPPORT THE OPERATION OF THE LANDFILL, THIS PROJECT INCLUDES THE REMOVAL OF TWO AREAS FROM THE FLOODPLAIN IN THE NORTHERN PORTION OF THE SITE. THESE TWO AREAS WILL BE USED FOR (1) OFFICES AND MAINTENANCE FACILITIES, INCLUDING ACCESS ROADS AND (2) A 16–ACRE AREA THAT WILL BE USED TO SUPPORT OPERATIONS, SUCH AS EQUIPMENT STORAGE, A CITIZEN CONVENIENCE CENTER, ENTRANCE FACILITIES, ACCESS ROADS, AND/OR A WOOD WASTE PROCESSING AREA.
3. REMOVAL OF NORTHEAST AREA FROM FLOODPLAIN TO ALLOW FOR THE CONTINUED DEVELOPMENT OF THE LANDFILL. THIS AREA IS PROPOSED TO BE REMOVED FROM THE INEFFECTIVE FLOW AREA OF THE 100–YEAR FLOODPLAIN.

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- ☒ FOR PERMITTING PURPOSES ONLY
- ☐ ISSUED FOR CONSTRUCTION
- ☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339–351–11
CAD: A.1–CLOMR COMP.DWG

DRAWN BY: VRS
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
CLOMR FLOODPLAIN CONDITION COMPARISON

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F–3727

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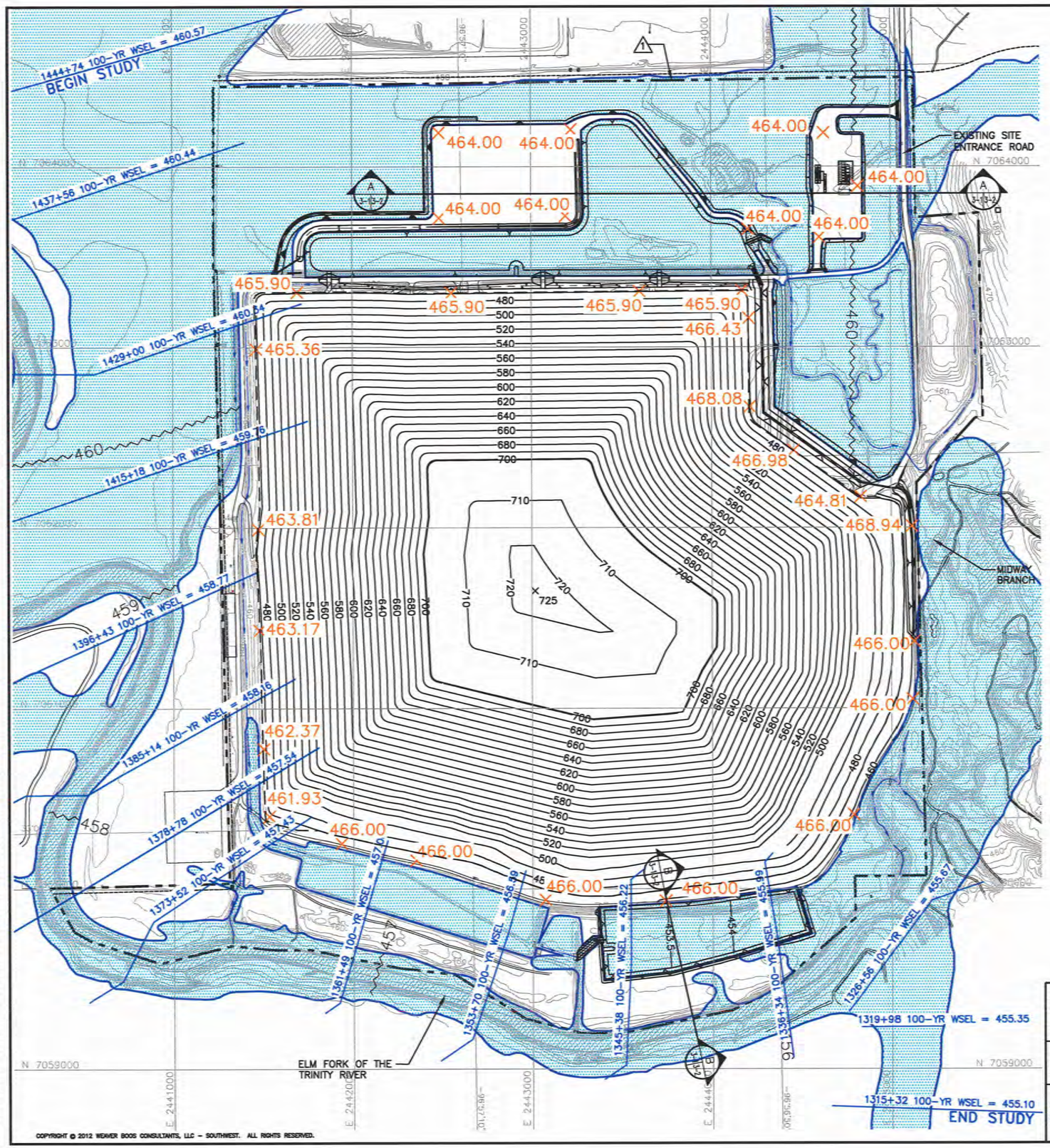
NAPERVILLE, IL
COLUMBUS, OH
DENVER, CO

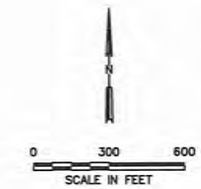
FORT WORTH, TX
(817) 735–9770

GRIFFITH, IN
SOUTH BEND, IN
SPRINGFIELD, IL
ST. LOUIS, MO

DRAWING 1110–A.1

O:\1339\351\EXPANSION 2009\PART III–SDP\1110–A\A.1 CLOMR COMPARISON.dwg, sfor4, 1:2





LEGEND

- SITE BOUNDARY
- PROPOSED LIMIT OF WASTE
- STATE PLANE COORDINATE SYSTEM
- GEODETIC COORDINATE SYSTEM
- EXISTING CONTOURS (SEE NOTE 1)
- 100-YEAR FLOODPLAIN (WBC AUGUST, 2011)
- FILL/CUT SLOPE INDICATORS
- 464.00 ELEVATION OF PERIMETER BERM
- 1378+78 100-YR WSEL = 457.54 HEC-RAS CROSS SECTION LOCATION
- 680 PROPOSED FINAL CONTOUR (SEE NOTE 3)
- 460 100 YEAR WATER SURFACE ELEVATION

NOTES:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-2010. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 1988. OFF-SITE CONTOURS AND ELEVATIONS PROVIDED BY DFWMAPS.COM FROM AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN JANUARY TO MARCH 2007.
2. CROSS SECTIONS LOCATIONS REPRESENT THE LIMITS OF THE MOLDED TERRAIN IN THE HEC-RAS HYDRAULIC MODEL OF THE ELM FORK OF THE TRINITY RIVER.
3. SITE BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PEISER SURVEYING CO. DATED AUGUST 2016. (1)

(1) INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

DRAFT

- [ ] FOR INFORMATION PURPOSES ONLY
- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: A.2 FREEBOARD AVAIL.DWG

DRAWN BY: SRF
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
FREEBOARD AVAILABILITY

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants

TBPE REGISTRATION NO. F-3727

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DRAWING 1110-A.2

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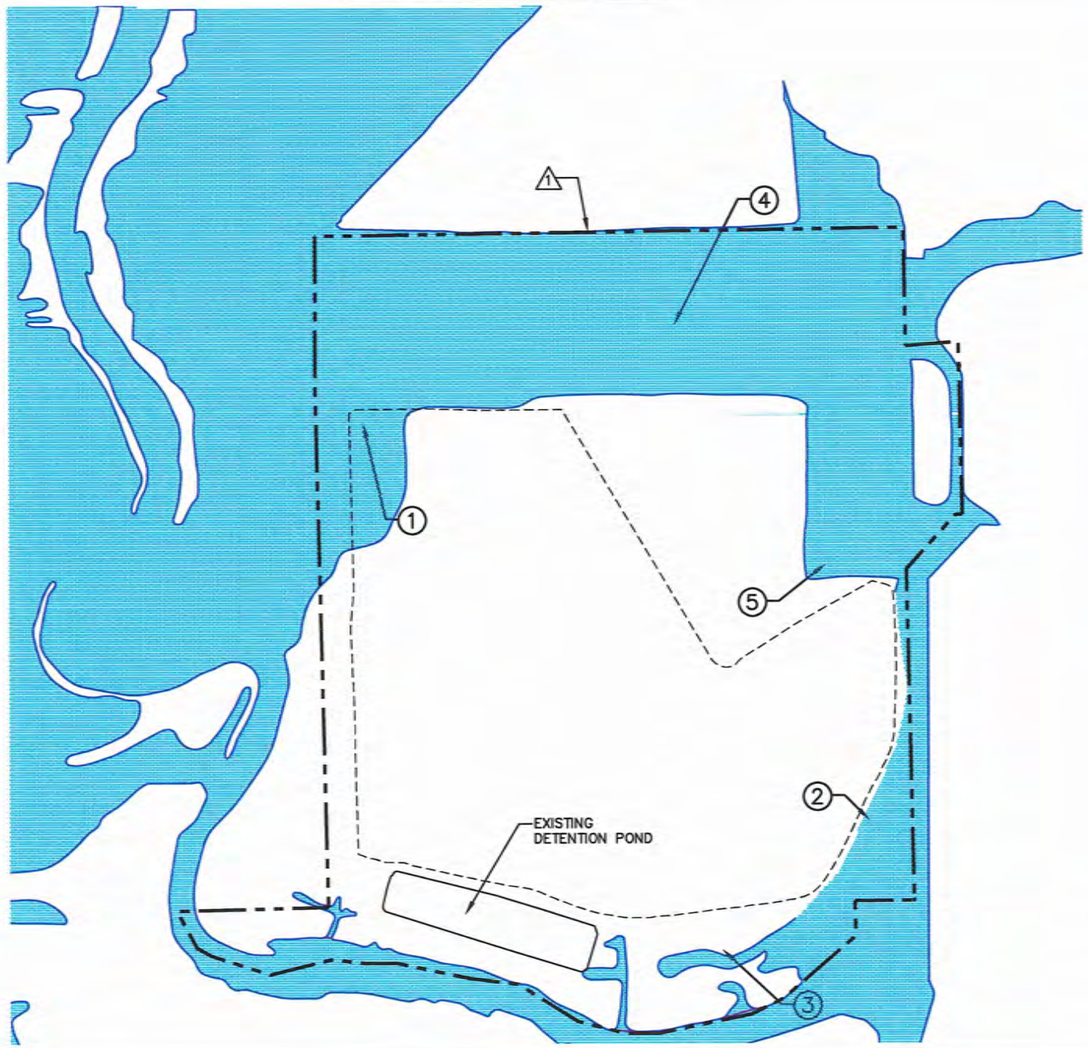
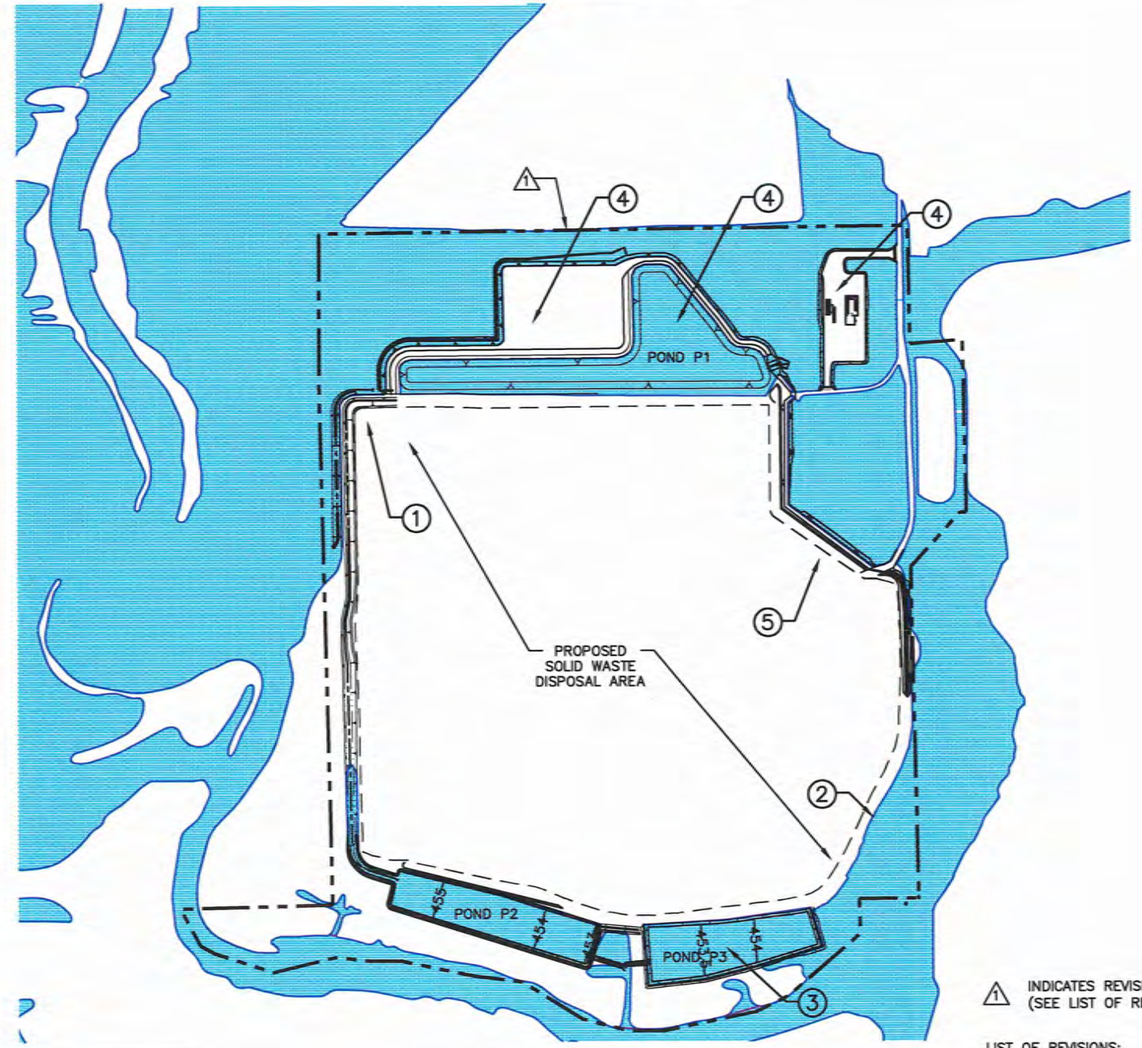
PRE-PROJECT CDC CONDITION



WITH-PROJECT CDC UPDATES



1 INDICATES REVISION (SEE LIST OF REVISIONS)

LIST OF REVISIONS:

1. UPDATED PERMIT BOUNDARY INFORMATION.

NOTE:

1. SITE BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PEISER SURVEYING CO. DATED AUGUST 2016. 1

N

0 500 1000

SCALE IN FEET

LEGEND

- SITE BOUNDARY
- POST-DEVELOPMENT LIMIT OF WASTE
- AUTHORIZED LIMIT OF WASTE
- 100-YEAR FLOODPLAIN

DRAFT

COMPARISON OF PRE-PROJECT AND WITH-PROJECT CONDITIONS

1. THE NORTHWEST CORNER IS REMOVED FROM THE 100-YEAR FLOODPLAIN. NO CHANGE TO THE HYDRAULIC MODEL IS NEEDED. THIS CHANGE REPRESENTS A MAP CORRECTION.
2. ADJUSTMENT OF THE FLOODPLAIN LIMITS ON THE EAST AND SOUTHEAST SIDES OF THE LANDFILL TO REFLECT AS-BUILT CONDITIONS. THIS IS MAPPING CHANGE ONLY. NO UPDATE TO THE HYDRAULIC MODEL HAS BEEN MADE FOR THIS CHANGE.
3. ADDITION OF EXISTING AND PROPOSED DETENTION PONDS. THE WESTERN POND HAS BEEN CONSTRUCTED AS PART OF THE CURRENT LANDFILL PERMIT. THE ADDITIONAL EAST DETENTION POND WILL FUNCTION SIMILAR TO THE EXISTING PERMITTED DETENTION POND.
4. NORTHERN AREA DEVELOPMENT. TO ALLOW FOR THE DEVELOPMENT OF FACILITIES TO SUPPORT THE OPERATION OF THE LANDFILL, THIS PROJECT INCLUDES THE REMOVAL OF TWO AREAS FROM THE FLOODPLAIN IN THE NORTHERN PORTION OF THE SITE. THESE TWO AREAS WILL BE USED FOR (1) ENTRANCE FACILITIES INCLUDING ACCESS ROADS AND (2) A 16-ACRE AREA THAT WILL BE USED AS AN OPERATION SUPPORT AREA.
5. REMOVAL OF NORTHEAST AREA FROM FLOODPLAIN TO ALLOW FOR THE CONTINUED DEVELOPMENT OF THE LANDFILL. THIS AREA IS PROPOSED TO BE REMOVED FROM THE INEFFECTIVE FLOW AREA OF THE 100-YEAR FLOODPLAIN.

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☒ FOR PERMITTING PURPOSES ONLY
☐ ISSUED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 03/2012
FILE: 1339-351-11
CAD: A.4-CDC FLOODPLAIN.DWG

DRAWN BY: VRS
DESIGN BY: CRM
REVIEWED BY: JPY

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PREPARED FOR

CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT
CDC FLOODPLAIN CONDITION COMPARISON
CAMELOT LANDFILL
DENTON COUNTY, TEXAS

Weaver Boos Consultants
TBPE REGISTRATION NO. F-3727

CHICAGO, IL
NAPERVILLE, IL
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SPRINGFIELD, IL
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DRAWING 1110-A.4

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CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART IV – SITE OPERATING PLAN

Prepared for

City of Farmers Branch

March 2012
Revised December 2012
Revised August 2013
Revised December 2013
Revised June 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

6-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Prepared by

Weaver Boos Consultants, LLC–Southwest
TPBE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6C

This document is intended for permitting purposes only.

4.5 Control of Windblown Wastes and Litter

Windblown wastes will be controlled at the Camelot Landfill by the methods used in Table 4.1.

4.6 Easements and Buffer Zones

4.6.1 Easements

~~Six~~ Three easements exist within the permit boundary as shown on Drawing I/IIA.1 in Appendix I/IIA. Two sanitary sewer easements (a varying width 20-foot to 30-foot easement and a 10-foot by 20-foot easement) are located along the western side of the permit boundary. A 20-foot electrical easement is located along the eastern side of the permit boundary. This easement serves the existing maintenance area. This easement will be abandoned prior to the development of this portion of the site. ~~A 40-foot right-of-way dedication and a 40-foot sanitary sewer easement cross the northern portion of the permit boundary. A 20-foot utility easement is located in the northeast corner of the site near the existing entrance facilities.~~ No solid waste unloading, storage, disposal, or processing operations will occur within any easement at the Camelot Landfill. Also, no waste disposal is allowed within 25 feet of the centerline of an easement. Easements are or will be marked as specified in Section 4.7 of this SOP.

4.6.2 Buffer Zones

No solid waste unloading, storage, disposal, or processing operations will occur within any buffer zone at the Camelot Landfill, except as noted below for the existing 100,000-gallon storage tank. In accordance with Title 30 TAC 330.543(b)(2)(B) and (C), the buffer zones vary around the perimeter of the site, but generally they are not less than 50 feet between the permit boundary and existing waste (the limits of waste that was permitted as part of MSW Permit No. 1312A) and 125 feet from the newly permitted limits of waste (refer to Parts I/II, Appendix I/IIC – Location Restrictions Demonstration for more information). The only exception is the existing 100,000-gallon leachate storage tank, which is located about 25 feet from the permit boundary. However, as discussed in Parts I/II, Appendix I/IIC – Section 2, an area over 150 feet wide is located between the leachate storage tank and the limits of waste. This area also includes the all-weather perimeter road to allow the safe passage of emergency vehicles. The 100,000-gallon leachate storage tank was approved by TCEQ on November 17, 2000 as part of a leachate storage system permit modification (refer to Parts I/II, Appendix I/IIC for additional information).

Internal separation distances between processing and disposal units are shown in Appendix I/IIC, Drawing I/IIC-1. The buffer zones around the site will provide for the safe passage of fire fighting or other emergency vehicles. All buffer zones will be clearly marked as specified in Section 4.7 of this SOP.

CAMELOT LANDFILL
CITY OF LEWISVILLE, DENTON COUNTY
TCEQ PERMIT NO. MSW-1312B

MAJOR PERMIT AMENDMENT APPLICATION

PART IV – SITE OPERATING PLAN
APPENDIX IVE
FLOODPLAIN MARKER PLAN

Prepared for

City of Farmers Branch

March 2012
Revised December 2013
Revised June 2014

Revised August 2016

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JASON A. EDWARDS, P.E., TEXAS LICENSE NO. 99336, ON

8-5-16

IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES

Prepared by

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TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 1339-351-11-02-6C

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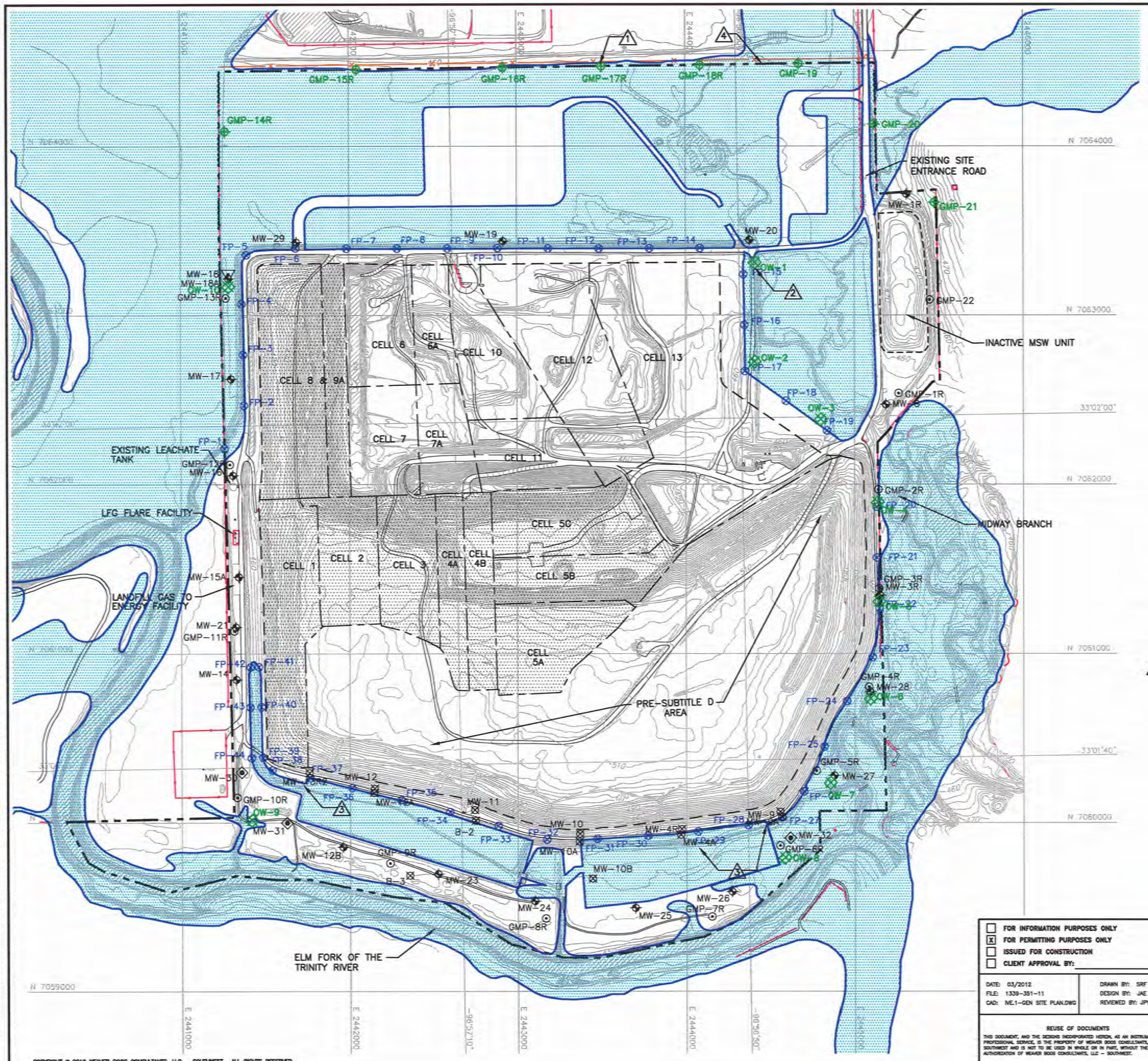

N

0 300 600
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY (SEE NOTE 2)
- LIMIT OF WASTE
- N 7064000 — STATE PLANE COORDINATE SYSTEM
- 33°02'00" — GEODETIC COORDINATE SYSTEM
- 500 — EXISTING CONTOUR
- MW-8 — EXISTING GROUNDWATER MONITORING WELL
- MW-30 — PROPOSED GROUNDWATER MONITORING WELL
- GMP-1R — EXISTING LANDFILL GAS MONITORING PROBE
- GMP-20 — PROPOSED LANDFILL GAS MONITORING PROBE
- MW-12 — OBSERVATION/MONITORING WELL
- FP-1 — PROPOSED FLOODPLAIN MARKER
- 2 OW-1 — PROPOSED WOODBINE MONITOR WELL
- EXISTING SUBTITLE D COMPOSITE LINED AREA
- EXISTING FENCE
- PROPOSED FENCE
- 100-YEAR FLOODPLAIN (SEE NOTE 3)
- 1 — INDICATES REVISION (SEE LIST OF REVISIONS)

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY METROPOLITAN AERIAL SURVEYS COMPILED FROM AERIAL PHOTOGRAPHY FLOWN 8-28-10. THE GRID SYSTEM IS TIED TO THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE NAD 1983. ELEVATIONS ARE BASED ON NAVD 88.
2. PERMIT BOUNDARY WAS REPRODUCED FROM LEGAL DESCRIPTION PREPARED BY PIESER SURVEYING CO. DATED AUGUST 2016. THE PERMIT BOUNDARY FOR TCEQ PERMIT NO. MSW-1312A IS SHOWN ON FIGURE I/II-3.1. (4)
3. FLOODPLAIN INFORMATION IS INCLUDED IN APPENDIX IIIO.

LIST OF REVISIONS:

1. UPDATED LOCATION OF GAS MONITORING PROBES GMP-15R THROUGH GMP-19.
2. ADDED PROPOSED WOODBINE MONITOR WELLS OW-1 THROUGH OW-10.
3. UPDATED GROUNDWATER MONITORING WELLS WITH AS-BUILT LOCATIONS.
4. UPDATED PERMIT BOUNDARY INFORMATION.

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- [x] FOR PERMITTING PURPOSES ONLY
- [ ] ISSUED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY:

DATE: 03/2012
FILE: 1339-351-11
CAD: IVE.1-GEN SITE PLAN.DWG
DRAWN BY: SRF
DESIGN BY: JAE
REVIEWED BY: JPY

PREPARED FOR
CITY OF FARMERS BRANCH

REVISIONS

NO.	DATE	DESCRIPTION
1	12/2012	1st TCEQ COMMENT RESPONSE
2	06/2014	SUPPLEMENTAL SUBMITTAL
10	08/2016	SEE LIST OF REVISIONS

MAJOR PERMIT AMENDMENT FLOODPLAIN MARKER PLAN

CAMELOT LANDFILL
DENTON COUNTY, TEXAS

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TBPE REGISTRATION NO. F-3727

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GRIFFITH, IN SOUTH BEND, IN SPRINGFIELD, IL ST. LOUIS, MO

DRAWING IVE.1

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O:\1339\351\EXPANSION 2009\PART IV\APPENDIX IV E\IV E.1-SITE PLAN.dwg, sfor4, 1:2

Aerial Map - Camelot

MEMORANDUM

TO: Donna Barron, City Manager

VIA: Keith Marvin, P.E., Director of Public Services

FROM: Karen Emadiazar, Utilities Manager, Public Services

DATE: October 5, 2016

SUBJECT: **Approval of an Award for the Lewisville Raw Water Intake Electrical Improvements to Russell Madden, Inc., Aubrey Texas, in the Amount of $218,001; and Authorization for the City Manager to Execute the Contract.**

BACKGROUND

The Public Services Department, acting through the Utilities Division operates the Lewisville Intake Structure, one of two pump stations that provide untreated water to the C. R. Feaster Water Plant. Electrical components within the structure are over forty years old and require replacement for operational efficiency, reliability and technology improvements that will provide for future drinking water needs for the utility.

The electrical improvements proposed include the replacement of the 480-volt motor control center; installation of variable frequency drives and harmonic filters; and provisions for a docking station for the emergency generator.

On September 22, 2016, bids were received for the Intake improvements, which include the electrical improvements, replacement of the station's door, an air handling system, and a warranty on the contractor's work against defects in material and workmanship for two years.

ANALYSIS

Two bids were received for the Lewisville Intake Electrical Improvements project; both vendors were evaluated on their experience and qualifications in similar projects, as well as their bid price. Russell Madden, Inc. had the lowest base bid in the amount of $207, 620, with a contingency of $10,381 for a total of $218,001. Funding is available in the Capital Improvements Account U1602.

RECOMMENDATION

It is City staff's recommendation that the City Council approves the award as set forth in the caption above.

MEMORANDUM

TO: Donna Barron, City Manager

THROUGH: Brenda Martin, Finance Director

FROM: Todd White, Purchasing Manager

DATE: October 6, 2016

SUBJECT: **Approval of an Award for the Lewisville Raw Water Intake Electrical Improvements to Russell Madden, Inc., Aubrey Texas, in the Amount of $218,001; and Authorization for the City Manager to Execute the Contract.**

BACKGROUND

A bid invitation was created and posted on Bidsync.com September 3, 2016. Specifications were created in accordance with Texas Local Government Code Chapter 252.043, *Award of Contract*. Specifications under this chapter of the law state the award is to be made on the basis of the best value for the municipality.

In determining the best value for the municipality, the municipality may consider, among other things: (1) the purchase price; (2) the quality of the bidder's goods or services; and (3) the extent to which those goods or services meet the municipality's needs.

ANALYSIS

Sealed bids were due September 22, 2016 and two bids were received. An evaluation of both bids were performed and it was determined Russell Madden, Inc. submitted the lowest bid and is being recommended on the basis of best value.

RECOMMENDATION

It is City staff's recommendation that the City Council approves the award as set forth in the cation above.

CITY OF LEWISVILLE
PURCHASING DIVISION
BID TABULATION
BID # 16-52-C
RAW WATER INTAKE ELECTRICAL IMPROVEMENTS

RUSSELL MADDEN, INC. **AUBREY, TEXAS**	**$218,001.00**
PRATTER ELECTRIC LLC DENTON, TEXAS	$233,467.50

STANDARD FORM OF AGREEMENT

STATE OF TEXAS
COUNTY OF DENTON

THIS CONTRACT, made and entered into the 17th day of October AD. 2016, by and between the City of Lewisville of the County of Denton and State of Texas, hereinafter "the City", and Russell Madden Incorporated of the City of Aubrey, County of Denton and State of Texas, hereinafter "the Contractor".

In consideration of the mutual covenants, promises, and agreements herein contained, the City and the Contractor hereby agree that the Contractor will commence and complete the construction of certain improvements described as follows:

Work included in this contract consists of the electrical improvements to the Lewisville Intake Structure. This work includes all labor, equipment and materials for the removal/disposal of existing motor control centers, conduit, panels and other electrical appurtenances, and replacements and all other electrical and instrumentation services. And all extra work in connection therewith, under the terms as stated in the General Conditions of the Agreement and at the Contractor's own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said construction, in accordance with the conditions and prices stated in the Proposal attached hereto, and in accordance with the Notice to Contractors, General and Special Conditions of Agreement, Plans and other drawings and printed or written explanatory matter thereof, and the Specifications and addenda therefore, as prepared by the City and attached hereto, together with the Contractor's written Proposal, the General Conditions of the Agreement, and the Performance and Payment Bonds hereto attached; all of which are made a part hereof and collectively evidence and constitute the entire contract.

The Contractor hereby agrees to commence work within ten (10) calendar days after the date of the written notice to commence work and to fully complete the project within 150 days, subject to such extensions of time as are provided by the General and Specific Conditions.

The City agrees to pay the Contractor in current funds the price or prices shown in the proposal, which forms a part of this contract, such payments to be subject to the General and Special Conditions of the contract.

IN WITNESS WHEREOF, the parties hereto have executed this contract in the year and day first above written.

APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS:

By: _____

DONNA BARRON, City Manager

ATTEST:

By: _____

JULIE HEINZE, City Secretary

APPROVED AS TO FORM:

By: _____

LIZBETH PLASTER, City Attorney

RUSSELL MADDEN, INC

By: _____

(Signature)

Russell Madden Pres.

(Print Full Name and Title)

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Eric Ferris, Deputy City Manager

DATE: October 5, 2016

SUBJECT: **Approval of a Wholesale Untreated Water Purchase Contract between the City of Dallas and City of Lewisville, and Authorization for the City Manager or Her Designee to Execute the Contract.**

BACKGROUND

The City of Lewisville executed an untreated water contract with the City of Dallas on December 17, 1986. The term of the 1986 contract was for 30 years and is set to expire on December 17, 2016. This contract is for the provision of untreated water for an additional thirty- year term.

ANALYSIS

The new contract is generally the same as the 1986 contract with only minor modifications made to language. The contract provides for two diversion points for the City of Lewisville, and the ability to request additional diversion points in the future. Lewisville is required to maintain accurate metering facilities and provide Dallas Water Utilities with projections in water usage. Water rates for untreated water shall be based on Dallas Water Utilities' Cost of Service Study, in conformity with standard utility rate-making practices. The new contract term will expire on December 17, 2046.

The long term Treated Water Contract and Untreated Water Contract with the City of Dallas provides the majority if not all of the future water needs for Lewisville.

RECOMMENDATION

That the City Council approve the contract as set forth in the caption above.

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Eric Ferris, Deputy City Manager

DATE: October 13, 2016

SUBJECT: **Approval of a Wholesale Untreated Water Purchase Contract between the City of Dallas and City of Lewisville, and Authorization for the City Manager or Her Designee to Execute the Contract.**

Staff is waiting for minor revisions that are being made to the contract by the City of Dallas. The contract will be added on Friday, October 14 or Monday, October 17 when we receive the final document.

STATE OF TEXAS §
§
COUNTY OF DALLAS §

WHOLESALE UNTREATED WATER PURCHASE CONTRACT
between City of Dallas and City of Lewisville

This Untreated Water Purchase Contract ("Contract") is made and entered into this the _____ day of _____, 2016, by and between the City of Dallas, a Texas home rule municipality (hereinafter called "Dallas"), and the City of Lewisville, a Texas home rule municipality (hereinafter called "Purchaser").

WHEREAS, pursuant to the Contract, untreated water will be taken from diversion points located along Lewisville Lake, Denton County; and

WHEREAS, Dallas, pursuant to Certificate of Adjudication No. 08-2456 (Lewisville Lake) is entitled to appropriate certain amounts of water from Lewisville Lake; and

WHEREAS, the diversion and use of the water by Purchaser from Lewisville Lake will affect the water rights of Dallas; and

WHEREAS, the water so diverted will be used for municipal purposes by Purchaser; and

WHEREAS, Purchaser currently purchases untreated water from Dallas, and Dallas currently sells untreated water to Purchaser as set forth under the terms, covenants, and conditions stated in the Untreated Water Purchase Contract ("Current Contract") which will expire on December 17, 2016; and

WHEREAS, the parties desire to enter into this Contract that shall allow Purchaser to purchase untreated water at the Dallas ordinance rate for regular untreated water in effect on the date of execution of this Contract, and as may thereafter be changed from time to time in the manner set out herein below, in accordance with applicable regulations and procedures established by the Texas Commission on Environmental Quality ("TCEQ") and the Texas Water Development Board ("TWDB"); and,

WHEREAS, the effectiveness of this Contract is dependent upon compliance with the applicable rules of the TCEQ and the TWDB.

NOW, THEREFORE, in consideration of the mutual promises, covenants, and conditions given by each party, Dallas and Purchaser agree as follows:

1. CONTRACT ADMINISTRATION

This Contract shall be administered on behalf of Dallas by its Director of Water Utilities, or the Director's designated representative (hereinafter called "Director"), and on behalf of Purchaser by its authorized official or designated representative.

2. TERM

The term of this Contract shall remain in full force and effect for a term of thirty (30) years from December 17, 2016 ("Effective Date") unless terminated earlier as provided herein.

3. AVAILABILITY AND DIVERSION POINT

Dallas agrees to sell untreated water contracted for by Purchaser for municipal uses, when available, and when not otherwise needed by Dallas for storage, diversion or use for authorized purposes in Lewisville Lake. The sale of untreated water to meet the requirements of Purchaser is subject to and limited by the available system supply (as determined by the Director). Sales, however, shall not be unreasonably withheld. Purchaser shall divert water only at diversion points as described in **Exhibit B**, Description of Pumping and Metering Equipment and Facilities and Location of Diversion Points, attached hereto and fully incorporated herein for all purposes as if copied word for word.

A. **Exhibit B** satisfies the requirement of 30 Texas Administrative Code (TAC) Section 295.101(b), to include in the water purchase contract a vicinity map that shows the diversion point and place of use.

B. Purchaser may, in the future, request additional diversion points under this Contract. Such additional diversion points may be granted with the approval of the Director and when so-approved, shall require the amendment of **Exhibit B** to this Contract to include those as-yet undetermined diversion points and comply with the requirements set out at 30 TAC § 295.101(b).

4. WATER YEAR

The term "Water Year" means the period described by applicable ordinance of the City of Dallas, as may be amended from time to time. Currently, the Water Year begins on June 1 and ends on May 31.

5. DEMAND: CHANGES IN DEMAND

A. "Demand" means the maximum average annual amount of untreated water, expressed in millions of gallons per day (MGD), to be withdrawn by Purchaser from Dallas' rights in Lewisville Lake within a Water Year.

B. Purchaser shall give annual notice to Dallas of Purchaser's projected water use and demand for untreated water for the coming Water Year by revising the Projected Water Usage (MGD) and Demand schedule, **Exhibit C**. Such notice shall be given at least ninety days in advance of the beginning of the Water Year. The Director may waive the ninety-day notice requirement for good cause shown.

C. In the event Purchaser withdraws more than the agreed MGD for untreated water during a Water Year as set out **Exhibit C**, which is subject to annual revision, Purchaser agrees to pay for such additional water under the same formula per 1,000 gallons as described in Section 12 of this Contract.

6. MEASUREMENT OF CONSUMPTION

A. Adequate metering facilities, as approved by the Director, will be provided by Purchaser at the diversion point(s). Purchaser will be responsible to ensure each meter is operated and maintained so as to record with commercial accuracy. Purchaser shall employ a professional meter testing firm that is acceptable to Dallas, to test such meters annually and shall invite representatives of Dallas to observe such tests. Dallas reserves the right to request that Purchaser test an appropriate meter. Dallas shall bear the cost of such requested testing in the event that the test reveals the meter was operating within manufacturer's specifications for accuracy. The Director shall have the right to test the meter. In the event the Director determines that the meter does not meet its manufacturer's specifications for accuracy and underreports consumption in favor of Purchaser, the Director shall bill Purchaser for quantities of underreported untreated water the Director shall estimate pursuant to the formula set out in Paragraph 6.B. below.

B. If a meter is discovered to be malfunctioning, the amount of water that has passed through such meter will be estimated for each day that the meter has not functioned correctly. The last correctly-measured monthly consumption will serve as the basis for calculating the amount of water actually consumed during the time such meter had not functioned correctly, or by another method Dallas and Purchaser agree to in writing by the Director and Purchaser. Purchaser shall maintain daily pumping logs to provide an alternate manner for estimating billings. Purchaser has a maximum of sixty (60) days to repair or replace any faulty meter. Upon completion of necessary repairs or replacement of a faulty meter, Purchaser shall be required to obtain the Director's approval for the use of any new or repaired meter.

C. Purchaser shall provide Dallas with monthly reports describing the amount of monthly usage of water. The reports shall be in a form prescribed by the Director.

7. METERING AND PUMPING FACILITIES

A. Purchaser shall be required to provide metering and pumping equipment and facilities as outlined in **Exhibit B**. Ownership and maintenance responsibility for the meters, pumps and facilities housing meters and pumps shall be with Purchaser. Purchaser shall maintain meters, pumps and motors and facilities to the satisfaction of the Director. All metering and

diversion facilities shall be designed, constructed, and operated in accordance with usual and customary industry practices and standards. Meters shall conform to American Water Works Association Standards and any other applicable standards where such standards exist.

B. Dallas has reviewed the existing facilities constructed for operation under this contract as identified in **Exhibit B**, and such diversion works and facilities are authorized.

C. Prior to purchase or letting of contracts, Purchaser shall submit to the Director for written approval of plans and specifications for proposed or additional intake facilities, pumping facilities, and metering equipment and facilities. Purchaser shall be responsible for the design, contracting, construction, and financing of all metering facilities. Purchaser agrees that Dallas has the right to make periodic inspections during the construction phase of the metering facilities. Final approval of completed metering facilities is subject to the mutual agreement of Purchaser and Dallas.

8. INSPECTION AND METER READING

Authorized Dallas employees shall have the right of reasonable ingress and egress on Purchaser's property and facilities during business hours to observe pumping operations, review pumping records, read meters, and to verify that untreated water is being used for the purposes and in the manner prescribed in this Contract.

9. ADDITIONAL WATER SUPPLIES

A. If Purchaser develops or acquires additional water supplies from any source other than Dallas that results in reduced demand from Dallas pursuant to this Contract, then Purchaser shall release Dallas from the applicable obligation to supply the demand pursuant to **Exhibit C**. In such event Dallas may adjust its supply obligation to levels commensurate with Purchaser's reduced demand.

B. In the event Purchaser ceases to purchase water from Dallas during the term of this Contract pursuant to the formula set out in **Exhibit C** because Purchaser has developed or acquired other water supplies, Dallas may exercise the option to hold Purchaser liable for charges at the annual billing level in effect at the date of such cessation for a period of five years from date of notification by Purchaser of its intent to reduce or cease taking water or the balance of this Contract, whichever is less. Dallas shall consider whether a direct or indirect liability has been incurred on Purchaser's behalf in determining whether to hold Purchaser liable for charges.

C. If, during the term of this Contract, Purchaser's demand from Dallas in any Water Year is diminished due to obtaining or developing other water supplies, other than from the City of Dallas, Purchaser's annual demand in years following the obtaining of additional supplies shall not be less than the highest demand in any previous Water Year occurring after Purchaser has obtained additional water supplies. In that event, Purchaser shall owe and pay for, at a minimum,

such highest demand notwithstanding the fact that Purchaser may take from Dallas a lesser amount of water. Payment of the minimum amount due shall be prorated on a monthly basis.

10. WATER WELLS

Nothing in this Contract shall be construed to impair or affect Purchaser's right to use any existing water wells or any water wells it may drill in the future.

11. SEWAGE TREATEMENT FACILITIES – EFFLUENT RETURN

Purchaser agrees to maintain adequate sewage treatment facilities to meet its needs and provide for any increased quantity of wastewater flow.

12. RATES

A. Purchaser shall pay Dallas for untreated water taken under this Contract at the regular rate for untreated water sales specified by any applicable City of Dallas ordinance in effect at the time, and shall pay all other applicable charges for untreated water as specified by any applicable City of Dallas ordinance in effect at the time.

B. The Director will furnish Purchaser a draft copy of the Cost of Service Study for proposed rates 30 days prior to the submittal to the Dallas City Council of a rate increase request. Any revision of rates shall be pursuant to principles set forth in **Exhibit A**, Wholesale Untreated Water Rate Principles, as it may be amended from time-to-time, and which is attached hereto and incorporated into this Contract, as shall be the case with any future amendments. Dallas shall give Purchaser a minimum of six months' notice of intent to revise rates.

Purchaser agrees to provide Dallas with comments, if any, in regard to the cost of service study within 20 days after receipt

C.

D. Purchaser agrees to give Dallas a minimum of thirty (30) days' notice of its intent to protest rates, or any other condition of service, before the TCEQ or any other state agency with jurisdiction over the Contract and the parties thereto.

13. OTHER CHARGES

In the event any sales or use taxes, assessments or charges of any similar nature are imposed on diverting, storing, delivering, gathering, impounding, taking, selling, using, or consuming the water received by Purchaser from Dallas, the amount of the tax, assessment, or charge shall be borne by Purchaser, in addition to all other charges, and whenever Dallas is required to pay, collect, or remit any tax, assessment, or charge on water received by Purchaser, then Purchaser shall promptly pay or reimburse Dallas for the tax, assessment or charge in the manner directed by Dallas.

14. PAYMENT

A. Purchaser agrees to pay for, as billed, for the quantity of water that was diverted.

B. Dallas agrees to render a statement of charges monthly. Payment is due upon receipt of statement and Purchaser agrees to pay promptly.

C. In the event a meter is discovered to be malfunctioning, the amount of water that has passed through the meter will be estimated for each day the meter was not functioning correctly. The last correctly-measured monthly consumption, or by another method mutually-agreed upon between Dallas and Purchaser memorialized in writing by the Director and Purchaser, shall be used as the basis for computing the amount of water actually delivered to Purchaser during the period of time the meter was not functioning correctly.

D. Dallas and Purchaser agree that any disputed charges on the monthly invoice shall be protested in accordance with Tex. Govt. Code Section 2251.042. Purchaser agrees that in the event it disputes any portion of the charges on the monthly invoice, Purchaser shall remain obligated to timely pay any undisputed amount in accordance with this Section.

15. LATE PAYMENT

Purchaser agrees that a payment is deemed late if received by Dallas more than 30 days after the date of the monthly billing statement. Late payments shall accrue interest at the interest rate provided in Section 2-1.1 of the Dallas City Code, or as authorized by Tex. Govt. Code Section 2251.021, whichever applies. If any money due and owed by Purchaser to Dallas is placed with an attorney for collection, Purchaser agrees to pay to Dallas, in addition to all other payments provided for by this Contract, including interest, Dallas' collection expenses, including court costs and reasonable attorney's fees.

16. WATER CONSERVATION AND DROUGHT CONTINGENCY PLANS AND CURTAILMENT

A. During a water shortage, Purchaser understands and acknowledges the water being provided by Dallas under this Contract is subject to curtailment in accordance with Texas Water Code § 11.039, "Distribution of Water During Shortage," with Dallas' water rights, and with Dallas' Drought Contingency Plan. Purchaser agrees that if water supplies or services are curtailed within Dallas, Dallas may impose a like curtailment on deliveries to Purchaser. Purchaser shall cooperate by imposing conservation measures upon its sales of water to its end-user customers.

B. Purchaser agrees to institute and maintain usage practices which ensure water is used in a manner that prevents waste, conserves water resources for their most beneficial and vital uses, and protects the public health. Purchaser agrees to develop and implement water conservation and drought contingency plans consistent with the applicable elements of 30 TAC

§ 288.20, "Water Conservation Plans, Drought Contingency Plans, Guidelines and Requirements." Purchaser agrees to furnish to Dallas with electronic copies of its water conservation and drought contingency plans and associated TCEQ and TWDB implementation reports

C. Purchaser acknowledges that Dallas has provided a copy of its current Water Conservation Plan and Drought Contingency Plan and has advised Purchaser of where to locate copies of plan updates.

D. To the extent Dallas imposes restrictions or grants privileges of general applicability to itself and customer cities, including rules relating to the curtailment of water delivery and availability, Dallas agrees to impose such restrictions and grant such privileges equitably and in a non-discriminatory fashion. Such curtailments shall be limited to the extent that such supplies and service are curtailed due to untreated water supply availability, in recognition of the fact that Purchaser diverts water from Lewisville Lake and supplies and provides transportation for all of its own untreated water. Lewisville shall cooperate with Dallas by imposing like curtailment measures upon its sales.

17. RIGHTS AND TITLE; NO RESALE

A. Purchaser agrees not to sell water purchased from Dallas to any person or entity outside Purchaser's corporate boundaries except for areas for which the State of Texas has issued Purchaser a "Certificate of Convenience and Necessity," as may be adjusted from time to time, unless Purchaser has received prior written approval from the Director.

B. In granting such authorization, Dallas may establish the terms and conditions of the conveyance of such water including, but not restricted to, the setting of monetary rates for sale of such water. Such control over terms, conditions, and rates by Dallas shall not be unreasonable and shall relate primarily to the untreated water component of such sales. "Conveyance" means the sale, trading, donation, exchange, transfer of title, or contracting for title. If Purchaser has existing customers or immediate plans to provide water service to customers in its current service area, Dallas agrees not to sell treated or untreated water to such customers in Purchaser's service area without approval from Purchaser.

C. Purchaser agrees that it shall acquire no rights or title to the use or reuse of Dallas' untreated raw water other than those rights explicitly set forth in this Contract. Purchaser shall not resell Dallas untreated raw water taken under this Contract.

18. ASSIGNMENT

Purchaser shall not sell, assign, transfer or convey its interest in this Contract, in whole or in part, without the prior written consent of the Director.

19. EASEMENTS, PERMITS AND FEES

A. In agreeing to accept delivery of water under this Contract, Purchaser warrants and represents that Purchaser's diversion and use of water is in compliance with all applicable laws and regulations, including, but not limited to, all applicable laws of the State of Texas, applicable rules, regulations and orders of TCEQ and TWDB, applicable Federal laws and regulations (including but not limited to environmental and water quality laws, rules, orders, and regulations), and the Charter and ordinances of the City of Dallas, as same may hereafter be amended. Dallas and Purchaser shall comply with the procedural requirements set out at 30 TAC §§ 295.101 and 297.101, as those regulations may be amended from time-to-time.

B. Purchaser shall obtain any easements or rights-of-way necessary for any water lines or facilities that may be required to implement the terms and conditions of this Contract.

C. Purchaser is responsible for the acquisition of any permits and for the payment of any regulatory or other fees required in connection with this Contract, including, but not limited to, permits, licenses, approvals or regulatory or other fees that may be required by TCEQ, TWDB, or any other governmental regulatory body. Should Purchaser be required to obtain a water right permit or water right permits, Purchaser shall provide Dallas with a copy of such a permit or permits and Dallas, upon receipt, is authorized to incorporate the permit or permits as a part of **Exhibit A** of this Contract.

D. In the event Purchaser is required to obtain any water right permit or permits, amendment or amendments, or other approvals from the State of Texas, Purchaser shall include in all applications for permits or approvals a request that all permits and approvals issued contain a reference to this Contract and that Purchaser's permit to impound or divert untreated water is contingent upon the continued effectiveness of Purchaser's Contract with Dallas.

E. Purchaser agrees to coordinate permit submittals with Dallas if both Purchaser and Dallas are required to obtain permits or amendments to permits.

F. Purchaser shall not commence construction of impoundments or diversion facilities prior to obtaining all permits and approvals that the State of Texas, the United States, or any other governmental authority may require. Purchaser shall divert water under this Contract only pursuant to such applicable permits or approvals, or to any amendment to any existing permits or approvals that TCEQ, the TWDB, the United States, or any other governmental authority with jurisdiction may issue to Purchaser that relates to the diversion of water, and to applicable regulations and approvals of TCEQ, TWDB, the United States, or any other governmental authority with jurisdiction, and the to the terms of this Contract.

20. DEFAULT – TERMINATION

A. Dallas, acting through the Director, shall have the right to terminate this Contract upon non-payment of the charges set out in this Contract for any period exceeding sixty (60) days. Dallas, however, shall provide notice of intent to terminate under this Subsection at least ten (10) days prior to the proposed effective date of termination, in order for Purchaser to tender payment and thereby cure a default as to non-payment under this Contract.

B. Dallas, acting through the Director, shall have the right to terminate this Contract if it is found that pumping logs are not adequately maintained, that a meter is bypassed, or that any water pumped by Purchaser is being used for unauthorized purposes without notice to Dallas and with Dallas' written consent. In addition, if the Contract is terminated under this Subsection, Dallas shall be entitled to payment for the maximum quantity of water for that Water Year in which the default under this Subsection occurs.

C. Dallas, acting through the Director, shall have the right to terminate this Contract if Purchaser knowingly takes untreated water, without Dallas' written consent, in excess of the maximum demand amount prescribed for the Water Year in question. If the Contract is terminated under this Subsection, Dallas shall be entitled to payment for the maximum quantity of water for that Water Year in which the default occurred, and payment for the diverted untreated water in excess of the maximum demand amount prescribed for the Water Year.

D. In addition to the foregoing, Dallas, acting through the Director, may terminate this Contract for non-compliance with any other contractual condition upon thirty (30) days' advance written notice to Purchaser of its intent to terminate; provided, however, that if Purchaser remedies the condition of contractual noncompliance within the thirty (30) day period, Dallas, acting through the Director and at the Director's sole option, may continue this Contract.

E. The remedies set forth in this Section shall not be considered exclusive, and Dallas retains all other rights and remedies available at law and in equity in the event of any breach by Purchaser of any of the terms or provisions of this Contract.

21. NO REPRESENTATIONS OR WARRANTIES; FORCE MAJEURE.

A. PURCHASER AGREES TO TAKE WATER DELIVERED BY DALLAS "AS IS." DALLAS MAKES NO REPRESENTATIONS OR WARRANTY, EXPRESS OR IMPLIED, AS TO THE CHARACTER, QUALITY OR AVAILABILITY OF THE WATER TO BE TAKEN AND PURCHASER AGREES TO ASSUME ALL SUCH RISKS, ACCEPTING SAID WATER, IF AVAILABLE, IN THE SAME STATE AS IT IS PUMPED OR RELEASED FROM THE DESIGNATED DIVERSION POINT(S). DALLAS ALSO DOES NOT MAKE ANY REPRESENTATION THAT THE WATER WILL BE SUITABLE FOR THE PURPOSES FOR WHICH PURCHASER DESIRES TO USE IT.

B. DALLAS SHALL NOT BE LIABLE IN ANY EVENT FOR THE INABILITY OF DALLAS TO PERFORM ANY OBLIGATION UNDER THIS CONTRACT FOR REASONS BEYOND ITS CONTROL, INCLUDING BUT NOT LIMITED TO ACTS OF GOD OR NATURAL DISASTER, WAR, DROUGHT, TERRORISM, FIRE, PUBLIC UTILITY POWER OUTAGE, OR THE RULES, REGULATIONS, OR ORDERS OF COURTS OR OF GOVERNMENTAL AGENCIES.

22. PROTECTION OF WATERSHED

To the extent allowed by law, Purchaser agrees to hold Dallas harmless for any runoff, overflow, or other release of water supply diverted under the Contract after it has been treated or altered by chemical or other means to achieve applicable health-based standards. Any such treatment of the water by chemical or other means prior to the point of diversion by the Purchaser shall be approved in advance by Dallas, which approval shall not be unreasonably withheld.

23. SPECIAL PROVISIONS

Special provisions applicable to this Contract are attached hereto and styled Exhibits are incorporated herein, as if copied word for word.

A. Exhibit A is the Wholesale Untreated Water Rate Principles.

B. Exhibit B delineates Lewisville's Pumping, Metering Equipment, Facilities, and location of Diversion Points

C. Exhibit C is Lewisville's Projected Water Use (MGD) and Demand

D. Exhibit D is the Special Conditions

24. VENUE

The parties agree that this Contract shall be enforceable in Dallas and Denton Counties, Texas, and if legal action is necessary to enforce it, exclusive venue shall lie in Dallas County, Texas.

25. GOVERNING LAW

This Contract shall be governed by and construed in accordance with the laws and court decisions of the State of Texas, without regard to conflict of law or choice of law principles of Texas or any other state.

26. SEVERABILITY; LEGAL CONSTRUCTION

A. In case any one or more of the provisions contained in this Contract shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision thereof and this Contract shall be considered as if such invalid, illegal, or unenforceable provision had never been contained in this Contract.

B. The parties acknowledge that this Contract is an "arm's length" agreement, entered into by Dallas and Purchaser freely, without duress, coercion or any undue influence. No presumption will apply in favor of either party in the interpretation of this Contract or in the resolution of any ambiguity of any provision of this Contract.

27. NO THIRD PARTY BENEFICIARIES

Dallas and Purchaser enter into this Contract solely for the benefit of themselves and agree that nothing in this Contract shall be construed to confer any right, privilege or benefit on any person or entity other than Dallas and Purchaser.

28. COUNTERPARTS

This Contract may be executed in any number of counterparts, each of which shall be deemed an original and constitute one and the same instrument. If this Contract is executed in counterparts, then it shall become fully executed only as of the execution of the last such counterpart called for by the terms of this Contract to be executed.

29. CAPTIONS

The captions to the various clauses of this Contract are for informational purposes only and shall not alter the substance of the terms and conditions of this Contract.

30. SUCCESSORS AND ASSIGNS

This Contract shall be binding upon and inure to the benefit of the parties and their respective successors and, except as otherwise provided in this Contract, their assigns.

31. NOTICES

Except as otherwise provided in Section 33, any notice, payment, statement, or demand required or permitted to be given under this Contract by either party to the other may be effected by personal delivery in writing or by mail, postage prepaid. Mailed notices shall be addressed to the parties at the addresses appearing below, but each party may change its address by written notice in accordance with this Section. Mailed notices shall be deemed communicated as of three (3) days after mailing.

TO DALLAS:	**TO PURCHASER:**
Director	City of Lewisville, Texas
Dallas Water Utilities	Attn: City Manager
Dallas City Hall	P.O. Box 299002
1500 Marilla – Room 4/a/North	Lewisville, Texas 75029-9002
Dallas, Texas 75201	

32. NOTICE OF CONTRACT CLAIM

This Contract is subject to the provisions of Section 2-86 of the Dallas City Code relating to requirements for filing a notice of a breach of contract claim against Dallas, which is expressly incorporated by reference and made a part of this Contract for all purposes as if written word for word in this Contract. Purchaser shall comply with the requirements of this ordinance as a precondition of any claim relating to this Contract, in addition to all other requirements in this Contract related to claims and notice of claims.

33. CONFLICT OF INTEREST

The following section of the Charter of the City of Dallas shall be one of the conditions, and a part of, the consideration of this Contract, to wit:

"CHAPTER XXII. Sec. 11. FINANCIAL INTEREST OF EMPLOYEE OR OFFICER PROHIBITED --

(a) No officer or employee shall have any financial interest, direct or indirect, in any contract with the City or be financially interested, directly or indirectly, in the sale to the City of any land, materials, supplies or services, except on behalf of the City as an officer or employee. Any violation of this section shall constitute malfeasance in office, and any officer or employee guilty thereof shall thereby forfeit the officer's or employee's office or position with the City. Any violation of this section, with knowledge, express or implied, of the person or corporation contracting with the City shall render the contract involved voidable by the City Manager or the City Council.

(b) The alleged violations of this section shall be matters to be determined either by the Trial Board in the case of employees who have the right to appeal to the Trial Board, and by the City Council in the case of other employees.

(c) The prohibitions of this section shall not apply to the participation by City employees in federally-funded housing programs, to the extent permitted by applicable federal or state law."

For purposes of this Section 34, the word "City" shall mean "City of Dallas."

34. GIFT TO PUBLIC SERVANT

A. Dallas may terminate this Contract immediately if Purchaser has offered, or agreed to confer any benefit upon a Dallas employee or official that the Dallas employee or official is prohibited by law from accepting.

B. For purposes of this section, "benefit" means anything reasonably regarded as pecuniary gain or pecuniary advantage, including benefit to any other person in whose welfare the beneficiary has a direct or substantial interest, but does not include a contribution or expenditure made and reported in accordance with law.

C. Notwithstanding any other legal remedies, Dallas may require Purchaser to remove any officer or employee of Purchaser from the administration of this Contract or any role in the performance of this Contract who has violated the restrictions of this section or any similar state or federal law, and obtain reimbursement for any expenditures made as a result of the improper offer, agreement to confer, or conferring of a benefit to a Dallas employee or official.

35. APPLICABLE LAWS AND REGULATIONS

This Contract is made subject to, and Dallas and Purchaser agree to comply with, all applicable laws of the State of Texas, applicable rules, regulations and orders of the TCEQ and the TWDB, applicable Federal Law (including but not limited to environmental and water quality laws, rules, orders, and regulations), and the Charter and other ordinances of the City of Dallas, as same may hereafter be amended. This Contract's effectiveness is dependent upon Dallas' and Purchaser's compliance with 30 TAC §§ 295.101 and 297.101 as those regulations may be amended from time-to-time. This Contract may be subject to review and approval by TCEQ or TWDB. In the event of any final judgment finding any violation of the laws, rules, regulations, or orders by Purchaser described above, Purchaser shall be strictly liable for any damages caused to the property of Dallas, including but not limited to Dallas' interest in Lewisville Lake water as a result of such violation.

36. ENTIRE AGREEMENT; NO ORAL MODIFICATIONS

This Contract with all referenced Exhibits, attachments, and provisions incorporated by reference) embodies the entire agreement of both parties, superseding all oral or written previous and contemporary agreements between the parties relating to matters set forth in this Contract. Except as otherwise provided elsewhere in this Contract, this Contract cannot be modified without written supplemental agreement executed by both parties.

37. AUTHORIZATION TO ACT

By their signatures below, the representatives of Dallas and Purchaser state that they are authorized to enter into this Contract. Dallas and Purchaser will each provide documentation that this Contract has been authorized by its respective governing body.

EXECUTED this the ___ day of _____, 2016, by the City of Dallas, signing by and through its City Manager, duly authorized to execute same by Resolution No.16-_____, adopted by the City Council on _____, 2016, and by Purchaser, acting through its duly authorized officials.

APPROVED AS TO FORM:
LARRY E. CASTO,
City Attorney

BY_____
Assistant City Attorney

CITY OF DALLAS
A. C. GONZALEZ,
City Manager

BY _____
Assistant City Manager

ATTEST:

BY_____
Julie Heinze, City Secretary

PURCHASER:
CITY OF LEWISVILLE

BY_____
Donna Barron, City Manager

APPROVED AS TO FORM:

BY_____
Lizbeth Plaster, City Attorney

EXHIBIT A

WHOLESALE UNTREATED WATER RATE PRINCIPLES

1. Key Rate Setting Principles

   a. Revenue requirements are to be determined on the utility basis, at original cost.

   b. Rate of Return – Embedded rate of interest on water obligations plus 1.5%

   c. Reservoirs – All existing and future reservoirs in a common rate base with untreated water Purchasers as a class paying their proportionate share of cost for reservoir storage, including a portion held for future use. Costs allocated to untreated water Purchasers shall be adjusted from time to time according to changes in actual usage.

   d. Untreated Water Transmission – Allocation of costs between untreated water Purchasers and treated water Purchasers based on test period usage.

   e. Other Administration – Allocated on the basis of the above allocations

   f. Rate Design – One-part rate (volume).

2. Cost-of-Service Studies

   Cost-of-Service studies to establish wholesale untreated water rates shall be conducted by Dallas. Such studies will be conducted in conformity with standard utility rate-making practices and subject to review, but not approval of, a rate subcommittee composed of designated members from the wholesale water Purchasers of the City of Dallas. At least one member of the subcommittee shall be from an untreated water Purchaser city.

EXHIBIT B

DESCRIPTION OF PUMPING AND METERING EQUIPMENT AND FACILITIES AND LOCATION OF DIVERSION POINTS

Description: Wholesale Untreated Water is currently provided to the Customer at the following diversion points:

DIVERSION POINT 1: CITY OF LEWISVILLE INTAKE STRUCTURE

Location: The intake structure is located on Lewisville Lake approximately 2600 feet northeast of the intersection of Jones and North Kealy Streets in the City of Lewisville. The site is owned by Lewisville.

Pipeline Capacity: The Lewisville Intake Structure contains six pumps: two 3MGD, two 6 MGD and one 8.8 MGD and one 9.0 MGD, for a total of 35.8 MGD. A 36" waterline exiting the Lewisville intake structure, reduces to a 30" line that transports untreated water to Lewisville's Feaster Water Plant. This line runs parallel to the toe of the dam, continuing west on the north side of Jones Street.

DIVERSION POINT 2: CITY OF LEWISVILLE/UPPER TRINITY REGIONAL WATER DISTRICT SHARED INTAKE STRUCTURE

Location: The shared intake structure is located on Lewisville Lake approximately 3800 feet northeast of the intersection of Jones and North Kealy Streets in the City of Lewisville. The site is shared by Lewisville and Upper Trinity Regional Water District.

Pipeline Capacity: The Lewisville portion of the Intake Structure contains three pumps: two 15.4 MGD and one 7.7 MGD, for a total of 38.5 MGD. A 42" waterline exiting the shared intake structure, reduces to a 36" line that transports untreated water to Lewisville's Feaster Water Plant. This line runs parallel to the toe of the dam, continuing west on the south side of Jones Street.

Metering Facilities: The metering station is located on Jones Street, approximately 400 feet east of the intersection of Jones and Cowan Streets. Both untreated water lines combine into an underground vault with a 36" electromagnetic flow meter that is permanently installed in the meter vault north of the Water Plant. The Metering Facility is located at (33'03'50.38482"N & 96'59'59.57116"W) in Lewisville, Texas

Please see the attachment for Diversion Point Map.

The City of Lewisville

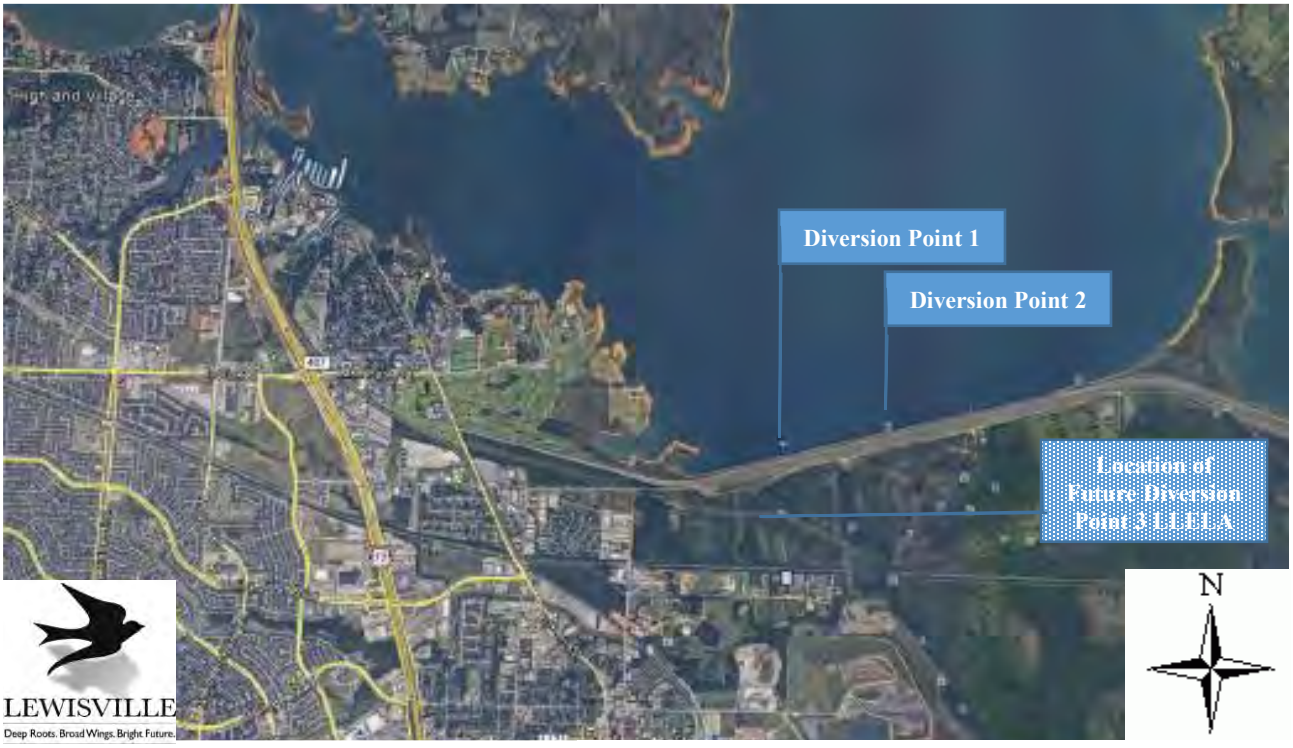
Future Facilities: Should additional pumping equipment, metering equipment and facilities and diversion points be agreed upon in the future, this Exhibit will be revised to recognize these facilities. Revisions to this Exhibit in order to add, delete, or modify pumping equipment, metering equipment and facilities and diversion points may be authorized by the DWU Director and do not require Dallas City Council approval.

VICINITY MAP OF DIVERSION POINT

Diversion Point 1: City of Lewisville Raw Water Intake is located at (33’03’57.59077” & 96’59’05.91512”), in Lewisville, Texas.

Diversion Point 2: City of Lewisville/Upper Trinity Regional Water District Shared Raw Water Intake is located at (33’04’01.55681” N & 96’58’49.40120” W) in Lewisville, Texas.

DIVERSION POINT MAP



City of Lewisville
Diversion Point Map-Wholesale Untreated Water Contract

EXHIBIT C

LEWISVILLE'S PROJECTED WATER USE (MGD) AND DEMAND

Year	Total Dallas Untreated	Dallas Untreated (MGD)	Dallas Treated	Total Requirement	Total Requirement (MGD)
2016*	2,226,500,000	6.1	3,285,000,000	5,511,500,000	15.1
2017	2,409,000,000	6.6	3,285,000,000	5,694,000,000	15.6
2018	2,628,000,000	7.2	3,285,000,000	5,913,000,000	16.2
2019	2,737,500,000	7.5	3,285,000,000	6,022,500,000	16.5
2020*	2,928,000,000	8.0	3,294,000,000	6,222,000,000	17.0
2021	3,102,500,000	8.5	3,285,000,000	6,387,500,000	17.5
2022	3,212,000,000	8.8	3,285,000,000	6,497,000,000	17.8
2023	3,011,200,000	8.2	3,650,000,000	6,661,200,000	18.2
2024*	3,102,500,000	8.5	3,650,000,000	6,752,500,000	18.5
2025	3,358,000,000	9.2	3,650,000,000	7,008,000,000	19.2
2026	3,102,500,000	8.5	4,015,000,000	7,117,500,000	19.5
2027	3,285,000,000	9.0	4,015,000,000	7,300,000,000	20.0
2028*	3,414,800,000	9.4	4,015,000,000	7,429,800,000	20.3
2029	3,175,500,000	8.7	4,380,000,000	7,555,500,000	20.7
2030	3,285,000,000	9.0	4,380,000,000	7,665,000,000	21.0

Projected Water Use are estimates; revisions will be made annually in accordance with the provisions in Section 5. B. of this contract.

**Leap Year*

EXHIBIT D

SPECIAL CONDITIONS

Conditions for Purchaser's Utilization of Diversion Point

Purchaser shall maintain a daily pumping log that includes the dates the pump was in operation, meter reads, total amount of gallons diverted along with the pump start and end times for those days. The log must be provided to DWU Wholesale Services Division on a monthly basis, or as requested by Dallas.

If additional special conditions or agreements pertaining to this Contract are required in the future, Exhibit D will be amended. Amendments to this Exhibit D that do not materially affect the terms of the Contract can be authorized by the DWU Director and do not require Dallas City Council approval.

MEMORANDUM

TO: Melinda Galler, Assistant City Manager

FROM: Russ Kerbow, Police Chief

DATE: September 28, 2016

SUBJECT: **Approval of a Memorandum of Understanding (MOU) for Interlocal Agreement Among the Cities of Lewisville, Highland Village, The Colony and the Town of Flower Mound, for the Shared Use of 3D Scanning Devices Purchased With Grant Funds by the City of Lewisville ; and Authorization for the City Manager or her Designee to Execute the Agreement.**

BACKGROUND

The City of Lewisville Police Department, with City Council approval, applied for grant funding in the amount of $124,364.89 from the State of Texas, under its Justice Assistance Grant program, for the purchase of 3D scanner equipment. The equipment will assist with crime scene forensic analysis and accident reconstruction.

The maximum amount that an individual agency is eligible for under the JAG grant is $80,000. Additional funding was approved on the basis of our grant proposal, which incorporated collaborating with nearby agencies in southern Denton County. Since each agency could submit a grant for up to $80,000, this regional grant was able to exceed the individual threshold.

On September 6, 2016, the City of Lewisville Police Department received notification that the proposal is funded.

ANALYSIS

To execute the funded grant, an MOU/Interlocal agreement between the cities of Lewisville, Highland Village, The Colony and the Town of Flower Mound, is required. The MOU stipulates the terms and conditions associated with the sharing of the equipment. The MOU has been reviewed and approved by the City Attorney and the granting agency.

A pivotal part of the approval by the Criminal Justice Division of the Governor's Office was the collaboration established between Lewisville, Flower Mound, The Colony and Highland Village. After purchase and training of the scanner, Lewisville agrees to send the equipment and an operator to our neighboring cities upon request and when staff is available. It is estimated that the department might receive 30-35 requests annually. One officer is needed to operate the equipment for up to two hours per incident. The estimated annual cost for 35 incidents would be approximately $2,000.

On occasion, the City of Lewisville has been the beneficiary of sharing of staff and equipment from other entities without having to reimburse those agencies for their costs. The Lewisville Police Department has utilized Denton and Flower Mound SWAT teams and the Denton County Sheriff's Office forensic crime scene search unit. The law enforcement agencies in the North Texas area provide assistance to each other as needed. The JAG MOU mirrors essentially the same conditions found in the North Texas Mutual Aid Agreement, of which Lewisville has been a long-standing member.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the agreement as set forth in the caption above.

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding ("MOU") is made by and between City of Lewisville ("Lewisville"), Town of Flower Mound ("Flower Mound"), City of Highland Village ("Highland Village") and City of The Colony ("The Colony") (collectively the "Parties"), acting by and through their authorized representatives.

WHEREAS, Lewisville has been awarded a grant from the Texas Criminal Justice Division to purchase 3D scanning devices to capture scenes of major crime scenes and fatality traffic crashes;

WHEREAS, Lewisville has agreed to collaborate with the other Parties to this MOU to assist them with major crime scenes and fatality traffic crashes in their jurisdictions by providing the equipment purchased with this grant ("Equipment") and Lewisville personnel trained to operate it ("Lewisville Personnel") upon request;

WHEREAS, Lewisville will provide the Equipment and Lewisville Personnel to the other Parties to this MOU upon request, except in circumstances that would not allow Lewisville to provide the Equipment;

WHEREAS, the Parties desire to enter into this MOU to effectively utilize regional resources for documenting and capturing major crime scenes and fatality traffic crashes that occur in the Parties' jurisdictions; and

NOW, THEREFORE, in consideration of the mutual covenants and the terms and conditions contained in this MOU, the Parties do hereby agree as follows:

1. The term of this MOU shall begin on October 1, 2016 and shall continue for the life of the Equipment (the "Term"). Lewisville may terminate this MOU by providing at least thirty (30) days prior written notice to the authorized representatives of the other Parties. Flower Mound, Highland Village, and The Colony may withdraw from this MOU at any time by providing written notice to Lewisville.

2. During the Term, Lewisville will provide assistance to the other Parties to this MOU by providing the Equipment and Lewisville Personnel upon request in order to document and capture major crime scenes and fatality traffic crashes. The Equipment shall only be operated by Lewisville Personnel.

3. The Equipment shall be requested by contacting the Lewisville watch commander. Lewisville does not guarantee its availability. Lewisville will make the Equipment available to the other Parties upon request whenever possible, but the Parties recognize that availability will be restricted at times due to circumstances including, but not limited to, availability of Lewisville Personnel, equipment malfunction or damage, or the Equipment being deployed elsewhere at the time of the request.

4. Lewisville Personnel are employees of Lewisville and are paid and insured exclusively by Lewisville. No joint enterprise shall be inferred under this MOU. Lewisville Personnel shall operate exclusively under Lewisville operating procedures. Lewisville Personnel shall take direction from the lead investigator or supervisor on scene solely with regard to the use of the Equipment for the investigation. If the Parties have a concern about a Lewisville employee, practice, or policy that cannot be resolved between the supervisors on scene, the Parties' authorized representative shall contact Lewisville's authorized representative.

5. Representatives from all Parties shall meet, as needed, to ensure the proper implementation and successful administration of this MOU.

6. Lewisville agrees that any injury that occurs by or to its employees arising out of this MOU will be the responsibility of Lewisville under its worker's compensation coverage.

7. Each Party agrees to accept full responsibility for the acts, negligence and/or omissions of its employees and agents.

8. Each Party does hereby agree to waive all claims against, release, and hold harmless the other party and its respective officials, officers, agents, employees, in both their public and private capacities, from any and all liability, claims, suits, demands, losses, damages, attorneys' fees, including all expenses of litigation or settlement, or causes of action which may arise by reason of injury to or death of any person or for loss of, damage to, or loss of use of any property arising out of or in connection with this contract.

9. In the event of joint or concurrent negligence of the parties, responsibility, if any, shall be apportioned comparatively in accordance with the laws of the State of Texas, without, however, waiving any governmental immunity available to either party individually under Texas law. Each Party shall be responsible for its sole negligence. The provisions of this paragraph are solely for the benefit of the parties hereto and are not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

10. It is expressly understood and agreed that, in the execution of this MOU, neither party waives, nor shall be deemed hereby to have waived any immunity or defense that would otherwise be available to it against claims arising in the exercise of governmental powers and functions. By entering in this MOU, the Parties do not create any obligations, express or implied, other than set forth herein, and this MOU shall not create any rights in parties not signatories hereto.

11. This MOU shall be deemed to have been drafted equally by all Parties. Any part of this MOU shall be constructed as a whole according to its fair and common meaning, and any presumptions or principal that the language herein is to be construed against any party shall not apply.

12. Except as may be otherwise specifically provided, all notices required or permitted under this MOU shall be in writing and shall be deemed delivered when deposited in the United States mail, postage prepaid, registered or certified mail, return receipt requested,

addressed to the Parties at the respective addresses set forth below or at other addresses as may have been previously specified by written notice delivered in accordance with this MOU.

City of Lewisville
Attn: Russ Kerbow
1197 West Main Street
Lewisville, Texas 75067

Town of Flower Mound
Attn: Andy Kancel
4150 Kirkpatrick Lane
Flower Mound, Texas 75028

City of Highland Village
Attn: Doug Reim
1000 Highland Village Road
Highland Village, Texas 75077

City of The Colony
Attn: David Coulon
5151 North Colony Blvd.
The Colony, Texas 75056

Each party shall notify the other in writing within ten (10) days of any change in the information listed in this paragraph.

13. No right or remedy granted herein or reserved to the parties is exclusive of any right or remedy granted by law or equity; but each shall be cumulative of every right or remedy given hereunder. No covenant or condition of this MOU may be waived without the express written consent of the parties. It is further agreed that one (1) or more instances of forbearance by either party in the exercise of its respective rights under this MOU shall in no way constitute a waiver thereof.

14. The provisions of this MOU are severable. In the event that any paragraph, section, subdivision, sentence, clause, or phrase of this MOU shall be found to be contrary to the law, or contrary to any rule or regulation having the force and effect of the law, such decisions shall not affect the remaining portions of this MOU. However, upon the occurrence of such event, either party may terminate this MOU by giving the other party thirty (30) days written notice of its intent to terminate.

15. The undersigned officer and/or agent of the Parties are the duly authorized officials and have the necessary authority to execute this MOU on behalf of the Parties.

16. The Parties each bind themselves, their respective successors and assigns to the other Parties to this MOU. Lewisville hereby agrees that this MOU will not be assigned or sublet without prior written consent of the Parties, and further agrees that none of Lewisville's rights, obligations or duties arising under this MOU will be sublet to anyone objectionable to the Parties. Lewisville agrees that the subletting of any right, obligation or duty arising under this MOU shall not relieve Lewisville from its full obligations to the Parties as provided by this MOU.

17. In case any one or more provisions of this MOU shall, for any reason, be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect the other provisions hereof and this MOU shall be construed as if such provision had never been contained herein.

18. The Parties agree and acknowledge that no Party is an agent of any other Party and that each Party is responsible for its own acts, forbearance, negligence and deeds, and for those of its agents or employees as provided under this MOU.

19. Venue for any action arising out of this MOU shall be in Denton County, Texas.

20. This MOU may be amended or modified only by the mutual agreement of the Parties. Such amendment or modification must be in writing and executed by an authorized representative of each Party.

21. This MOU supersedes any prior understandings or written or oral agreements between the Parties respecting this subject matter. This MOU contains all commitments, agreements, warranties and representations of the Parties. Any oral or written commitments, agreements, warranties or representations not contained herein shall have no force or effect to alter any term or condition of this MOU.

22. This MOU may be executed in counterparts, each of which shall be deemed to be an original, but all of which, taken together, shall constitute one and the same agreement.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement to be effective upon execution and dating by each party.

CITY OF LEWISVILLE, TEXAS

_____ _____

Signature Date

TOWN OF FLOWER MOUND, TEXAS

_____ _____

Signature Date

CITY OF HIGHLAND VILLAGE, TEXAS

_____ _____

Signature Date

CITY OF THE COLONY, TEXAS

_____ _____

Signature Date

MEMORANDUM

TO: Melinda Galler, Assistant City Manager

FROM: Russ Kerbow, Chief of Police

DATE: September 28, 2016

SUBJECT: **Approval of a Memorandum of Understanding (MOU)/Release of Liability Agreement Between the City of Lewisville and Denton County Allowing Use of Vacant Buildings; and Authorizing the Mayor to Execute the Agreement.**

BACKGROUND

Denton County recently vacated the Denton County Government Center at 190 N. Valley Parkway for their new building located at 400 N. Valley Parkway. The vacant buildings are slated for demolition later this year or early next year.

ANALYSIS

The police and fire departments are seeking permission from Denton County to perform training exercises in the vacant Denton County Government Center at 190 N. Valley Parkway prior to demolition. Denton County requires an MOU/Release of Liability agreement before allowing the exercises. The City Attorney prepared the MOU/Release of Liability agreement and it is approved by Denton County's legal counsel. The agreement releases the county from "foreseen and unforeseen bodily and personal injuries or property damages resulting from the city's use of the Vacant Buildings." The police department plans to practice building search techniques and 'active shooter' response using 'simulated' ammunition. A simulated pistol or rifle round chambers in a firearm like normal ammunition but the projectile uses a paint pellet instead of a lead bullet. Using simulated ammunition requires all participants to use additional protective equipment. The fire department plans to also conduct training in the vacant county buildings.

RECOMMENDATION

It is City staff's recommendation that City Council approve the Memorandum of Understanding/Release of Liability Agreement as set forth in the caption above.

THE COUNTY OF DENTON §
§
THE STATE OF TEXAS §

MEMORANDUM OF UNDERSTANING/
RELEASE OF LIABILITY

THIS MEMORANDUM OF UNDERSTANDING/RELEASE OF LIABILITY is made and entered into by and between Denton County, a political subdivision of the State of Texas ("the **COUNTY**") and the City of Lewisville, a municipality of Denton County, Texas ("the **CITY**").

WHEREAS, the **COUNTY** owns two vacant buildings located at 190 N. Valley Parkway, Lewisville, Texas 75067, within the corporate city limits of the City of Lewisville, Texas (the "Vacant Buildings");

WHEREAS, the **CITY** has requested and the **COUNTY** has agreed to allow the **CITY** to perform police and fire training exercises at the Vacant Buildings, which may result in the partial or total destruction of said Vacant Buildings; and

WHEREAS, the **CITY** has agreed to release the **COUNTY** of all liability resulting from its use of the Vacant Buildings.

NOW, THEREFORE, the **COUNTY** and the **CITY**, for the mutual consideration hereinafter stated, agree and understand as follows:

I.

This MOU/Release shall be effective from the last date signed and marked by either party.

II.

The **COUNTY** consents to the use of the Vacant Buildings by the **CITY** for police and fire training exercises, which may result in the partial or total destruction of said Vacant Buildings.

III.

The **CITY** hereby releases and holds the **COUNTY**, its agents and employees harmless from all claims, actions, demands, rights, damage-costs, loss of service, expenses, and compensation whatsoever which may hereafter arrive on account of or in any way growing out of all known and unknown, foreseen and unforeseen bodily and personal injuries or property damages resulting from the **CITY's** use of the Vacant Buildings.

IV.

In the event any portion of this MOU/Release shall be found to be contrary to law it is the intent of the parties hereto that the remaining portions shall remain valid and in full force and effect to the fullest extent possible.

V.

The undersigned officers and/or agents of the parties hereto are the properly authorized officials and have the necessary authority to execute this MOU/Release on behalf of the parties hereto and each party hereby certifies to the other that any necessary orders or resolutions extending said authority have been duly passed and are now in full force and effect.

EXECUTED in triplicate originals on the dates set forth below.

The **COUNTY**

By: _____
Mary Horn, County Judge
Denton County, Texas

Acting on behalf of and by the authority of the Commissioners Court of Denton County, Texas

DATED:_____

ATTEST:

By:_____
Denton County Clerk

APPROVED AS TO FORM:

By:_____
Assistant District Attorney

The **CITY**

By:_____
Rudy Durham
Mayor

Acting on behalf of and by the authority of the Lewisville City Council

DATED:_____

ATTEST:

By:_____
City Secretary

APPROVED AS TO FORM:

By:_____
City Attorney

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Nika Reinecke, Director of Economic Development and Planning

DATE: October 17, 2016

SUBJECT: **Approval of a Resolution for Financing by the Woodloch Health Facilities Development Corporation of a Health Facility Located Within Lewisville, Texas for Senior Care Living VII, LLC.**

BACKGROUND

Woodloch Health Facilities Development Corporation is proposing to issue bonds on behalf of the City of Woodloch, Texas for the development of a senior care and related facilities located on Round Grove Road in Lewisville. The facilities will be owned by Senior Care Living VII, LLC (the borrower).

ANALYSIS

The bonds are issued pursuant to the Health Facilities Development Act, Chapter 221. The consent of Lewisville is required prior to financing of the facilities with bond proceeds due to the location of the project in the Lewisville city limits.

This consent is required solely for the purposes of satisfying Section 221. 030 of the Act and to comply with a federal income tax requirement, which will enable the Issuer to proceed with the proposed financing of the Facilities with Bond proceeds. This consent in no way imposes any payment or other obligations on the City of Lewisville in connection with the financing. The City of Lewisville will have no liability with respect to the proposed Bonds.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the proposed resolution as set forth in the caption above.

LAW OFFICES

McCALL, PARKHURST & HORTON L.L.P.

600 CONGRESS AVENUE
SUITE 1800
AUSTIN, TEXAS 78701-3248
TELEPHONE: 512 478-3805
FACSIMILE: 512 472-0871

717 NORTH HARWOOD
SUITE 900
DALLAS, TEXAS 75201-6587
TELEPHONE: 214 754-9200
FACSIMILE: 214 754-9250

700 N. ST. MARY'S STREET
SUITE 1525
SAN ANTONIO, TEXAS 78205-3503
TELEPHONE: 210 225-2800
FACSIMILE: 210 225-2984

September 27, 2016

Mayor Rudy Durham
151 W. Church Street
Lewisville, Texas 75029

Re: Woodloch Health Facilities Development Corporation Senior Housing Revenue Bonds (Inspired Living at Lewisville Project), Series 2016A-1

Woodloch Health Facilities Development Corporation Taxable Senior Housing Revenue Bonds (Inspired Living at Lewisville Project), Series 2016A-2

Woodloch Health Facilities Development Corporation Subordinate Senior Housing Revenue Bonds (Inspired Living at Lewisville Project), Series 2016B

Dear Mayor Durham:

Woodloch Health Facilities Development Corporation (the "Issuer") proposes, on behalf of the City of Woodloch, Texas, to issue the captioned bonds and notes (the "Bonds") in one or more series pursuant to the Health Facilities Development Act, Chapter 221, Texas Health and Safety Code (the "Act") to provide funds to finance and refinance a senior living facility consisting of approximately 106 assisted living units 43 units of memory care and related common areas such as dining, recreation and administrative spaces (the "Facilities"), located at Round Grove Road and South Valley Parkway, Lewisville, Texas 75067. The Facilities are owned by Senior Care Living VII, LLC (the "Borrower"). The Borrower is a Florida limited liability company. Our firm is acting as bond counsel to the Issuer in connection with the issuance of the Bonds.

Section 221.030 of the Act requires that for any health facilities located outside the City of Woodloch, Texas to be financed with Bond proceeds, the Issuer must obtain a consent to the financing from each City, County and hospital district within which such health facilities are located.

The Borrower has requested the Issuer to finance the Facilities, which are located within the jurisdiction of the City of Lewisville, Texas. Therefore, pursuant to Section 221.030 of the Act, the consent of Lewisville, Texas is required prior to the financing of the Facilities with Bond proceeds. For your convenience, I have enclosed a proposed form of a consent resolution with the description included.

This consent is required solely for the purposes of satisfying Section 221.030 of the Act and to comply with a federal income tax requirement, which will enable the Issuer to proceed with the proposed financing of the Facilities with Bond proceeds. This consent in no way imposes any payment or other obligations on the City of Lewisville in connection with the financing. The City of Lewisville will have no liability with respect to the proposed Bonds.

The Issuer sponsored a public hearing held on September 26, 2016 at 10 a.m. 151 W. Church Street, Lewisville, Texas 75029. Notice of the public hearing was published in the Lewisville Leader on September 11, 2016. No member of the public appeared at the public hearing.

Therefore, on behalf of the Issuer and the Borrower, we respectfully request that consideration of adoption of the enclosed consent be placed on the agenda of the City Council of Lewisville, Texas at its next available meeting, and that the City Council approve and adopt such consent. If adopted, please provide me with three (3) executed copies of the resolution

Please do not hesitate to contact me at (214) 754-9221 should you have any questions or comments. Thank you very much for your cooperation and assistance.

Sincerely,

RESOLUTION APPROVING THE FINANCING BY THE
WOODLOCH HEALTH FACILITIES DEVELOPMENT CORPORATION
OF A HEALTH FACILITY LOCATED WITHIN LEWISVILLE, TEXAS
FOR SENIOR CARE LIVING VII, LLC

WHEREAS, the Health Facilities Development Act, Chapter 221, Texas Health and Safety Code (the "Act"), authorizes and empowers Woodloch Health Facilities Development Corporation (the "Issuer") to issue revenue bonds on behalf of the City of Woodloch, Texas (the "Issuing Unit") to finance and refinance the costs of health facilities found by the Board of Directors of the Issuer to be required, necessary or convenient for health care, research and education, any one or more, within the State of Texas and in furtherance of the public purposes of the Act; and

WHEREAS, Section 221.030 of the Act provides that the Issuer may provide for the financing or refinancing of health facilities located outside the limits of the Issuing Unit with the consent of each City, County or hospital district within such health facility is or is to be located; and

WHEREAS, Senior Care Living VII, LLC (the "Borrower"), a Florida limited liability corporation, proposes to obtain financing and refinancing from the Issuer from the proceeds of one or more series of the Issuer's bonds and notes in a maximum principal amount of $47,000,000 for the costs of a senior living facility consisting of approximately 106 assisted living units 43 units memory care units and related common areas such as dining, recreation and administrative spaces (the "Facilities"), located at Round Grove Road and South Valley Parkway, Lewisville, Texas; and

WHEREAS, the Facilities will be located within Lewisville, Texas (the "City") and outside the limits of the Issuing Unit;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF LEWISVILLE, TEXAS THAT:

Section 1. The City hereby consents to the financing by the Issuer of the Facilities for the purposes of Section 221.030 of the Act and approves the financing for the purposes of Section 147(f) of the Internal Revenue Code of 1986; provided that the City shall have no liability in connection with the financing of the Facilities and shall not be required to take any further action with respect thereto.

Section 2. This Resolution shall take effect immediately from and after its adoption and it is accordingly so ordered.

PASSED AND APPROVED, this the _____ day of _____, 2016.

_____
Mayor

CERTIFICATE OF COUNTY CLERK

STATE OF TEXAS §
COUNTY OF DENTON §

I, _____, County Clerk of Denton County, Texas, have legal custody of the written instrument(s) of record referred to herein, which are available for inspection, and I do hereby certify that the copy of such written instrument(s) of record attached to this Certificate is a true and correct copy of the original as same appears in the records of this office. This written instrument(s) or record(s) referred to herein and attached to this Certificate as described as follows:

Resolution _____, approved by Denton County Commissioners' Court on _____, 2016.

In testimony whereof, I subscribed my name hereto officially under the corporate seal of Wichita County, Texas, on this the _____ day of _____, 2016.

_____
County Clerk
Denton County, Texas

(SEAL)

Aerial Map

VALLEY PKY
VISTA DR
ROUND GROVE RD
VALLEY PKY
VISTA DR
ROUND GROVE RD
ROUND GROVE RD
ACE LN
VALLEY PKY
VALLEY PKY
SPINKS RD
SPINKS RD
N
1 = 800 feet

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, APPROVING THE FINANCING BY THE WOODLOCH HEALTH FACILITIES DEVELOPMENT CORPORATION OF A HEALTH FACILITY LOCATED WITHIN LEWISVILLE, TEXAS FOR SENIOR CARE LIVING VII, LLC.

WHEREAS, the Health Facilities Development Act, Chapter 221, Texas Health and Safety Code (the "Act"), authorizes and empowers Woodloch Health Facilities Development Corporation (the "Issuer") to issue revenue bonds on behalf of the City of Woodloch, Texas (the "Issuing Unit") to finance and refinance the costs of health facilities found by the Board of Directors of the Issuer to be required, necessary or convenient for health care, research and education, any one or more, within the State of Texas and in furtherance of the public purposes of the Act; and

WHEREAS, Section 221.030 of the Act provides that the Issuer may provide for the financing or refinancing of health facilities located outside the limits of the Issuing Unit with the consent of each City, County or hospital district within such health facility is or is to be located; and

WHEREAS, Senior Care Living VII, LLC (the "Borrower"), a Florida limited liability corporation, proposes to obtain financing and refinancing from the Issuer from the proceeds of one or more series of the Issuer's bonds and notes in a maximum principal amount of $47,000,000 for the costs of a senior living facility consisting of approximately 106 assisted living units 43 units memory care units and related common areas such as dining, recreation and administrative spaces (the "Facilities"), located at Round Grove Road and South Valley Parkway, Lewisville, Texas; and

WHEREAS, the Facilities will be located within Lewisville, Texas (the "City") and outside the limits of the Issuing Unit;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The City hereby consents to the financing by the Issuer of the Facilities for the purposes of Section 221.030 of the Act and approves the financing for the purposes of Section 147(f) of the Internal Revenue Code of 1986; provided that the City shall have no liability in connection with the financing of the Facilities and shall not be required to take any further action with respect thereto.

SECTION 2. This Resolution shall take effect immediately from and after its adoption and it is accordingly so ordered.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, ON THIS THE 17TH DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Cleve Joiner, Director of Neighborhood Services

DATE: October 4, 2016

SUBJECT: **Approval of a Resolution Authorizing Agreements Between the City of Lewisville and Community Development Block Grant Sub-Recipients; Between the City of Lewisville and City Social Service Agency Fund Recipients; and Between the Neighborhood Services Department and the Public Services Department for FY 2016-2017; and Authorization for City Officials to Execute the Agreements.**

BACKGROUND

The City of Lewisville, a U.S. Department of Housing and Urban Development (HUD) Entitlement City, has submitted its 2016 Annual Action Plan as required by HUD to receive Community Development Block Grant (CDBG) funds. Agreements have been prepared for each of the non-profit entities receiving CDBG funds as well as those receiving City Social Service Agency Funds.

The City's Community Development Block Grant (CDBG) allocation for FY 2016 -2017 is $599,101, a decrease from the 2015 - 2016 Plan Year allocation of $616,796. The plan includes continued funding for the First-time Homebuyer Assistance Program, the Lewisville Housing Rehabilitation Program and grants to sub-recipients for social service programs. It also funds two new projects: Manhole Rehabilitation and Land Acquisition for Habitat for Humanity.

ANALYSIS

This year, the City has continued funding for social service agencies with the following exceptions: one new agency, New Hope Learning Center, was funded for a day care program at the First United Methodist Church; and two programs closed their doors (Christian Community Action (CCA) closed the Adult Health Clinic and Health Services of North Texas (HSNT) closed its Nutrition Center); however both CCA and Health Services are funded again for new programs. CCA's program, Family Assistance Services, and HSNT's program, Indigent Primary Care, will both be funded by the Community Development Block Grant.

HUD requires agreements for CDBG sub-recipients prior to drawdown of funds by any budgeted agency. The City also requires agreements with recipients of the City Social Service Agency Fund. Each social services contract is based on cost-per-unit reimbursements for services

rendered specifically to Lewisville residents. Agencies report monthly or quarterly on the number of clients served and the number and value of contracted services provided. Payment is not guaranteed if agencies do not achieve minimum goals established. Additionally, the agreements set performance goals including outcome measures that are reported on at the end of the year. This year's contracts are for a term of one year.

Staff has reviewed goals and costs with each agency comparing actual past performance to goals proposed by the agencies in their applications. Any significant differences were addressed resulting in updated goals as reported in the Performance Goals attachment.

There is one CDBG agreement with a sub-recipient for a brick-and-mortar project. Habitat for Humanity applied for funding for land acquisition for a vacant lot in Lewisville as part of their goal to build 50 houses in Denton County in the next five years.

Note that HUD expects the City to execute an agreement when funds are administered by Departments other than the Neighborhood Services Department which has primary responsibility for administration of the CDBG program. Therefore a Letter of Agreement between Neighborhood Services and Public Services Departments is included in the Exhibits.

One agreement has a special condition added this year due to recent reporting issues. Special Abilities of North Texas will have to turn each monthly report by the 15th, and if two consecutive reports are not submitted in a timely manner, they will not receive a reimbursement for that second consecutive late monthly request for reimbursement.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the resolution and authorize appropriate City officials to execute the agreements.

2016 - 2017 SOCIAL SERVICE AGENCIES PERFORMANCE MEASUREMENTS GOALS

Exhibit No.	AGENCY	FUNDING TYPE	RECOMMENDED FUNDING	AGENCY SERVICES GOAL	CONTRACT GOAL	SERVICE UNITS	COST PER SERVICE UNIT	AGENCY UNDUPLICATED CLIENTS	CONTRACT UNDUPLICATED CLIENTS	INTERMEDIATE PERFORMANCE MEASURE	LONG TERM PERFORMANCE MEASURE
J	BOYS & GIRLS CLUBS OF NORTH CENTRAL TEXAS	CDBG	$6,000	10,200	5,350	program hour	$1.12	20	10	90% Improved GPA with a focus on achieving B' or above scoring	90% On-time progression to the next grade level
A	CAMP SUMMIT	City Fund	$5,000	18	5	camperships	Up to $1,141.33	20	5	90% satisfaction rate on camp client survey	75% of previous year clients will return for another camping session
K	CHILDREN'S ADVOCACY CENTER	CDBG	$13,000	2,350	225	Victim Services	$57.91	150	14	95% of children showing PTSD symptoms that show a reduction in these symptoms 10 counseling sessions after initial testing.	70% of cases filed by Lewisville Police Department and worked through CACDC will result in a conviction of adult alleged child sexual abuse offenders
B		City Fund	$13,000	2,350	225	Victim Services	$57.91	150	14		
L	CCA	CDBG	$10,000	5,800	145	Case mgmt. services	$68.95	4,000	90	30% of unduplicated households completing the client satisfaction/progress survey will rate their experience in FAS as "very good" or above.	40% of unduplicated households completing a second client satisfaction/progress survey will show progress on their action plan moving them towards self-sufficiency
C	CHISHOLM TRAIL - Retired Senior Volunteer Program (RSVP)	City Fund	$10,500	17,000	2,764	Volunteer Hrs Submitted	$3.80	95	16	Increase number of newly enrolled Lewisville clients by 10%	Increase the level of community involvement of Lewisville senior adults by 5%

2016 - 2017 SOCIAL SERVICE AGENCIES PERFORMANCE MEASUREMENTS GOALS

Exhibit No.	AGENCY	FUNDING TYPE	RECOMMENDED FUNDING	AGENCY SERVICES GOAL	CONTRACT GOAL	SERVICE UNITS	COST PER SERVICE UNIT	AGENCY UNDUPLICATED CLIENTS	CONTRACT UNDUPLICATED CLIENTS	INTERMEDIATE PERFORMANCE MEASURE	LONG TERM PERFORMANCE MEASURE
D	COMMUNITIES IN SCHOOLS (CIS)	City Fund	$31,500	55,000	1,106	Services to Case Managed Students	$28.48	700	225	85% of clients will show improvement in one or more of the following areas: academics, attendance, behavior, and social services.	85% of clients will stay in school and/or graduate from high school.
M	COURT APPOINTED SPECIAL ADVOCATES (CASA)	CDBG	$14,000	121	9	Cases Staffed	$1,564.32	121	9	95% of CASA recommendations are accepted by judges and juries	60% of clients will be placed in permanent housing within 18 months of initial service
N	DENTON COUNTY FRIENDS OF THE FAMILY	CDBG	$10,000	900	128	Shelter Days	$78.58	56	9	75% of clients will report an increased sense of safety	100 % will show improvement in one or more of their individually stated goals
E		City Fund	$8,000	1,960	108	Face to Face Services	$74.54	320	18		
G	NEW HOPE LEARNING CENTER	City Fund	$5,000	553	148	Day care days	$33.74	7	2	90% satisfaction rate on the parent survey.	To be determined.
O	HEALTH SERVICE OF NORTH TEXAS	CDBG	$7,865	1,636	205	Medical visits	$38.51	600	75	65% of all adult diabetic patients will have a HbA1c level less than 9.	72% of diagnosed hypertensive adult patients will have a systolic blood pressure measurement less than 140 mmHg and a diastolic blood pressure measurement less than 90 mmHg.
F	PEDIPLACE	City Fund	$57,000	16,780	635	Office Visits	$89.87	4,326	173	90% or more clients will establish a medical home	66% of patients will receive at least one well-child exam annually

2016 - 2017 SOCIAL SERVICE AGENCIES PERFORMANCE MEASUREMENTS GOALS

Exhibit No.	AGENCY	FUNDING TYPE	RECOMMENDED FUNDING	AGENCY SERVICES GOAL	CONTRACT GOAL	SERVICE UNITS	COST PER SERVICE UNIT	AGENCY UNDUPLICATED CLIENTS	CONTRACT UNDUPLICATED CLIENTS	INTERMEDIATE PERFORMANCE MEASURE	LONG TERM PERFORMANCE MEASURE
P	SPECIAL ABILITIES OF NORTH TEXAS	CDBG	$5,000	3,400	66	Half-day habilitation session	$37.85	18	2	90% satisfaction rate on client satisfaction survey.	50% of clients will achieve health stabilization.
Q	SPECIAL PROGRAM FOR AGING NEEDS (SPAN)	CDBG	$24,000	24,418	4,290	Congregate Meals	$1.60	257	136	85 percent report their nutrition is improved as a result of participation in the nutrition program	85 percent report feeling more secure in their home and/or connected to the community by virtue of participation in the nutrition program
					10,710	Home-delivered	$1.60				
H	YOUTH & FAMILY COUNSELING - CPC	City Fund	$15,000	1,370	247	Counseling Sessions	$60.71	570	102	87% of clients will show improvement on 70% of the indicators as measured by the Goal Attainment Survey	80% of clients do not return for counseling for presenting problem in a two year period
I	YOUTH & FAMILY COUNSELING - FOP & Other Kids	City Fund	$25,000	1,280	413	Counseling Session	$60.60	365	117	87% of clients will show improvement on 70% of the indicators as mesured by the Goal Attainment Survey	85% of children completing the program will not be arrested a second time in a one year period

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, AUTHORIZING THE CITY MANAGER TO CONTRACT WITH BUDGETED SUBRECIPIENTS RECEIVING PORTIONS OF THE CITY OF LEWISVILLE'S U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD) COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG) ENTITLEMENT FUNDING AND CITY OF LEWISVILLE SOCIAL SERVICE FUNDING; AND AUTHORIZING THE DIRECTOR OF NEIGHBORHOOD SERVICES TO EXECUTE LETTERS OF AGREEMENT WITH CITY DEPARTMENTS RECEIVING CDBG FUNDING FOR FY 2016-2017.

WHEREAS, the City of Lewisville is receiving Community Development Block Grant (CDBG) entitlement funding from the U.S. Department of Housing and Urban Development (HUD); and

WHEREAS, the Lewisville City Council has approved the FY 2016-2017 Community Development Block Grant (CDBG) Budget submitted by the Lewisville Community Development Block Grant Advisory Committee; and

WHEREAS, the City of Lewisville is also providing funding to eligible social service agencies through the Social Service Agency Fund;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION 1. The City Manager is authorized to execute grant agreements shown as Exhibits A-R on behalf of the City of Lewisville, Texas with Community Development Block Grant subrecipients and City of Lewisville Social Service Agency Fund recipients.

SECTION 2. The Director of Neighborhood Services is authorized to execute a Letter of Agreement shown in Exhibit S with City departments managing Community Development Block Grant projects.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF LEWISVILLE, TEXAS, ON THIS THE 17th DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No. _____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
CAMP SUMMIT

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and CAMP SUMMIT (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $5,000 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

The Residential Camping Program provides a year-round therapeutic recreational outlet for the individual with disabilities and provides caregiver relief. The funding request will help provide financial assistance in the form of one-week and/or weekend scholarships to Lewisville residents with disabilities who are unable to pay the fees.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 5

B. Service Unit 1: Provide 5 campership(s). Each campership(s) will be reimbursement up to $1,141.33 per camper.

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. 90% satisfaction rate on camp client survey

B. Long-term Outcome Measure
   1. 75% of previous year clients will return for another camping session

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for CAMP SUMMIT will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome –Affordability

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $5,000 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $5,000.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

CAMP SUMMIT

BY:_____
Carla Weiland
Executive Director

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No. _____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND CHILDREN'S ADVOCACY CENTER
FOR DENTON COUNTY

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and CHIDREN'S ADVOCACY CENTER FOR DENTON COUNTY (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $13,000 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

The Victim Sevices Program seeks to minimize the trauma of child abuse to the chidren and non-offending family members by offering on-site forensic interviews and assessments, crisis counseling, group therapy, play therapy, court preparation, and psychological testing as needed.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 14

B. Service Unit 1: Provide 225 victim service(s). Each victim service(s) will be reimbursed at a rate of $57.91.

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. 95% of children showing PTSD symptoms show a reduction in these symptoms 10 counseling sessions after initial testing.

B. Long-term Outcome Measure
   1. 70% of cases filed by Lewisville Police Department and worked through CACDC will result in a conviction of adult alleged child sexual abuse offenders.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for CHILDREN'S ADVOCACY CENTER FOR DENTON COUNTY will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome – Availability/Accessibility

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

October 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $13,000 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $13,000.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's

discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

CHILDREN'S ADVOCACY CENTER FOR DENTON COUNTY

BY:_____
Dan Leal
EXECUTIVE DIRECTOR

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No._____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
CHISHOLM TRAIL RETIRED SENIOR VOLUNTEER PROGRAM (RSVP)

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and CHISHOLM TRAIL RETIRED SENIOR VOLUNTEER PROGRAM (RSVP) (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $10,500 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

RSVP recruits and places volunteers age 55 and over to meet ongoing and episodic requests from community agencies. RSVP serves as a tool for increased longevity and engagement in community for older adult volunteers.

II. SCOPE OF SERVICES

A. Target Newly Enrolled Lewisville (Unduplicated) Clients: 16

B. Service Unit 1: Provide 2,764 volunteer hour(s). Each volunteer hour(s) will be reimbursement at a rate of $3.80 per volunteer hour(s).

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. Increase number of newly enrolled Lewisville clients by 10 percent.

B. Long-term Outcome Measure
   1. Increase the level of community involvement of Lewisville senior adults by 5 percent.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for CHISHOLM TRAIL RETIRED SENIOR VOLUNTEER PROGRAM (RSVP) will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome – Sustainability

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $10,500 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $10,500.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

CHISHOLM TRAIL RETIRED SENIOR VOLUNTEER PROGRAM (RSVP)

BY:_____
Diana Corona
EXECUTIVE DIRECTOR

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No._____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
COMMUNITIES IN SCHOOLS OF NORTH TEXAS

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and COMMUNITIES IN SCHOOLS OF NORTH TEXAS (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $31,500 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

The Communities in Schools of North Texas Dropout Prevention Program will offer campus-based direct case management services to students identified as "at-risk" by the Texas Education Agency enrolled at 9 high need school campuses that feed into Lewisville High School and Lewisville High School as well.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 225

B. Service Unit 1: Provide 1,106 service(s) to case managed students. Each service(s) will be reimbursement at a rate of $28.48 per service(s).

III. OUTCOME MEASURES

A. Intermediate Outcome Measure

1. 85 percent of clients will show improvement in one or more of the following areas: academics, attendance, behavior, and social services.

B. Long-term Outcome Measure

1. 85 percent of clients will stay in school and/or graduate from high school.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for COMMUNITIES IN SCHOOLS OF NORTH TEXAS will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome – Availability/Accessibility

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $31,500 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $31,500.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

COMMUNITIES IN SCHOOLS OF NORTH TEXAS

BY:_____
Ann Pape
EXECUTIVE DIRECTOR

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No._____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
DENTON COUNTY FRIENDS OF THE FAMILY

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and DENTON COUNTY FRIENDS OF THE FAMILY (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $8,000 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

The Lewisville Relationship Violence & Sexual Assault Recovery Program offers free individual and group counseling to both children and adults. The Outreach Advocacy Program provides clients with assistance to service immediate needs such as food, clothing, shelter, and legal advocacy.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 18

B. Service Unit 1: Provide 108 face to face service(s). Each face to face service(s) will be reimbursed at a rate of $74.54 per face to face service(s).

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. 75% of clients will report an increased sense of safety.

B. Long-term Outcome Measure
   1. 100% of clients will show improvement in one or more of their individually stated goals.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for DENTON COUNTY FRIENDS OF THE FAMILY will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome – Availability/Accessibility

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $8,000 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $8,000.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

DENTON COUNTY FRIENDS OF THE FAMILY

BY:_____
Toni Johnson-Simpson
EXECUTIVE DIRECTOR

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No. _____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
NEW HOPE LEARNING CENTER

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and NEW HOPE LEARNING CENTER (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $5,000 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

New Hope Learning Center will provide child care for low-income and at-risk children ages Kindergarten through fifth grade during all teacher workdays, holidays, and summer break.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 2

B. Service Unit 1: Provide 148 day care days. Each service(s) will be reimbursed at a rate of $33.74 per day spent at New Hope Learning Center.

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. 80% satisfaction rate on the parent survey.
B. Long-term Outcome Measure
   1. To be determined.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for NEW HOPE LEARNING CENTER will be used by the City in reporting public service activity:

1. Objective – Create Economic Opportunities
2. Outcome – Availability/Accessibility

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

A. The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $5,000 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $5,000.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS NEW HOPE LEARNING CENTER

BY:_____
Donna Barron
CITY MANAGER

BY:_____
Janet Page
Director

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No. _____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
PEDIPLACE

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and PEDIPLACE (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $57,000 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

Pediplace provides healthcare for the indigent/uninsured children in Denton County who have no medical home and/or are unable to access healthcare due to limited resources and cultural barriers.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 173

B. Service Unit 1: Provide 635 office visits(s). Each office visit(s) will be reimbursed at a rate of $89.87 per patient visit(s).

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. 90 percent or more of clients will establish a medical home.

B. Long-term Outcome Measure
   1. 66 percent of patients will receive at least one well-child exam annually.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for PEDIPLACE will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome – Availability/Accessibility

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $57,000 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $57,000.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

PEDIPLACE

BY:_____
Larry Robins
EXECUTIVE DIRECTOR

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No._____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
YOUTH & FAMILY COUNSELING

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and YOUTH & FAMILY COUNSELING hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $15,000 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

The Community Psychological Health Care Program provides counseling and psychological therapy performed by professional therapists on a sliding scale fee structure to the citizens of Southern Denton County, a majority of whom do not have access to quality mental healthcare.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 102

B. Service Unit 1: Provide 247 counseling session(s). Each counseling sessions(s) will be reimbursed at a rate of $60.71 per counseling session(s).

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. 87 percent of clients will show improvement on 70% of the indicators as measured by the Goal Attainment Survey.

B. Long-term Outcome Measure
   1. 80 percent of clients do not return for counseling for presenting problem in a two year period.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for YOUTH & FAMILY COUNSELING will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome – Availability/Accessibility

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $15,000 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $15,000.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

YOUTH & FAMILY COUNSELING

BY:_____
Terri Donsbach
EXECUTIVE DIRECTOR

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No. _____

THE STATE OF TEXAS
COUNTY OF DENTON

AGREEMENT BETWEEN THE
CITY OF LEWISVILLE, TEXAS AND
YOUTH & FAMILY COUNSELING

This agreement is hereby entered into by and between the City of Lewisville, Texas, a Home Rule Municipal Corporation, (hereinafter referred to as City) and YOUTH & FAMILY COUNSELING (hereinafter referred to as Agency);

WHEREAS, the City Council has reviewed the scope of services of the Agency and has determined that the Agency performs an important human service for the residents of Lewisville without regard to race, religion, color or national origin and therefore Council recommends funding the Agency; and

WHEREAS, the City has determined that the Agency merits assistance and has provided for $25,000 in its budget for funding the Agency;

NOW, THEREFORE, the parties hereto mutually agree as follows:

I. PROGRAM SUMMARY

The agency shall in a satisfactory and proper manner perform the following tasks, and achieve the goals, for which the monies provided by the City may be used:

The First Offender and At-Risk Kids Program provides counseling to youth and their families after referral from the Lewisville Police Department and other at-risk youth that are registered with LISD that could benefit from family counseling.

II. SCOPE OF SERVICES

A. Target Lewisville (Unduplicated) Clients: 117

B. Service Unit 1: Provide 413 counseling session(s). Each counseling session(s) will be reimbursed at a rate of $60.60 per counseling session(s).

III. OUTCOME MEASURES

A. Intermediate Outcome Measure
   1. 87 percent of clients will show improvement on 70% of the indicators as measured by the Goal Attainment Survey.

B. Long-term Outcome Measure
   1. 85 percent of children completing the program will not be arrested a second time in a one year period.

C. H.U.D. Performance Measure – Effective October 1, 2006, the City began using objectives (Suitable Living Environment, Decent Housing, or Creating Economic Opportunities) and outcomes (Availability, Accessibility, or Sustainability) matching H.U.D.'s performance reporting when setting up public services at the beginning of each program year.

The following objective and outcome designated for YOUTH & FAMILY COUNSELING will be used by the City in reporting public service activity:

1. Objective – Suitable Living Environment
2. Outcome – Affordability

IV. OBLIGATIONS OF AGENCY

In consideration of the receipt of funds from the City, Agency agrees to the following terms and conditions:

A. It will establish, operate, and maintain an account system for this program that will allow for a tracking of funds and a review of the financial status of the program.

B. It will provide service information to the City on a monthly or quarterly basis.

C. It will indemnify and hold harmless the City from any and all claims and suits arising out of the activities of the Agency, its employees, and/or contractors.

D. It will permit authorized officials of the City to audit its program performance and accounts upon request.

E. It will not enter into any contracts that would encumber City funds for a period that would extend beyond the term of this Agreement.

F. It will appoint a representative who will be available to meet with the Director of Finance and other City Officials when requested.

V. TIME OF PERFORMANCE

The services funded by the City shall be undertaken by the Agency within the following time frame:

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

VI. METHOD OF PAYMENT

A. Payment by the City for services provided hereunder will be reimbursed within 21 days following timely receipt of proper reporting documents. On or after the last day of each quarter reimbursements will be made at a rate up to the contracted cost per service unit(s) (See Section II – Scope of Services).

B. It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month/quarter.

C. It is expressly understood that no compensation will be reimbursed without submission of an invoice of detailed expenditures and a monthly/quarterly statement of services provided by the Agency to Lewisville residents.

D. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed the maximum sum of $25,000 for all the services rendered.

E. It is expressly understood and agreed that in no event under the terms of this contract will the total compensation to be paid hereunder exceed $25,000.

VII. EVALUATION

The Agency agrees to participate in the programmatic and fiscal requirements outlined in the City of Lewisville City Fund Monitoring Guide. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report

B. Client Services Summary Report

C. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

VIII. SUSPENSION OR TERMINATION

The City may suspend or terminate this Agreement and payments to the Agency, in whole or part, for cause. Cause shall include but not be limited to the following:

A. Agency's improper, misuse, or inept use of funds.

B. Agency's failure to comply with the terms and conditions of this agreement.

C. Agency's submission of data and/or reports that are inaccurate or incomplete in any material respect.

D. If for any reason the carrying out of this agreement is rendered impossible or unfeasible.

In the event the City determines that the provisions of this agreement have been breached by Agency, the City may suspend payment hereunder; and, in case of suspension, the City shall advise the Agency, in writing, as to conditions precedent to the resumption of funding and specify a reasonable date for compliance.

Either party may terminate this agreement upon giving the other party sixty (60) days written notice of such termination. In case of termination, the Agency will remit to the City any unexpended City funds. Acceptance of these funds shall not constitute a waiver of any claim the City may otherwise have arising out of this Agreement.

IN WITNESS THEREOF, the parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

CITY OF LEWISVILLE, TEXAS

BY:_____
Donna Barron
CITY MANAGER

YOUTH & FAMILY COUNSELING

BY:_____
Terri Donsbach
EXECUTIVE DIRECTOR

ATTEST: _____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
BOYS AND GIRLS CLUB OF NORTH CENTRAL TEXAS
FOR
AFTER-SCHOOL ACTIVITIES

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and BOYS AND GIRLS CLUB OF NORTH CENTRAL TEXAS (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Youth Development After-school Activities Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Subrecipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a) (2) benefit low/moderate income persons. Activities benefiting low/moderate income persons - Limited Clientele: Require information on family size and income so that it is evident that at least 51 percent of the clientele are persons whose family income does not exceed the low and moderate income limit. Grantee has applicable volumes of 24 CFR pertinent to this Agreement for review or reproduction.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous month or quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $6,000. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist City of Lewisville 151 West Church Street P.O. Box 299002 Lewisville, TX 75029 (972) 219-5026 Fax (972) 219-3698 Email: lmitchell@cityoflewisville.com	Rick Troutman, President BOYS AND GIRLS CLUB OF NORTH CENTRAL TEXAS Fed. I.D. 75-2440493 303 Alamo Avenue Lake Dallas, TX 75065 (940) 597-5639 Fax: (940) 239-9313

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore, subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

G. Amendments

The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to confirm with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

H. Suspension or Termination

Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

2. Cost Principles

The Subrecipient shall administer its program in conformance with OMB Circulars A-122, "Cost Principles for Non-Profit Organizations," or A-21, "Cost Principles for Educational Instructions," as applicable (grantee has copies available for reproduction or review). These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

B. Documentation and Record-Keeping

1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

3. Client Data

The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

5. Close-Outs

The Subrecipients obligation to the Grantee shall not end until all close-out requirements are completed. Activities during this close-out period shall include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the Grantee), and determining the custodianship of records.

6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

7. Monitoring

The Subrecipient agrees to participate in the implementation of the programmatic and fiscal requirements outlined in the City of Lewisville CDBG Subrecipient Monitoring Guidebook. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report
B. Client Data Summary Report
C. Population Served Report
D. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month.

5. Procurement

1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and shall maintain inventory records of all non-expendable personal property as

defined by such policy as may be procured with funds provided herein. All program assets (unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipient will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term "minority and female owned business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

2. Subcontracts

a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

d. Selection Process

The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce,

publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville

By:_____
Donna Barron, City Manager

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

BOYS AND GIRLS CLUB OF NORTH CENTRAL TEXAS

By:_____
Rick Troutman, President

Attachment A - Program Summary

The Youth Development After-school Activities program works toward keeping kids in school, ensuring they are promoted to the next grade level on time, ensure they stay on target for graduation, and stay out of the juvenile justice system. Boys and Girls Club is opening a new location in Lewisville in partnership with North Texas Collegiate Academy at 960 Raldon St.

Attachment B - Program Time Line

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 10

B. Service Unit 1: Provide 5,350 program hour(s). Each service(s) will be reimbursed at a rate of $1.12 per program hour provided.

Attachment D – Outcome Measures

A. Intermediate
    1. 90% improved GPA with a focus on achieving ‘B’ or above scoring.
B. Long-term
    1. 90% on-time progression to the next grade level.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for BOYS AND GIRLS CLUB OF NORTH CENTRAL TEXAS will be used by the City in reporting public service activity:

    1. Objective – Suitable Living Environment
    2. Outcome – Availability/Accessibility

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
CHILDREN'S ADVOCACY CENTER FOR DENTON COUNTY
FOR
VICTIMS SERVICES

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and CHILDREN'S ADVOCACY CENTER FOR DENTON COUNTY (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Victim's Services Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Subrecipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a))(2)(A) Activities benefiting low/moderate income persons - Limited Clientele/Presumed Benefit: benefit persons who are generally presumed to be principally low and moderate income persons. Activities that exclusively serve a group of persons in any one or a combination of the following categories may be presumed to benefit persons, 51 percent of whom are low-and moderate-income: abused children, battered spouses, elderly persons, adults meeting the Bureau of Census' Current Population Reports definition of "severely disabled", homeless persons, illiterate adults, persons living with AIDS, and migrant farm workers.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $13,000. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist City of Lewisville 151 West Church Street P.O. Box 299002 Lewisville, TX 75029 (972) 219-5026 Fax (972) 219-3698 Email: lmitchell@cityoflewisville.com	Dan Leal, Executive Director CHILDREN'S ADVOCACY CENTER FOR DENTON COUNTY Fed. I.D. #75-255-9765 1854 Cain Drive Lewisville, TX 75077 (972) 317-2818 Ext. 227 Fax (972) 317-6989

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore, subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

G. Amendments

The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to confirm with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

H. Suspension or Termination

Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

2. Cost Principles

The Subrecipient shall administer its program in conformance with OMB Circulars A-122, "Cost Principles for Non-Profit Organizations," or A-21, "Cost Principles for Educational Instructions," as applicable (grantee has copies available for reproduction or review). These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

B. Documentation and Record-Keeping

1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

3. Client Data

The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

5. Close-Outs

The Subrecipients obligation to the Grantee shall not end until all close-out requirements are completed. Activities during this close-out period shall include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the Grantee), and determining the custodianship of records.

6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

7. Monitoring

The Subrecipient agrees to participate in the implementation of the programmatic and fiscal requirements outlined in the City of Lewisville CDBG Subrecipient Monitoring Guidebook. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report
B. Client Data Summary Report
C. Population Served Report
D. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month.

5. Procurement

1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and shall maintain inventory records of all non-expendable personal property as

defined by such policy as may be procured with funds provided herein. All program assets (unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipient will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term "minority and female owned business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

2. Subcontracts

a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

d. Selection Process

The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce,

publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville

By:_____
Donna Barron, City Manager

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

CHILDREN'S ADVOCACY CENTER FOR DENTON COUNTY

By:_____
Dan Leal, Executive Director

Attachment A - Program Summary

The Victims Services Program seeks to minimize the trauma of child abuse to the children and non-offending family members by offering on-site forensic interviews and assessments, crisis counseling, group therapy, play therapy, court preparation, and psychologocal testing as needed.

Attachment B - Program Time Line

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 14

B. Service Unit 1: Provide 225 victim service(s). Each service(s) will be reimbursed at a rate of $57.91 not to exceed $13,000 for the entire contract.

Attachment D – Outcome Measures

A. Intermediate
    1. 95% of children showing PTSD symptoms show a reduction in these symptoms 10 counseling sessions after initial testing.
B. Long-term
    1. 70% of cases filed by Lewisville Police Department and worked through CACDC will result in a conviction of adult alleged child sexual abuse offenders.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for CHILDREN'S ADVOCACY CENTER FOR DENTON COUNTY will be used by the City in reporting public service activity:

    1. Objective – Suitable Living Environment
    2. Outcome – Availability/Accessibility

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
CHRISTIAN COMMUNITY ACTION
FOR
FAMILY ASSISTANCE SERVICES PROGRAM

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and CHRISTIAN COMMUNITY ACTION (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Family Assistance Services Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Sub-recipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a) (2) Activities benefiting low/moderate income persons - Limited Clientele: Require information on family size and income so that it is evident that at least 51 percent of the clientele are persons whose family income does not exceed the low and moderate income limit. Grantee has applicable volumes of 24 CFR pertinent to this Agreement for review or reproduction.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $10,000. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist	Charles Parker, President & CEO
City of Lewisville	CHRISTIAN COMMUNITY ACTION
151 West Church Street	
P.O. Box 299002	
Lewisville, TX 75029-9002	
(972) 219-5026	Fed. I.D. # 23-731-9371
Fax (972) 219-3698	200 South Mill Street
Email: lmitchell@cityoflewisville.com	Lewisville, TX 75057
	(972) 219-4379
	Fax (972) 219-4339

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore, subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

G. Amendments

The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to confirm with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

H. Suspension or Termination

Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

2. Cost Principles

The Subrecipient shall administer its program in conformance with OMB Circulars A-122, "Cost Principles for Non-Profit Organizations," or A-21, "Cost Principles for Educational Instructions," as applicable (grantee has copies available for reproduction or review). These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

B. Documentation and Record-Keeping

1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

3. Client Data

The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

5. Close-Outs

The Subrecipients obligation to the Grantee shall not end until all close-out requirements are completed. Activities during this close-out period shall include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the Grantee), and determining the custodianship of records.

6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

7. Monitoring

The Subrecipient agrees to participate in the implementation of the programmatic and fiscal requirements outlined in the City of Lewisville CDBG Subrecipient Monitoring Guidebook. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report
B. Client Data Summary Report
C. Population Served Report
D. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month.

5. Procurement

1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and shall maintain inventory records of all non-expendable personal property as

defined by such policy as may be procured with funds provided herein. All program assets (unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipient will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term "minority and female owned business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

2. Subcontracts

a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

d. Selection Process

The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce,

publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville

By:_____
Donna Barron, City Manager

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

CHRISTIAN COMMUNITY ACTION

By:_____
Charles Parker, President & CEO

Attachment A - Program Summary

The Family Assistance Services Program seeks to meet the crisis or financial relief needs of Lewisville's low-income residents. Funds requested will provide case management services such as counseling, rental assistance, and life skills training to low-to-moderate income individuals and families.

Attachment B - Program Time Line

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 90

B. Service Unit 1: Provide 145 case management service(s). Each case management service(s) will be reimbursed at a rate of $68.95 not to exceed $10,000 for the entire contract.

Attachment D – Outcome Measures

A. Intermediate
    1. 30% of unduplicated households completing the client satisfaction/progress survey will rate their experience in FAS as "very good" or above.
B. Long-term
    1. 40% of unduplicated households completing a second client satisfaction/progress survey will show progress on their action plan moving them towards self-sufficiency.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for CHRISTIAN COMMUNITY ACTION will be used by the City in reporting public service activity:

    1. Objective – Suitable Living Environment
    2. Outcome – Availability/Accessibility

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
COURT APPOINTED SPECIAL ADVOCATES
FOR
COURT ADVOCACY PROGRAM

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and COURT APPOINTED SPECIAL ADVOCATES (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Court Advocacy Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Subrecipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a) (2) (A) benefit low/moderate income persons. Activities that exclusively serves a group of persons in any one or a combination of the following categories may be presumed to benefit persons, 51 percent of whom are low-and moderate-income: abused children, battered spouses, elderly persons, adults meeting the Bureau of Census' Current Population Reports definition of "severely disabled, "homeless persons, illiterate adults, persons living with AIDS, and migrant farm workers. Grantee has applicable volumes of 24 CFR pertinent to this Agreement for review or reproduction.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $14,000. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist City of Lewisville 151 West Church Street P.O. Box 299002 Lewisville, TX 75029 (972) 219-5026 Fax (972) 219-3698 Email: lmitchell@cityoflewisville.com	Sherri Gideon, Executive Director COURT APPOINTED SPECIAL ADVOCATES Fed. I.D. #75-241-7472 614 North Bell Avenue Denton, Texas 76209 (940) 243-2272 Ext. 101 Fax (940) 243-1605

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore, subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

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The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

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The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to confirm with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

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Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

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1. Records to be Maintained

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a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

3. Client Data

The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

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The Subrecipients obligation to the Grantee shall not end until all close-out requirements are completed. Activities during this close-out period shall include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the Grantee), and determining the custodianship of records.

6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

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The Subrecipient agrees to participate in the implementation of the programmatic and fiscal requirements outlined in the City of Lewisville CDBG Subrecipient Monitoring Guidebook. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report
B. Client Data Summary Report
C. Population Served Report
D. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month.

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1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and shall maintain inventory records of all non-expendable personal property as

defined by such policy as may be procured with funds provided herein. All program assets (unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipient will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term "minority and female owned business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

2. Subcontracts

a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

d. Selection Process

The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce,

publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville

By:_____
Donna Barron, City Manager

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

COURT APPOINTED SPECIAL ADVOCATES

By:_____
Sherri Gideon, Executive Director

Attachment A - Program Summary

The Court Advocacy Program trains community volunteers to be advocates in the District Civil Courts of Denton County for children who have been removed from their homes by Child Protective Services (CPS) due to abuse and/or neglect.

Attachment B - Program Time Line

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year-period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 9

B. Service Unit 1: Staff 9 case(s). Each case(s) staffed will be reimbursed at a rate of $1,564.32 not to exceed $14,000 for the entire contract.

Attachment D – Outcome Measures

A. Intermediate
   1. 95 percent of CASA recommendations are accepted by judges and juries.

B. Long-term
   1. 60 percent of clients will be placed in permanent housing within 18 months of initial service.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for COURT APPOINTED SPECIAL ADVOCATES will be used by the City in reporting public service activity:

   1. Objective – Suitable Living Environment
   2. Outcome – Availability/Accessibility

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
DENTON COUNTY FRIENDS OF THE FAMILY
FOR
RELATIONSHIP VIOLENCE & SEXUAL ASSAULT EMERGENCY SHELTER

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and DENTON COUNTY FRIENDS OF THE FAMILY (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Relationship Violence Emergency Shelter Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Sub-recipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a) (2) (A) benefit low/moderate income persons. Activities that exclusively serves a group of persons in any one or a combination of the following categories may be presumed to benefit persons, 51 percent of whom are low-and moderate-income: abused children, battered spouses, elderly persons, adults meeting the Bureau of Census' Current Population Reports definition of "severely disabled, "homeless persons, illiterate adults, persons living with AIDS, and migrant farm workers. Grantee has applicable volumes of 24 CFR pertinent to this Agreement for review or reproduction.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $10,000. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist	Toni Johnson-Simpson, Executive Director
City of Lewisville	DENTON COUNTY FRIENDS OF THE FAMILY
151 West Church Street	
P.O. Box 299002	
Lewisville, TX 75029-9002	
(972) 219-5026	Fed. I.D. # 75-1734175
Fax (972) 219-3698	P.O. Box 640
Email: lmitchell@cityoflewisville.com	Denton, TX 76202
	(940) 387-5131
	Fax (940) 383-1816

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore, subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

G. Amendments

The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to confirm with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

H. Suspension or Termination

Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

2. Cost Principles

The Subrecipient shall administer its program in conformance with OMB Circulars A-122, "Cost Principles for Non-Profit Organizations," or A-21, "Cost Principles for Educational Instructions," as applicable (grantee has copies available for reproduction or review). These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

B. Documentation and Record-Keeping

1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

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4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

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All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

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If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

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The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

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The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipient will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term "minority and female owned business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

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1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

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a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

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The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

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The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce,

publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville

By:_____
Donna Barron, City Manager

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

DENTON COUNTY FRIENDS OF THE FAMILY

By:_____
Toni Johnson-Simpson, Executive Director

Attachment A - Program Summary

The Lewisville Relationship Violence & Sexual Assault Recovery Program offers free individual and group counesling to both children and adults. The Emergency Shelter Program provides clients a 32 bed shelter facility as well as support services including case managmeent, advocacy, counseling and safety planning.

Attachment B - Program Time Line

October 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 9

B. Service Unit 1: Provide 128 shelter day(s). Each shelter day(s) will be reimbursed at a rate of $78.58 not to exceed $10,000 for the entire contract.

Attachment D – Outcome Measures

A. Intermediate
   1. 75% of clients will report an increased sense of safety.

B. Long-term
   1. 100% of clients will show improvements in one or more of their individually stated goals.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for DENTON COUNTY FRIENDS OF THE FAMILY will be used by the City in reporting public service activity:

   1. Objective – Suitable Living Environment
   2. Outcome – Availability/Accessibility

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
HEALTH SERVICES OF NORTH TEXAS
FOR
INDIGENT PRIMARY CARE PROGRAM

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and HEALTH SERVICES OF NORTH TEXAS (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Indigent Primary Care Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Sub-recipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a) (2) Activities benefiting low/moderate income persons - Limited Clientele: Require information on family size and income so that it is evident that at least 51 percent of the clientele are persons whose family income does not exceed the low and moderate income limit. Grantee has applicable volumes of 24 CFR pertinent to this Agreement for review or reproduction.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $7,865. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist City of Lewisville 151 West Church Street P.O. Box 299002 Lewisville, TX 75029-9002 (972) 219-5026 Fax (972) 219-3698 Email: lmitchell@cityoflewisville.com	Doreen M. Rue., Chief Executive Officer HEALTH SERVICES OF NORTH TEXAS Fed. I.D. # 75-225-2866 4401 N. I-35; Suite 312 Denton, TX 76207 (940) 381-1501 Fax (940) 566-8059

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore,

subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

G. Amendments

The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to confirm with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

H. Suspension or Termination

Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

2. Cost Principles

The Subrecipient shall administer its program in conformance with OMB Circulars A-122, "Cost Principles for Non-Profit Organizations," or A-21, "Cost Principles for Educational Instructions," as applicable (grantee has copies available for reproduction or review). These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

B. Documentation and Record-Keeping

1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

3. Client Data

The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

5. Close-Outs

The Subrecipients obligation to the Grantee shall not end until all close-out requirements are completed. Activities during this close-out period shall include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the Grantee), and determining the custodianship of records.

6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

7. Monitoring

The Subrecipient agrees to participate in the implementation of the programmatic and fiscal requirements outlined in the City of Lewisville CDBG Subrecipient Monitoring Guidebook. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report
B. Client Data Summary Report
C. Population Served Report
D. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month.

5. Procurement

1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and shall maintain inventory records of all non-expendable personal property as defined by such policy as may be procured with funds provided herein. All program assets

(unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

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1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term "minority and female owned business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

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3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

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a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

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The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

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The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce,

publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville

By:_____
Donna Barron, City Manager

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

HEALTH SERVICES OF NORTH TEXAS

By:_____
Doreen M. Rue., Chief Executive Officer

Attachment A - Program Summary

The Indigent Primary Care Prograam provides primary health care services to low-to-moderate income Lewisville residents. “Medical visits” include medical exams, blood draws, laboratory services, diagnostic testing, imaging and patient education. One visit can include one or a multiple of these services given in the same day.

Attachment B - Program Time Line

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 15

B. Service Unit 1: Provide 40 medical visit(s). Each medical visit(s) will be reimbursed at a rate of $200.00 not to exceed $7,865 for the entire contract.

Attachment D – Outcome Measures

A. Intermediate
   1. 85% of all adult diabetic patients will have a HbA1c level less than 9.

B. Long-term
   1. 72% of diagnosed hypertensive adult patients will have a systolic blood pressure measurement less than 140 mmHg and a diastolic blood pressure measurement less than 90 mmHg.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for HEALTH SERVICES OF NORTH TEXAS will be used by the City in reporting public service activity:

   1. Objective – Suitable Living Environment
   2. Outcome – Affordability

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
SPECIAL ABILITIES OF NORTH TEXAS
FOR
ADULT DAY STAY PROGRAM

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and SPAN, Inc. (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Adult Day Stay Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Sub-recipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a) (2) Activities benefiting low/moderate income persons - Limited Clientele: Require information on family size and income so that it is evident that at least 51 percent of the clientele are persons whose family income does not exceed the low and moderate income limit. Grantee has applicable volumes of 24 CFR pertinent to this Agreement for review or reproduction.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $5,000. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist	Troy Greisen, President & CEO
City of Lewisville	SPECIAL ABILITIES OF NORTH TEXAS
151 West Church Street	
P.O. Box 299002	
Lewisville, TX 75029	Fed. I.D. #75-248-0904
(972) 219-5026	1511 Justin Rd., Suite B
Fax (972) 219-3698	Lewisville, TX 75077
Email: lmitchell@cityoflewisville.com	(972) 317-1515

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore,

subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

Subrecipient must submit timely reports. Based on past performances, City Staff will enforce that once two consecutive reports are submitted late, the subrecipient will not receive the second consecutive month's funding. The funding can be claimed in the following month's reimbursement request.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

G. Amendments

The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to conform with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

H. Suspension or Termination

Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time

as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

2. Cost Principles

The Subrecipient shall administer its program in conformance with OMB Circulars A-122, "Cost Principles for Non-Profit Organizations," or A-21, "Cost Principles for Educational Instructions," as applicable (grantee has copies available for reproduction or review). These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

B. Documentation and Record-Keeping

1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds

under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

3. Client Data

The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

5. Close-Outs

The Subrecipients obligation to the Grantee shall not end until all close-out requirements are completed. Activities during this close-out period shall include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the Grantee), and determining the custodianship of records.

6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

7. Monitoring

The Subrecipient agrees to participate in the implementation of the programmatic and fiscal requirements outlined in the City of Lewisville CDBG Subrecipient Monitoring Guidebook. The

Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report
B. Client Data Summary Report
C. Population Served Report
D. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month.

5. Procurement

1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and shall maintain inventory records of all non-expendable personal property as defined by such policy as may be procured with funds provided herein. All program assets (unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the

Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipient will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term “minority and female owned business enterprise” means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, “minority group members” are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

2. Subcontracts

a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

d. Selection Process

The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code.

Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce, publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville	Special Abilities of North Texas
By:_____	By:_____
Donna Barron, City Manager	Troy Greisen, President & CEO

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

Attachment A - Program Summary

Special Abilities of North Texas will use $5,000 to provide vocational, health, life skills training and education programs to clients who are low-income, meeting H.U.D's definition of presumed benefit, and functionally impaired adults.

Attachment B - Program Time Line

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 2

B. Service Unit 1: Provide 66 session(s). Each session(s) will be reimbursed at a rate of $37.85 not to exceed $5,000 for entire contract.

Attachment D – Outcome Measures

A. Intermediate
    1. 90% satisfaction rate on client satisfaction survey.
B. Long-term
    1. 50% of clients will achieve health stabilization.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for SPAN, Inc. will be used by the City in reporting public service activity:

    1. Objective – Suitable Living Environment
    2. Outcome – Affordability

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
SPAN, Inc.
FOR
MEALS ON WHEELS OF DENTON COUNTY

THIS AGREEMENT entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and SPAN, Inc. (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year Congregate and Home Delivery Meal Program in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Sub-recipient certifies that the activities carried out with funds provided under this Agreement will meet the CDBG program's National Objectives as defined in the requirements of 24 CFR Part 570.208 (a) (2) Activities benefiting low/moderate income persons - Limited Clientele: Require information on family size and income so that it is evident that at least 51 percent of the clientele are persons whose family income does not exceed the low and moderate income limit. Grantee has applicable volumes of 24 CFR pertinent to this Agreement for review or reproduction.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line".

III. BUDGET

The Subrecipient shall operate fiscally within the Scope of Services - "Attachment C". It is expressly understood and agreed that repayment shall be based on a cost per service unit delivered for services provided in the previous quarter.

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content prescribed by the Grantee. Any amendments to the scope of services for cost per service unit delivery must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $24,000. Draw downs for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

Failure to meet the contracted service unit goal by the end of the contract term could result in reimbursement of less than the full grant award of this contract. Exceptions may be made on a case-by-case basis, subject to Grantee approval.

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Laura Mitchell, CDBG Program Specialist City of Lewisville 151 West Church Street P.O. Box 299002 Lewisville, TX 75029 (972) 219-5026 Fax (972) 219-3698 Email: lmitchell@cityoflewisville.com	Deborah Robertson, Executive Director SPAN, Inc. Fed. I.D. #75-149-7010 1800 Malone Street Denton, TX 76201 (940) 382-2224 Fax (940) 383-8433

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore,

subrecipients will be required to report homeless data for the Denton County Homeless Management Information System.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (Grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

G. Amendments

The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to conform with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

H. Suspension or Termination

Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

VIII. ADMINISTRATIVE REQUIREMENTS

A. Financial Management

1. Accounting Standards

The Subrecipient agrees to comply with the financial management requirements of OMB Circular A-110 (grantee has a copy available for review or reproduction) and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

2. Cost Principles

The Subrecipient shall administer its program in conformance with OMB Circulars A-122, "Cost Principles for Non-Profit Organizations," or A-21, "Cost Principles for Educational Instructions," as applicable (grantee has copies available for reproduction or review). These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

B. Documentation and Record-Keeping

1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meet one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

3. Client Data

The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

5. Close-Outs

The Subrecipients obligation to the Grantee shall not end until all close-out requirements are completed. Activities during this close-out period shall include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the Grantee), and determining the custodianship of records.

6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

7. Monitoring

The Subrecipient agrees to participate in the implementation of the programmatic and fiscal requirements outlined in the City of Lewisville CDBG Subrecipient Monitoring Guidebook. The Agency agrees to make available its financial records for review by the City at the City's discretion. In addition, the Agency agrees to provide the City the following data and/or reports no later than the 15th of the month following the reimbursement period:

A. Performance Objectives Report
B. Client Data Summary Report
C. Population Served Report
D. Request for Reimbursement

Multiple failures to submit timely reports will be reflected in the Agency file and may be considered during the renewal process.

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month.

5. Procurement

1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and shall maintain inventory records of all non-expendable personal property as

defined by such policy as may be procured with funds provided herein. All program assets (unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until five years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. Personal & Participant Conditions

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipient will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term "minority and female owned business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

2. Subcontracts

a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

d. Selection Process

The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce,

publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

X. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this contract as of the date first written above.

City of Lewisville	SPAN, Inc.
By:_____	By:_____
Donna Barron, City Manager	Deborah Robertson, Executive Director

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

_____
Lizbeth Plaster, City Attorney

Attachment A - Program Summary

The Congregate Meals provides both nutrition and socialization; the Home-Delivered Meals provides nutrition and contact/support for home-bound elderly community members.

Attachment B - Program Time Line

OCTOBER 1, 2016 THROUGH SEPTEMBER 30, 2017

The grant award is made for a one-year period.

Attachment C – Scope of Services

A. Targeted Lewisville (Unduplicated) Clients: 136

B. Service Unit 1: Provide 4,290 congregate meal(s). Each congregate meal(s) will be reimbursed at a rate of $1.60 not to exceed $24,000 for entire contract.

C. Service Unit 2: Provide 10,710 home delivered meal(s). Each home delivered meal(s) will be reimbursed at a rate of $1.60 not to exceed $24,000 for entire contract.

Attachment D – Outcome Measures

A. Intermediate
   1. 85 percent report their nutrition is improved as a result of participation in the nutrition program.
B. Long-term
   1. 85 percent report feeling more secure in their home and/or connected to the community by virtue of participation in the nutrition program.

C. H.U.D. Mandated Performance Measure – the following objective and outcome designated for SPAN, Inc. will be used by the City in reporting public service activity:

   1. Objective – Suitable Living Environment
   2. Outcome – Affordability

Resolution No. _____

STATE OF TEXAS §

COUNTY OF DENTON §

AGREEMENT BETWEEN THE CITY OF LEWISVILLE
AND
HABITAT FOR HUMANITY OF DENTON COUNTY
FOR
LAND ACQUISTION

THIS AGREEMENT, entered this 1st day of October, 2016 by and between the City of Lewisville (herein called the "Grantee") and Habitat for Humanity of Denton County (herein called the "Subrecipient").

WHEREAS, the City of Lewisville has applied for and notified that it will receive grant monies from the United States Government under Title I of the Housing and Community Development Act of 1974, Public Law 93-383; and

WHEREAS, the Grantee wishes to engage the Subrecipient to assist the Grantee in utilizing such funds:

NOW, THEREFORE, it is agreed between the parties hereto that;

I. SCOPE OF SERVICES

A. Activities

The Subrecipient will be responsible for administering a CDBG 2016 Plan Year **Land Acquisition Project** in a manner satisfactory to the Grantee and consistent with any standards required as a condition of providing these funds. Such program will include activities described in "Attachment A - Program Summary including Levels of Accomplishment"

B. National Objectives

The Subrecipient certifies that the activities carried out with funds provided under this Agreement will meet the following CDBG program's National Objective as defined in requirements of 24 CFR Part 570.208. LMH 570.208(a)(3) Activities benefiting low/moderate income persons - Housing activities: An eligible activity carried out for the purpose of providing or improving permanent residential structures which, upon completion, will be occupied by low- and moderate-income households. If the structure contains two dwelling units, at least one must be so occupied, and if the structure contains more than two dwelling units, at least 51 percent of the units must be so occupied.

II. TIME OF PERFORMANCE

Services of the Subrecipient shall start on the 1st day of October, 2016 and end on the 30th day of September, 2017. Subrecipient will act in accordance with "Attachment B - Program Time Line". If Quarterly Benchmarks noted in Attachment B and they are not met, the Grantee may review the project and decide to terminate the agreement.

III. BUDGET

The Subrecipient shall operate fiscally within the Program Budget - "Attachment C".

The Grantee may require a more detailed budget breakdown than the one contained herein, and the Subrecipient shall provide supplementary budget information in a timely fashion in the form and content

prescribed by the Grantee. Any amendments to this budget must be approved in writing by the Grantee and the Subrecipient.

IV. PAYMENT

It is expressly agreed and understood that the total amount to be paid by the Grantee under this contract shall not exceed $25,000. Drawdowns for the payment of eligible expenses shall be made against the line item budgets specified in paragraph III herein and in accordance with performance. Increases or decreases in budget line items must be approved by the Grantee in writing.

Payments may be contingent upon certification of the Subrecipient's financial management system in accordance with the standards specified in OMB Circular A-110 (grantee has copy available for review or reproduction).

V. NOTICES

Communication and details concerning this contract shall be directed to the following representatives:

Grantee	Subrecipient
Jamey Kirby, Grants Coordinator	Carol Kyer, Executive Director
City of Lewisville	Fed. I.D. #: 75-2552661
1197 West Main	Habitat for Humanity of Denton County
Lewisville, TX 75067	1721 N. Carroll Blvd
(972) 219-3780	Denton, TX 76201
Fax (972) 219-3698	(940) 484-5006
Email: jkirby@cityoflewisville.com	Email: carolkyer@hfhdentoncounty.org

VI. SPECIAL CONDITIONS

Subrecipient will not commingle CDBG monies with any other funds in any manner which would prevent the Grantee from readily identifying expenditures for operation of the Program. Furthermore, the subrecipient will be required to report homeless data for the Denton County Homeless Management Information System if homeless clients are served. Subrecipient agrees that Grantee will have final approval of housing location and design.

Subrecipient agrees to submit construction contractors' weekly payrolls for weeks covered by the construction invoices submitted for projects covered by the Davis-Bacon Act. Grantee may require use of software for purpose of labor regulations compliance that may be paid for with grant funds or other project funds.

VII. GENERAL CONDITIONS

A. General Compliance

The Subrecipient agrees to comply with the requirements of the Code of Federal Regulations (CFR), Part 570 of the Housing and Urban Development (HUD) regulations (grantee has copy available for review or reproduction) concerning Community Development Block Grants (CDBG). The Subrecipient also agrees to comply with all other applicable Federal, state and local laws, regulations, and policies governing the funds provided under this contract. The Subrecipient further agrees to utilize funds available under this Agreement to supplement rather than supplant funds otherwise available.

B. "Independent Contractor"

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Subrecipient shall at all times

remain an "independent contractor" with respect to the services to be performed under this Agreement. The Grantee shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance as the Subrecipient is an independent subrecipient.

C. Hold Harmless

The Subrecipient shall hold harmless, defend, and indemnify the Grantee from any and all claims, actions, suits, charges and judgments whatsoever that arise out of the Subrecipient's performance or nonperformance of the services or subject matter called for in the Agreement.

D. Workers' Compensation

The Subrecipient shall provide Workers' Compensation Insurance coverage or its equivalent for all of its employees involved in the performance of this contract.

E. Insurance & Bonding

The Subrecipient shall carry sufficient insurance coverage to protect contract assets from loss due to theft, fraud and/or undue physical damage, and as a minimum shall purchase a blanket fidelity bond covering all employees in an amount equal to cash advances from the Grantee.

The Subrecipient shall comply with the bonding and insurance requirements of OMB Circular A-110 (grantee has copy available for review or reproduction).

F. Grantor Recognition

The Subrecipient shall insure recognition of the role of the grantor agency in providing services through this contract. All activities, facilities and items utilized pursuant to this contract shall be prominently labeled as to funding source. In addition, the Subrecipient will include a reference to the support provided herein in all publications made possible with funds made available under this contract.

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The Grantee or Subrecipient may amend this Agreement at any time provided that such amendments make specific reference to this Agreement, and are executed in writing, signed by a duly authorized representative of both organizations, and approved by the Grantee's governing body. Such amendments shall not invalidate this agreement, nor relieve or release the Grantee or Subrecipient from its obligations under the Agreement.

The Grantee may, in its discretion, amend this Agreement to conform with Federal, state or local governmental guidelines, policies and available funding amounts, or for other reasons. If such amendments result in a change of funding, the scope of services, or schedule of the activities to be underwritten as part of this Agreement, such modifications will be incorporated only by written amendment signed by both Grantee and Subrecipient.

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Either party may terminate this contract at any time by giving written notice to the other party of such termination and specifying the effective date thereof at least 30 days before the effective date of such termination. Partial terminations of the Scope of Service in Paragraph I.A above may only be undertaken with the prior approval of the Grantee. In the event of any termination for convenience, all finished or unfinished documents, data, studies, surveys, maps, models, photographs, reports or other materials prepared by the Subrecipient under this Agreement shall, at the option of the Grantee, become the property of the Grantee, and the Subrecipient shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents or materials prior to the termination.

The Grantee may also suspend or terminate this Agreement, in whole or in part, if the Subrecipient materially fails to comply with any term of this Agreement, or with any of the rules, regulations or provisions referred to

herein; and the Grantee may declare the Subrecipient ineligible for any further participation in the Grantee's contracts, in addition to other remedies as provided by law. In the event there is probable cause to believe the Subrecipient is in noncompliance with any applicable rules or regulations, the Grantee may withhold up to fifteen (15) percent of said contract funds until such time as the Subrecipient is found to be in compliance by the Grantee, or is otherwise adjudicated to be in compliance.

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1. Records to be Maintained

The Subrecipient shall maintain all records required by the Federal regulations specified in 24 CFR Part 570.506, that are pertinent to the activities to be funded under this Agreement. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken including records documenting development, acquisition, financing and construction activities related to real property covered by this grant as well as services provided at facilities improved as a result of this grant;
b. Records demonstrating that each activity undertaken meets one of the National Objectives of the CDBG program;
c. Records required to determine the eligibility of the activities;
d. Records required to document the acquisition, improvement, use or disposition of real property acquired or improved with CDBG assistance;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG Program including data on the extent to which each racial and ethnic group and single-headed households have applied for, participated in, or benefited from, any program or activity funded in whole or in part with CDBG funds;
f. Financial records as required by 24 CFR Part 570.502, and OMB Circular A-110;
g. Other records necessary to document compliance with Subpart K of 24 CFR 570.

2. Retention

The Subrecipient shall retain all records pertinent to expenditures incurred under this contract for a period of four (4) years from the date of submission of the annual performance and evaluation report as required by 24 CFR 570.502.. Records for non-expendable property acquired with funds under this contract shall be retained for four (4) years after final disposition of such property. Notwithstanding the above, if there is litigation, claims, audits, negotiations or other actions that involve any of the records cited and that have started before the expiration of the four-year period, then such records must be retained until completion of the actions and resolution of all issues, or the expiration of the four-year period, whichever occurs first.

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The Subrecipient shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to Grantee monitors or their designees for review upon request.

4. Disclosure

The Subrecipient understands that client information collected under this contract is private and the use or disclosure of such information, when not directly connected with the administration of the Grantee's or Subrecipient's responsibilities with respect to services provided under this contract, is prohibited unless written consent is obtained from such person receiving service and, in the case of a minor, that of a responsible parent/guardian.

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6. Audits & Inspections

All Subrecipient's records with respect to any matters covered by this Agreement shall be made available to the Grantee, grantor agency, their designees or the Federal Government, at any time during normal business hours, as often as the Grantee or grantor agency deems necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the Subrecipient within 30 days after receipt by the Subrecipient. Failure of the Subrecipient to comply with the above audit requirements will constitute a violation of this contract and may result in the withholding of future payments. The Subrecipient hereby agrees to have an annual agency audit conducted in accordance with current Grantee policy concerning recipient audits and, as applicable. OMB Circular A-133 (grantee has copy available for review or reproduction).

C. Reporting and Payment Procedures

1. Program Income

The Subrecipient shall report monthly all program income as defined in 24 CFR 570.500(a) generated by activities carried out with CDBG funds made available under this contract. The use of program income by the Subrecipient shall comply with the requirements set forth at 24 CFR 570.504. By way of further limitations, the Subrecipient may use such income during the contract period for activities permitted under this contract and shall reduce requests for additional funds by the amount of such program income balances on hand. All unused program income shall be returned to the Grantee at the end of the contract period. Any interest earned on cash advances from the U.S. Treasury is not program income and shall be remitted promptly to the Grantee.

2. Indirect Costs

If indirect costs are charged, the Subrecipient will develop an indirect cost allocation plan for determining the appropriate Subrecipient's share of administrative costs and shall submit such plan to the Grantee for approval, in a form specified by the Grantee.

3. Payment Procedures

The Grantee will pay the Subrecipient funds available under this contract based upon information submitted by the Subrecipient and consistent with any approved budget and Grantee policy concerning

payments. With the exception of certain advances, payments will be made for eligible expenses actually incurred by the Subrecipient, and not to exceed actual cash requirements. Payments will be adjusted by the Grantee in accordance with advance fund and program income balances available in Subrecipient accounts. In addition, the Grantee reserves the right to liquidate funds available under this contract for costs incurred by the Grantee on behalf of the Subrecipient.

4. Progress Reports

The Subrecipient shall submit the following Monthly Activity Summary Reports: CDBG Request for Reimbursement Form and subsequent back-up documentation, Performance Objectives Report, Population Served Report, and CDBG Client Data Summary Report to the City of Lewisville Community Development Department no later than the 15th of each month. Additionally, for construction projects, the Subrecipient shall submit a monthly progress narrative that reports on each item specified in "Attachment B – Program Timeline".

5. Procurement

1. Compliance

The Subrecipient shall comply with current Grantee policy concerning the purchase of equipment and procurement of professional services and contractors, and shall maintain inventory records of all non-expendable personal property as defined by such policy as may be procured with funds provided herein. All program assets (unexpended program income, property, equipment, etc.) shall revert to the Grantee upon termination of this contract.

2. OMB Standards

The Subrecipient shall procure all materials, property, or services in accordance with the requirements of OMB Circular A-110. Procurement Standards, and shall subsequently follow the Property Management Standards as modified by 24 CFR 570.502(B)(6), covering utilization and disposal of property.

3. Reversion of Assets

Upon its expiration the Subrecipient shall transfer to the City of Lewisville any CDBG funds on hand at the time of expiration and any accounts receivable attributable to the use of the CDBG funds. Also, any real property under the Subrecipient's control that was acquired or improved in whole or in part with CDBG funds in excess of $25,000 is either:

a. Used to meet the national objective stated under Section 1, Part A until ten years after expiration of this agreement, or such longer period of time as determined appropriate by the City of Lewisville, or
b. Is disposed of in a manner which results in the City of Lewisville being reimbursed in the amount of the current fair market value of the property less any portion thereof attributable to expenditures of non-CDBG funds for acquisition of, or improvement to, the property. Such reimbursement is not required after the period of time specified in accordance with (1) above.

4. Travel

The Subrecipient shall obtain written approval from the Grantee for any travel outside the metropolitan area with funds provided under this contract.

IX. RELOCATION, REAL PROPERTY ACQUISITION AND ONE-FOR ONE HOUSING REPLACEMENT

The Subrecipient agrees to comply with (a) the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (URA), and implementing regulations as 49 CFR 24 and 24 CFR 570.606(c) governing the Residential Antidisplacement and Relocation Assistance Plan under section 104(d) of the Hatch Act; and (c) the requirements in § 570.606(d) governing optional relocation policies. [The Grantee may

preempt the optional policies.] The Subrecipient shall provide relocation assistance to persons (families, individuals, businesses, nonprofit organizations and farms) that are displaced as a direct result of acquisition, rehabilitation, demolition or conversion for a CDBG-assisted project. The Subrecipient also agrees to comply with applicable Grantee ordinances, resolution and policies concerning the displacement from their residences.

X. PERSONAL & PARTICIPANT CONDITIONS

A. Civil Rights

1. Compliance

The Subrecipient agrees to comply with Title VI of the Civil Rights Act of 1964 as amended, Title VII of the Civil Rights Act of 1968 as amended, Section 104(b) and Section 109 of Title 1 of the Housing and Community Development Act of 1974 as amended, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Executive Order 11063, and with Executive Order 11246 as Amended by Executive Orders 11375 and 12086. Grantee has copies of applicable compliance documents for review or reproduction.

2. Nondiscrimination

The Subrecipient will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, disability or other handicap, age, marital/family status, or status with regard to public assistance. The Subrecipients will take affirmative action to ensure that all employment practices are free from such discrimination. Such employment practices include but are not limited to the following: hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

3. Land Covenants

This contract is subject to the requirements of Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and 24 CFR 570.601 and 602. In regard to the sale, lease, or other transfer of land acquired, cleared or improved with assistance provided under this contract, the Subrecipient shall cause or require a covenant running with the land to be inserted in the deed or lease for such transfer, prohibiting discrimination as herein defined, in the sale, lease or rental, or in the use or occupancy of such land, or in any improvements erected or to be erected thereon, providing that the Grantee and the United States are beneficiaries of and entitled to enforce such covenants. The Subrecipient, in undertaking its obligation to carry out the program assisted hereunder, agrees to take such measures as are necessary to enforce such covenant, and will not itself so discriminate.

4. Section 504

The Subrecipient agrees to comply with any Federal regulations issued pursuant to compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 706), which prohibits discrimination against the handicapped in any Federally assisted program. The Grantee shall provide the Subrecipient with any guidelines necessary for compliance with that portion of the regulations in force during the term of this contract.

B. Equal Employment Opportunity

1. W/MBE

The Subrecipient will use its best efforts to afford minority- and women-owned business enterprises the maximum practicable opportunity to participate in the performance of the contract. As used in this contract, the term “minority and female owned business enterprise” means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, “minority

group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Subrecipient may rely on written representations by business regarding their status as minority and female business enterprises in lieu of an independent investigation.

2. Access to Records

The Subrecipient shall furnish and cause each of its own subrecipients or subcontractors to furnish all information and reports required hereunder and will permit access to its books, records and accounts by the Grantee, HUD or its agent, or other authorized Federal officials for purposes of investigation to ascertain compliance with the rules, regulations and provisions stated herein.

3. Notifications

The Subrecipient will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or worker's representative of the Subrecipient's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. EEO Statement

The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that it is an Equal Opportunity employer.

C. Employment Restrictions

1. Prohibited Activity

The Subrecipient is prohibited from using funds provided herein or personnel employed in the administration of the program for political activities; sectarian or religious activities; lobbying, political patronage, and nepotism activities.

2. Labor Standards

The subrecipient agrees to comply with the requirements of the Secretary of Labor in accordance with the Davis-Bacon Act as amended, the provisions of Contract Work Hours and Safety Standards Act, the Copeland "Anti-Kickback" Act (40 U.S.C. 276a-276a-5; 40 U.S.C. 327 and 40 U.S.C. 276c) and all other applicable Federal, state and local laws and regulations pertaining to labor standards insofar as those acts apply to the performance of this contract. The Subrecipient shall maintain documentation that shall be made available to the Grantee for review upon request.

The Subrecipient agrees that, except with respect to the rehabilitation or construction of residential property containing less that eight (8) units, all contractors engaged under contracts in excess of $2,000.00 for construction, renovation or repair work financed in whole or in part with assistance provided under this contract, shall comply with Federal requirements adopted by the Grantee pertaining to such contracts and with the applicable requirements of the regulations of the Department of Labor, under 29 CFR Parts 1,3, 5, and 7 governing the payment of wages and ratio of apprentices and trainees to journey workers; provided, that if wage rates higher than those required under the regulations are imposed by state or local law, nothing hereunder is intended to relieve the Subrecipient of its obligation, if any, to require payment of the higher wage. The Subrecipient shall cause or require to be inserted in full, in all such contracts subject to such regulations, provisions meeting requirements of this paragraph.

3. "Section 3" Clause

a. Compliance

Compliance with the provisions of Section 3, the regulations set forth in 24 CFR 135, and all applicable rules and orders issued hereunder prior to the execution of this contract, shall be a condition of the

Federal financial assistance provided under this contract and binding upon the Grantee, the Subrecipient and subcontractors. Failure to fulfill these requirements shall subject the Grantee, the Subrecipient and any of the Subrecipient's subrecipients and subcontractors, their successors and assigns, to those sanctions specified by the Agreement through which Federal assistance is provided. The Subrecipient certifies and agrees that no contractual or other disability exists which would prevent compliance with these requirements.

The Subrecipient further agrees to comply with these "Section 3" requirements and to include the following language in all subcontracts executed under this agreement:

> "The work to be performed under this contract is a project assisted under a program providing direct Federal financial assistance from HUD and is subject to the requirements of Section 3 of the Housing and Urban Development ACT of 1968, as amended, 12 U.S.C. 1701. Section 3 requires that to the greatest extent feasible opportunities for training and employment be given to low- and very-low income residents of the project area and contracts for work in connection with the project be awarded to business concerns that provide economic opportunities for low- and very low-income persons residing in the metropolitan area in which the project is located."

The Subrecipient further agrees to ensure that opportunities for training and employment arising in connection with a housing rehabilitation (including reduction and abatement of lead based paint hazards), housing construction, or other public construction projects are given to low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to low- and very low-income persons within the service area of the project or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs; and award contracts for work undertaken in connection with a housing rehabilitation (including reduction and abatement of lead-based paint hazards), housing construction, or other public construction projects are given to business concerns that provide economic opportunities for low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to business concerns which provide economic opportunities to low- and very low-income residents within the service area or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs.

The Subrecipient certifies and agrees that no contractual or other legal incapacity exists which would prevent compliance with these requirements.

b. Notifications

The Subrecipient agrees to send to each labor organization or representative of workers with which it has a collective bargaining agreement or other contract or understanding, if any, a notice advising said labor organization or workers' representative of its commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment training.

c. Subcontracts

The Subrecipient will include this Section 3 clause in every subcontract and will take appropriate action pursuant to the subcontract upon a finding that the subcontractor is in violation of regulations issued by the grantor agency. The Subrecipient will not subcontract with any entity where it has notice or knowledge that the latter has been found to be in violation of regulations under 24 CFR 135 and will not let any subcontract unless the entity has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.

D. Conduct

1. Assignability

The Subrecipient shall not assign or transfer any interest in this contract without the prior written consent of the Grantee thereto; provided, however, that claims for money due or to become due to the Subrecipient from the Grantee under this contract may be assigned to a bank, trust company, or other financial institution

without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

2. Subcontracts

a. Approvals

The Subrecipient shall not enter into any subcontracts with any agency or individual in the performance of this contract without written consent of the Grantee prior to the execution of such agreement.

b. Monitoring

The Subrecipient will monitor all subcontracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

c. Content

The Subrecipient shall cause all of the provisions of this contract in its entirety to be included in and made a part of any subcontract executed in the performance of this Agreement.

d. Selection Process

The Subrecipient shall undertake to insure that all subcontracts let in the performance of this Agreement shall be awarded on a fair and open competition basis. Executed copies of all subcontracts shall be forwarded to the Grantee along with documentation concerning the selection process.

3. Hatch Act

The Subrecipient agrees that no funds provided, nor personnel employed under the contract, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V United States Code.

4. Conflict of Interest

The Subrecipient agrees to abide by the provisions of 24 CFR 570.611 with respect to conflicts of interest, and covenants that it presently has no financial interest and shall not acquire any financial interest, direct or indirect, which would conflict in any manner or degree with the performance of services required under this Agreement. The Subrecipient further covenants that in the performance of this agreement no person having such a financial interest shall be employed or retained by the Subrecipient hereunder. These conflict of interest provisions apply to any person who is an employee, agent, consultant, officer, or elected official or appointed official of the Grantee, or of any designated public agencies or subrecipients which are receiving funds under the CDBG Entitlement program.

5. Lobbying

The Subrecipient hereby certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this

Federal Contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;

c. It will require that the language of paragraph (d) of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly; and

d. Lobbying Certification - Paragraph d

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1362, title 31, U.S.C. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

6. Copyright

If this contract results in any copyrightable material or inventions, the Grantee and/or grantor agency reserves the right to royalty-free, non-exclusive and irrevocable license to reproduce, publish or otherwise use and to authorize others to use, the work or materials for government purposes.

7. Religious Organization

The Subrecipient agrees that funds provided under this contract will not be utilized for religious activities, to promote religious interests, or for the benefit of a religious organization in accordance with the Federal regulations specified in 24 CFR 570.200(j).

XI. ENVIRONMENTAL CONDITIONS

A. Air and Water

The Subrecipient agrees to comply with the following requirements insofar as they apply to the performance of this contract:

Clean Air Act, 42 U.S.C., 7401, et. seq.
Federal Water Pollution Control Act, as amended, 33 U.S.C. 1261, et. seq., as amended 1218 relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.
Environmental Protection Agency (EPA) regulations pursuant to 40 CFR Part 50, as amended.

B. Flood Disaster Protection

In accordance with the requirements of the Flood Disaster Protection Act of 1973 (42 U.S.C. 4001), the Subrecipient shall assure that for activities located in an area identified by FEMA as having special flood hazards, flood insurance under the National Flood Insurance Program is obtained and maintained as a condition of financial assistance for acquisition or construction purposes (including rehabilitation).

C. Lead-Based Paint

The Sub-recipient agrees that any construction or rehabilitation of residential structures with assistance provided under this contract shall be subject to HUD Lead-Based Paint Regulations at 24 CFR 570.608, and 24 CFR Part 35 including the new Lead Safe House Rule effective Sept. 15, 2000. Such regulations pertain to all HUD assisted housing and require that all owners, prospective owners, and tenants of properties constructed prior to 1978 be properly notified that such properties may include lead-based paint. Such notification shall point out the hazards of lead-based paint and explain the symptoms, treatment and precautions that should be taken when dealing with lead-based pain poisoning and the advisability and availability of blood lead screening for children under seven. The notice should also point out that if lead-based paint is found on the property, abatement measures may be undertaken.

D. Historic Preservation

The Subrecipient agrees to comply with the Historic Preservation requirements set forth in the National Historic Preservation Act of 1965, as amended (16 U.S.C. 470) and the procedures set forth in 36 CFR Part 800, Advisory Council on Historic Preservation Procedure for Protection of Historic Properties, insofar as they apply to the performance of this contract.

In general, this requires concurrence from the State Historic Preservation Officer for all rehabilitation and demolition of historic properties that are fifty years old or older or that are included on a Federal, state, or local historic property list.

E. Environmental Review Process

The Subrecipient agrees that an Environmental Review must be performed by the Grantee before any use of CDBG funds, or funds from other sources, is allowed. The Grantee must document the level of environmental review required under 24 CFR Part 58. (Exempt, Categorically Excluded, Environmental Assessment or Environmental Impact Statement). When required, the Grantee must also document environmental conditions complying with 24 CFR Parts 51, 55 and 58. As part of the ERR process, progress on a project could be halted to allow for the completion of the Environmental Review and alternatives may have to be considered including alternate site selection, modifications to the project and cancellation of the project. Depending on the level of review, the Grantee may be required to complete a statutory checklist to document compliance with various laws and authorities listed at 24 CFR 58.5. Furthermore, the Grantee may have to publish Notices of Intent to Request Release of Funds and/or Findings of No Significant Impact. Before project funds are committed, the Grantee may also have to wait for a written Release of Funds response from HUD.

XII. SEVERABILITY

If any provision of this Agreement is held invalid, the remainder of the Agreement shall not be affected thereby and all other parts of this Agreement shall nevertheless be in full force and effect.

IN WITNESS WHEREOF, the Parties do hereby affix their signatures and enter into this funding Agreement as of the 1st day of October, 2016.

City of Lewisville	**PediPlace**
By:_____	By:_____
Donna Barron, City Manager	Carol Kyer, Executive Director

Attest:_____
Julie Heinze, City Secretary

APPROVED AS TO FORM:

_____
Lizbeth Plaster, City Attorney

Attachment A- Program Summary

This project will expand access to affordable housing options for Lewisville residents. Habitat for Humanity of Denton County will purchase vacant land or property with substandard homes in Old Town Lewisville. The property search will emphasize areas in the CDBG designated Targeted Neighborhood Revitalization areas. The purchased plot will be brought to the Planning and Zoning Commission followed by the Council for rezoning as necessary. The location and design are also subject to City approval. The project goal is to house at least one low-to-moderate income family that would otherwise be unable to afford a high quality, low cost, energy efficient home.

Scope of Services

The project will provide the land for Habitat for Humanity of Denton County to build at least one home for a low-to-moderate income family.

Attachment B- Program Time Line and Benchmarks

Date	Description
October 1, 2016 - December 31, 2016	**Environmental Review**: Neighborhood Services staff performs an Environmental Assessment, publishes findings, and requests release of funds from HUD after a public comment period. Note the review may depend on having specific properties identified.
October 1, 2016 - January 31, 2017	**Property Search and Identification:** Subrecipient will identify potential locations and seek City clearance prior to making offers.
January 31, 2017	**Funding Benchmark:** Subrecipient has raised or identified project match funding for land purchase as well as funds or financing for construction as needed.
January 1, 2017 - April 30, 2017	**Land Purchase**: Subrecipient makes an offer and closes on property with assistance from Neighborhood Services staff to meet HUD requirements.
July 31, 2017	**Grant Closeout**
June 1, 2017 - March 31, 2018	**Construction**: to be accomplished by subrecipient using other resources and following close out of the land acquisition grant with occupancy and final grant reporting by March 2018

Attachment C- Budget

Sources

CDBG Funds	$25,000
Match: Habitat for Humanity of Denton County Funds	$7,500
Total for Land Acquisition	**$32,500**

Uses of CDBG Funds
Funds will be used to fund the cost of acquiring the land to build the home on.

Resolution No. _____

LETTER OF AGREEMENT

This letter and the attached documents constitute an agreement between the City of Lewisville, Neighborhood Services Department and the Public Services Department, for the performance of the following project and associated costs:

PROJECT NAME	FUND/ACCOUNT/CENTER	AMOUNT
Sewer Manhole Rehabilitation	**Grant Fund – CDBG 280.40.383.600.4540**	**Sewer Manhole Rehabilitation - $278,000**

The Neighborhood Services Department will provide the Public Services Department with Community Development Block Grant (CDBG) funds not to exceed $ 278,000 (including $84,000 of prior year funding) for the operation of the above listed program for the purposes specified by Program Summary (Exhibits A), Program Time Line (Exhibit B) and the Operating Budget (Exhibit C).

The Period of performance for the work will begin October 1, 2016 and end September 30, 2017.

These funds will be provided through the City's accounting system and the requisition documents will be reviewed by the Grant Coordinator. Copies of any Time and Attendance reports reflecting actual hours worked and any other expenditure associated with the project must be submitted to the Grant Coordinator by the 15th of the month for the preceding month, along with monthly or quarterly activity reports indicating the achievements toward the goals and objectives specified in the Program Summaries. Mileage and telephone logs are to be maintained, if payment is charged or reimbursement is requested from CDBG accounts. In addition, the Public Services Department agrees to maintain adequate backup to document the achievement of the program goals in a detail suitable for HUD audit for five (5) years after the completion of Programs, or if audit findings exist, five (5) years after clearance of the findings.

Any expenses incurred by activities of the Public Services Department Staff using CDBG monies found by the Grant Coordinator to be outside the scope of this agreement shall be deemed to be reimbursable expense to the appropriate CDBG account.

_____	_____
Grover Joiner	Keith Marvin
Director of Neighborhood Services	Director of Public Services
_____	_____
Date:	Date:

EXHIBIT A
PROGRAM SUMMARY

The purpose of manhole rehabilitation is to, help prevent I/I "inflow and infiltration", help prevent odor, stabilize the manhole integrity, and replace manhole cover/frame/seal sections. I/I has a negative impact on the wastewater collections and wastewater treatment process. The negative impacts include capacity for both the collection system and the treatment plant, as well as the treatment cost as it reaches the treatment plant. The deteriorated and failing manhole structures contribute to I/I as well as odor complaints. They also pose a safety concern due to manholes located within roadways. I/I and odor issues can be resolved by coating the manhole with a cementitious coating, which would seal the inside lining of the manhole. The safety concerns within the roadways are able to be dismissed by replacing the manhole cover/frame/seal sections of the manhole.

Project locations were determined using a study by RJN Group commissioned by the City. The study identified failing sewer lines and manholes. First the RJN list was compared to areas that HUD has determined to be low-to-moderate income by census tract and block group. That list was further refined by removing manholes that were located on sewer lines that served commerical or other non-residential uses. The result is a list of 130 manholes in need of rehabilitation that serve residential neighborhoods and apartment complexes in low-to-moderate income areas, predominantly or wholly within census tract/block groups determined by the American Community Survey to have a majority of residents that are low-to-moderate-income residents.

Program Goal: To complete rehabilitation of 130 sewer manholes in low-to-moderate income neighborhoods throughout Lewisville.

EXHIBIT B
PROGRAM TIMELINE

Date	Description
October 1, 2016 - November 30, 2016	**Environmental Review**: Neighborhood Services staff performs an Environmental Assessment, publishes findings, requests release of funds from HUD and waits for receipt of release of funds approval after a public comment period.
October 1, 2016 - January 31, 2017	**Sewer Manhole Design:** Public Services will engage civil engineering firm to write work specification and standard details matched to project locations and to prepare bid documents.
January 1, 2017 - February 28, 2017	**Sewer Manhole Bid & Award**: Public Services and NSD staff develop a bid packet, expand bid lists to include minority and Section 3 businesses as possible, pull Davis Bacon wage determination, release bid, conduct pre-bid conference, review bids and recommend award of contract to City Council.
March 1, 2017 - July 31, 2017	**Construction**: pre-construction conferences, contractor/subcontractor certifications, clear debarred list, construction, Davis Bacon wage interviews, and inspections.

EXHIBIT C
PROJECT BUDGET

Sewer Manhole Rehabilitation - CDBG Facility Project

PY 2016 CDBG Funds committed	$194,000.00
Prior year CDBG Funds committed	$84,000
City General Funds or other funding	$0

IN-KIND SERVICES

The Public Services Department will manage the design and specifications process, inspection and construction oversight, and financial management for this project at no charge to the CDBG Program.

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Claire Swann, Assistant City Manager

DATE: September 26, 2016

SUBJECT: **Acceptance of a 4.308 Acre Tract of Land in the Russell Craft Survey, Abstract No. 255; Located on the North-Bound Access Road of I-35 Between Millican Drive and Valley Ridge Boulevard; Being Donated to the City of Lewisville, Texas by Deed from TAT Lewisville I-35, LLC.**

BACKGROUND

The Texas Department of Transportation bought a portion of a tract of land owned by TAT Lewisville I-35 LLC (the "Owner") that fronts onto the north bound I-35 access road between Millican Drive and Valley Ridge Boulevard. The Owner wants to donate the remainder of the tract of land to the City of Lewisville.

ANALYSIS

Prior to TxDOT's 2014 purchase of a portion of the Owner's property for the I-35 expansion, the owner operated a trucking company from the site, specifically storing eighteen wheelers. Since the purchase, all of the trucks have been removed and the site remains vacant. TxDOT's purchase effectively closed the site's direct access to I-35. Access still remains where Harn Drive, a residential street, dead-ends into the south-east corner of the property. The Owner desires to dedicate the remainder of the parcel to the City of Lewisville. He has also expressed an interest in removing his one on-premise pole sign located on the property. Staff has advised that any removal of the sign must occur prior to closing.

The property is zoned Light Industrial District zoning (LI) and approximately 90 percent of the property is located in the 100-year floodplain. Prairie Creek runs along the northern boundary. The Owner has provided the city with a Level I Environmental Study, and it shows no reported environmental hazards. The city will also be acquiring title insurance prior to ownership and preliminary title research shows that there are no liens on the property.

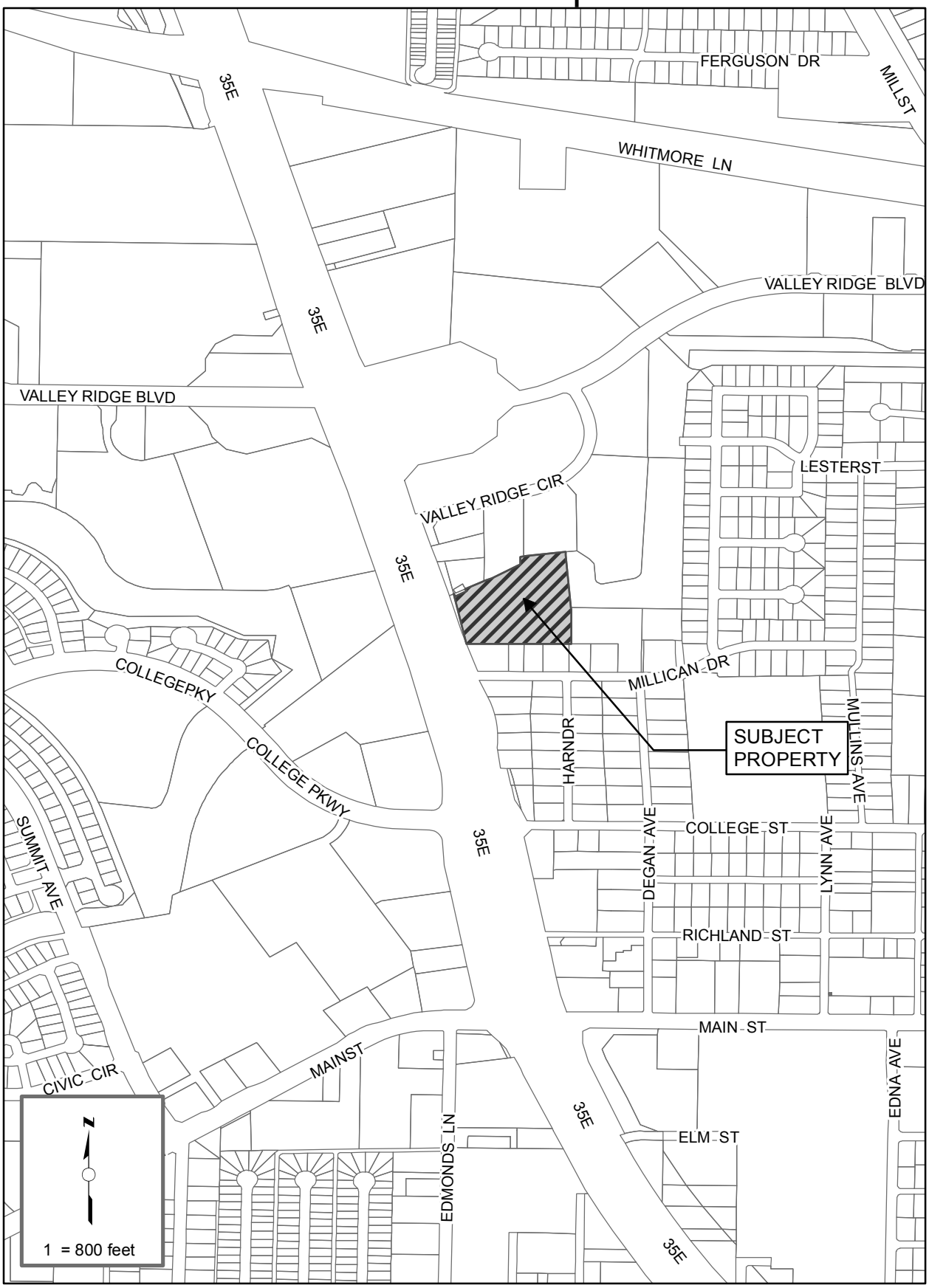
Both the Lewisville Trail Master Plan as well as the I-35 Corridor Plan already identify the northern portion of this property for future trail use. The conceptual location of a future trail did not anticipate that this entire property would be offered to the city. That being said, staff recommends accepting this entire remainder parcel to give additional flexibility for increased trail

design but also to allow the city to control the property for maintenance and flood plain management purposes.

RECOMMENDATION

That the City Council accept the 4.308 acre tract of land to be donated to the City of Lewisville, Texas by TAT Lewisville I-35, LLC.

Location Map



COMPANY RESOLUTION
TAT LEWISVILLE, I-35, LLC
A Texas Limited Liability Company

A special meeting of the Managing Members of TAT Lewisville, I-35, LLC, a Texas Limited Liability Company ("Company") was held on OCTOBER, 5th, 2016. TOM TORCELLINI, called this meeting. TOM TORCELLINI served as chairman of the meeting. TOM TORCELLINI, acted as Secretary of the meeting and recorded the minutes. The following Members were present:

TOM TORCELLINI

BE IT HEREBY RESOLVED, that Company authorizes TOM TORCELLINI as Managing Member, to sell the real property with a legal description being described as follows:

Exhibit "A" Attached

TOM TORCELLINI as Managing Member, shall execute and deliver any legal instruments relating to the conveyance of the Property, including but not limited to general and special warranty deeds, notes, deeds of trust, and other legal instruments. TOM TORCELLINI as Managing Member, shall make all decisions and take all actions for the Company, without limitation, necessary and appropriate, conveying the real property with a legal description being described as follows:

Exhibit "A" Attached

The conveyance of Property to City of Lewisville, Texas a home-rule municipality shall be in the form of a gift equal to $620,000.00.

IN TESTIMONY WHEREOF, We have hereunto set our hand and attest that the signatures set opposite the names listed above are their genuine signatures.

We each have read all the provisions of this Resolution, and we each personally and on behalf of the Company certify that all statements and representations made in this Resolution are true and correct.

Dated this 5TH day of OCTOBER, 2016.

MANAGING MEMBER:

Tom Torcellini

TOM TORCELLINI

Approved by the following Members, which represents 100% of the Members:

Tom Torcellini

TOM TORCELLINI

EXHIBIT A

BEING all that certain lot, tract or parcel of land situated in the Russell Craft Survey, Abstract No. 255, City of Lewisville, Denton County, Texas, and being part of the certain tract of land described in deed to TAT Lewisville I-35, LLC, recorded in Instrument No. 2008-16151, Official Records, Denton County, Texas, and being more particularly described as follows:

BEGINNING at a 1/2" rebar found with cap stamped "G&A Consultants" being the northwest corner of that certain tract of land described in deed to the City of Lewisville, recorded in Volume 4505, Page 230, Real Property Records, Denton County, Texas, and being in the east line of I 35 E;

THENCE N 25°03'00" W, a distance of 18.88', to a 1/2" rebar found with cap stamped "G&A Consultants";

THENCE N 15°06'15" W, a distance of 116.33', to a TxDOT monument found;

THENCE N 13°49'10" W, a distance of 34.71', to a 1/2" rebar set with cap stamped "G&A Consultants", from which a TxDOT monument bears N 13°49'10" W, a distance of 112.17';

THENCE N 63°33'15" E, a distance of 174.04' to a 1/2" rebar set with cap stamped "G&A Consultants";

THENCE N 54°36'15" E, a distance of 74.21' to a 1/2" rebar set with cap stamped "G&A Consultants";

THENCE N 35°23'45"W, a distance of 99.67' to a 1/2" rebar found in the south line of Lot 1, Block A, Ratliff Masonry Addition, an addition to the City of Lewisville, according to the plat thereof recorded in Cabinet Q, Page 110, Plat Records, Denton County, Texas;

THENCE N 54°36'15" E, with the south lien of said Lot 1, Ratliff Addition, a distance of 154.19' to a 5/8" rebar found at the southeast corner thereof;

THENCE N 00°18'45" E, with the east line of said Lot 1, Ratliff Addition, a distance of 29.41' to a 1/2" rebar set with cap stamped "G&A Consultants" at the southwest corner of Lot 2 of said Ratliff Addition;

THENCE N 83°44'35" E, with the south line of said Lot 2, Ratliff Addition, a distance of 217.23' to a 1/2" rebar found being the most westerly northwest corner of Lot 5R-BR, Block A Valley Ridge Business Park East, an addition to the City of Lewisville, according to the plat thereof recorded in Cabinet U, Page 854, Plat Records, Denton County, Texas;

THENCE S 02°01'35" E, with the west line of said Lot 5R-C, a distance of 333.85' to a 1/2" rebar found;

THENCE S 00°51'45" E, with the west line of said Lot 5R-C, a distance of 172.83' to a 1/2" rebar set with cap stamped "G&A Consultants", being the northeast corner of said City of Lewisville tract;

THENCE S 89°58'15" W, with the north line of said City of Lewisville tract, a distance of 468.12 feet to the **POINT OF BEGINNING** and containing approximately 4.308 acres of land.

MEMORANDUM

TO: Donna Barron, City Manager

FROM: David Salmon, P.E., City Engineer

VIA: Eric Ferris, Assistant City Manager

DATE: September 30, 2016

SUBJECT: **Consideration of Two Variances to the Lewisville City Code Section 6-103 (Access Management) Regarding Deceleration Lane and Driveway Spacing Requirements Related to the La Quinta Located at 1657 South Stemmons Freeway, as Requested by Kevin Patel, Triangle Engineering, LLC, on Behalf of the Owner.**

BACKGROUND

The subject site is a 2.947-acre lot zoned Light Industrial (LI) within the La Quinta Addition. The property owner is proposing to build a new four-story hotel with 129 rooms at this location in full compliance with the City's hotel requirements. Texas Department of Transportation (TxDOT) has acquired right-of-way along the IH-35E frontage of this property for its future needs which caused the previous development, hotel and restaurant, to be demolished. TxDOT is also imposing control of access limits of 219.6 feet from the south property line of the lot. Staff has reviewed and approved the engineering site plan for La Quinta subject to the City Council approval of the two variances: a) to waive the deceleration lane requirement along IH-35E and b) to allow driveway spacing less than 230' along IH-35E.

ANALYSIS

a. To waive deceleration lane requirements along IH-35E.

Section 6-103(e) – Access Management, Auxiliary Lanes

The General Development Ordinance requires a deceleration lane at each driveway along the Frontage Roads of IH-35E. Since the driveway location is at the north end of the lot predicated by providing maximum spacing from the Corporate Drive jug handle access, the proposed deceleration lane would be along the neighboring property to the north for which there is no additional right-of-way for the deceleration lane to be built within. In addition, the owner has prepared a traffic impact analysis concluding a deceleration lane is not required since the peak right turn volume to this development is less than 50 vehicles per hour. The owner has requested a variance to waive the deceleration lane requirement. TxDOT is still reviewing a request for driveway access for this development. Staff has no objection to the request because the lack of right-of-way along the neighboring property and the anticipated traffic volume of less than 50 vehicles per hour which is the TXDOT warrant for a deceleration lane.

b. To allow driveway spacing less than 230 foot along IH-35E.

Section 6-103(c)(2), Access Spacing

This section of the ordinance requires a minimum spacing of 230 feet between driveways along specified Major Traffic Carriers on the City of Lewisville Thoroughfare Plan including the Stemmons Freeway Service Roads. The owner has requested a variance to allow the proposed driveway spacing of 100.91 feet. Staff has no objection to the request since this is only location on the lot that is outside of the denial of access limits imposed by TxDOT.

RECOMMENDATION

It is City staff's recommendation that the City Council approve the variances as set forth in the caption above.

T: 214.609.9271 | F: 469.359.6709 | W: triangle-engr.com | O: 1333 McDermott Drive, Suite 200, Allen, TX 75013

ATTN: Jeff Kelley, P.E.
City of Lewisville
151 W. Church Street
Lewisville, TX 75057

Date: Sep 30th,2016

RE: Variance Request Letter for La Quinta **Inn & Suites @** 1657 Stemmons Freeway, City of Lewisville, Texas

Dear Sir/Madam,

The intent of this letter is to request following variances for the proposed La Quinta Inn & Suites Development Project at 1657 Stemmons Freeway.

a) **To waive Deceleration Lane requirements along IH 35E.**
b) **To allow driveway spacing less than 230' along IH 35E.**

The engineering analysis (Traffic Analysis) was conducted to evaluate the need for a right turn deceleration lane along the I-35E (South Stemmons Freeway) southbound frontage road for the proposed La Quinta Inn in Lewisville, TX. The proposed development will replace a prior La Quinta Inn at 1657 S Stemmons Freeway in the northwest corner of the I-35E at Corporate Drive interchange that has been demolished. The site is assumed be developed in a single phase. The build out is assumed to occur in 2017. The proposed development will be accessible via two access points, one on the southbound frontage road and one on Southwest Parkway. The proposed development is predicted to generate 1,054 trips on a daily basis, 68 during the AM peak hour and 77 trips during the PM peak hour for Driveway off of IH 35E Southbound Frontage Rd and Southwest Parkway. Per TIA Table No. 2, I-35E Southbound Frontage Rd at La Quinta Inn Driveway will generate only 16 trips during the AM and PM peak hour. Based on guidelines presented in TxDOT's Access Management Manual, right turn deceleration lanes are typically considered when Right turn volumes greater than 50 vph (if posted speed limit greater than 45 mph). Per TIA, a southbound right turn deceleration lane is not recommended along at the proposed driveways. Refer Enclosed Traffic Impact Analysis. Therefore, we are requesting that a Deceleration lane requirement variance be granted.

The proposed Driveway on the southbound I-35E frontage road is located at 100.91' from the existing driveway located on northern property. The location of the proposed Driveway does not meet City's minimum access spacing criteria. However, given that: (1) inadequate site frontage exists to provide 230' spacing; (2) the site developer is reducing the degree of the existing deficiency by closing one of the two existing driveways on the southbound frontage road; and (3) the existing deficiency was associated with a hotel land use that generates light volumes of traffic and is being replaced in kind, we are requesting that a driveway spacing variance be granted.

We appreciate your assistance with this application and look forward to working with you and the City of Lewisville on La Quinta Inn & Suite development.

Thanks

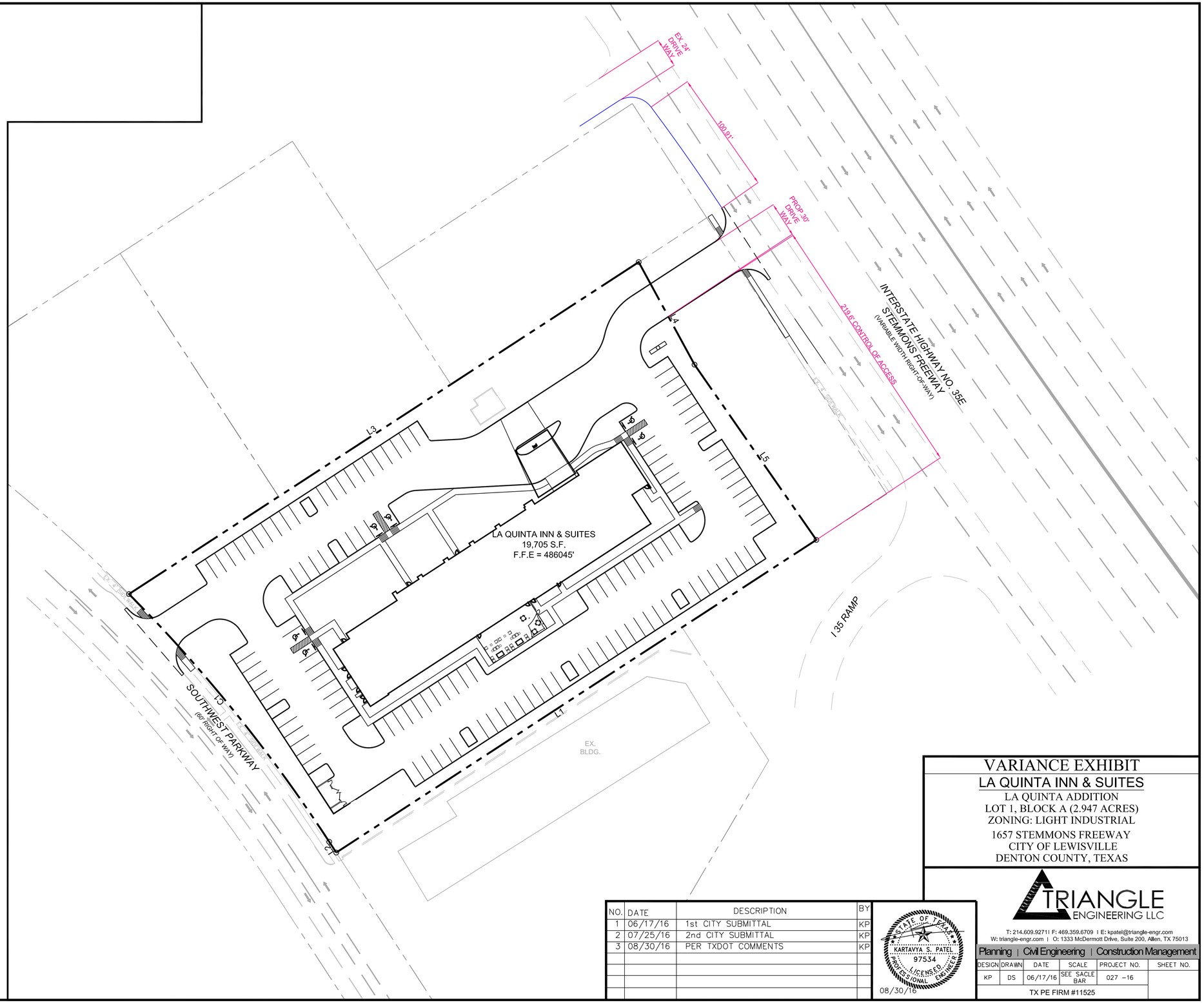
Sincerely
(Kartavya (Kevin) Patel, P.E.)

0 40 80

SCALE: 1" = 40'

VARIANCES APPROVED BY CITY COUNCIL ON OCTOBER 17,2016

a) TO WAIVE THE DECELERATION LANE REQUIREMENT ALONG IH-35E
b) TO ALLOW DRIVEWAY SPACING LESS THAN 230' ALONG IH-35E



VARIANCE EXHIBIT

LA QUINTA INN & SUITES

LA QUINTA ADDITION
LOT 1, BLOCK A (2.947 ACRES)
ZONING: LIGHT INDUSTRIAL

1657 STEMMONS FREEWAY
CITY OF LEWISVILLE
DENTON COUNTY, TEXAS

NO.	DATE	DESCRIPTION	BY
1	06/17/16	1st CITY SUBMITTAL	KP
2	07/25/16	2nd CITY SUBMITTAL	KP
3	08/30/16	PER TXDOT COMMENTS	KP

STATE OF TEXAS
KARTAVYA S. PATEL
97534
LICENSED
PROFESSIONAL ENGINEER
08/30/16

TRIANGLE ENGINEERING LLC

T: 214.609.9271 | F: 469.359.6709 | E: kpatel@triangle-engr.com
W: triangle-engr.com | O: 1333 McDermott Drive, Suite 200, Allen, TX 75013

Planning | Civil Engineering | Construction Management

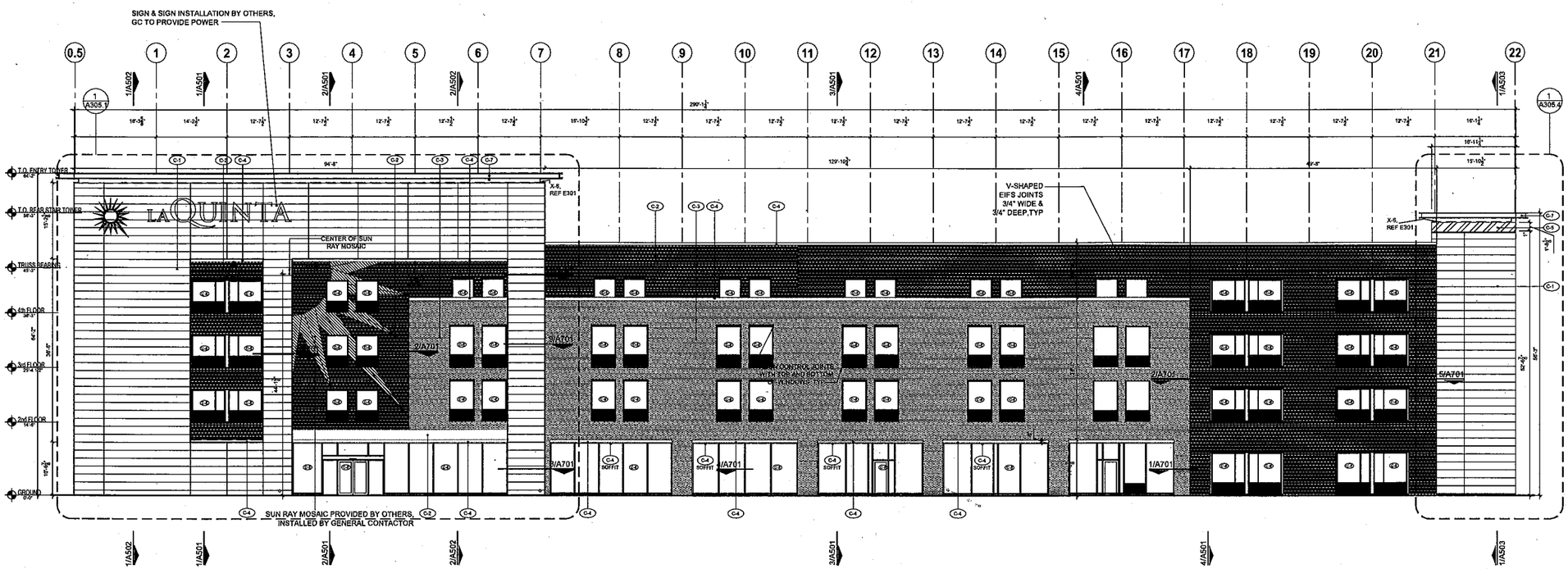
DESIGN	DRAWN	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	DS	06/17/16	SEE SACLE BAR	027 -16	

TX PE FIRM #11525

COLOR SCHEDULE

C-1	CERAMIC PANELS MANUF: NEOLITH COLOR: IRON CORTEN CONTACT: PETER HOLLAND HOLLAND MARBLE 972.247.1621
C-2	BRICK BY OWNER & LQ APPROVAL SIMILAR IN COLOR TO SW-7645 - THUNDER GRAY
C-3	BRICK BY OWNER & LQ APPROVAL SIMILAR IN COLOR TO SW-7031 - MEGA GREIGE
C-4	EIFS (FINE SAND TEXTURE) SW-7010 - DUCK WHITE
C-5	EIFS (FINE SAND TEXTURE) SW-6374 - TORCHLIGHT
C-6	DOOR & FRAME PAINT (AS NOTED) SW-7645 - THUNDER GRAY
C-7	ALUMINUM (TOWER PARAPET EXTENSIONS) PAC-CLAD - SILVER
C-8	ALUMINUM (WINDOWS, STOREFRONT, & PTAC GRILLS) CLEAR ANODIZED
C-9	ALUMINUM FLUSH PANELS (PORTE-COCHERE) PAC-CLAD - STONE WHITE FINISH

TOWER, COPING, PORTE-COCHERE METAL FABRICATOR
MFG: METAL-ERA
CONTACT: DANA SPURGEON
(P) 262.650.6449



1 FRONT ELEVATION
SCALE: 1/8" = 1'-0"

EXTERIOR ELEVATIONS

CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AT THE JOB SITE AND NOTIFY THE ARCHITECT OF ANY DIMENSIONAL ERRORS, OMISSIONS BEFORE FABRICATING ANY WORK. DO NOT SCALE DRAWINGS.

LAQUINTA INNS & SUITES
1657 Stemmons Freeway
Lewisville, Texas
6941

VINTAGE HOTELS, LLC.
3004 Dandcourt Dr.
Irving,Texas 75063
Owner contact:
765-606-6797 - dkpatel10972@yahoo.com

REGISTERED ARCHITECT
J. MONSANTO
7967
STATE OF TEXAS
07/18/16

hugo monsanto architect
200 south rogers street #102 • waxahachie texas 75165 • monsantoarchitects@att.net • 972.938.2500

JOB NUMBER
LAQ-6595-11

SHEET NUMBER
A301

DATE OF ORIGINAL ISSUE
10/09/11

VARIANCE LOCATION MAP
FOR
LA QUINTA INN

MEMORANDUM

TO: Donna Barron, City Manager

FROM: Lisa Weaver, Sustainability Manager

VIA: Eric Ferris, Assistant City Manager

DATE: October 3, 2016

SUBJECT: **Consideration of An Ordinance of the Lewisville City Council Amending Chapter 16, Utilities, Article IX, Municipal Setting Designations, of the Lewisville City Code by Repealing and Replacing Article IX in its Entirety; Providing for Severability; Providing a Penalty, Providing an Effective Date; and Declaring an Emergency.**

BACKGROUND

In February 2015, City Council approved Ordinance No. 4158-02-2015 establishing a process for consideration of Municipal Setting Designations (MSD) applications for properties with contaminated groundwater. A MSD is an official designation given to a property and certified by the Texas Commission on Environmental Quality (TCEQ) that prohibits the use of groundwater within the boundaries of the designated property as potable water. In order for a MSD to be certified by TCEQ, the property owner must get support from the municipality where the property is located and provide evidence of that support during the application process with TCEQ. The City's MSD ordinance set forth the steps for the property owner to seek support from the City.

Subsequent to Council approval of this ordinance, the City received and processed two MSD applications, which were approved by Council in late 2015. Staff members involved in MSD application review determined that the process for reviewing, meeting with applicants, conducting public meetings and public hearings, and seeking Council approval for site specific MSDs needed revision to allow staff more time to conduct its review and data gathering. As a result, the ordinance has been revised to extend the timeframes associated with application review and public input. Additionally, the ordinance was revised to include additional pertinent definitions and required information to enhance staff's ability to make recommendations concerning MSD applications in the future.

ANALYSIS

As approved in February 2015, the MSD ordinance required the property owner to complete the City's application form and provide information about the property and the contaminants present on the property. After receiving the first application, it became readily evident that the timeframe provided for staff to review and process applications was insufficient. The ordinance stated that

within 45 days of receiving an application, the City would conduct a public meeting to get input from affected parties. Sixty days after receiving the application, the City was required to conduct a public hearing. Given that a fifteen day notice of public meetings and public hearings was also required of staff, review time and applicant response time for questions and additional information were severely limited. Staff quickly recognized that rather than using the date the application was received, it was more appropriate to start the clock on the deadlines for public meeting and public hearings on the date the application is deemed complete. This allows time for staff to request additional information and the applicant to respond. The proposed ordinance therefore allows thirty days after receipt of the application for staff to review and communicate with the applicant. The applicant will have sixty days to respond to staff's comments. Once the application is deemed complete, staff will then have sixty days to conduct the public meetings and another thirty days to conduct the public hearing.

During the review of the two MSD applications received in late 2015, staff also determined that the ordinance needed to be more specific about required information provided on the property and the contaminants of concern. This meant the ordinance would need revisions to add definitions related to contamination limits and to require more specific information about the property's history and extent of contamination. Those changes have been made in the proposed ordinance.

RECOMMENDATION

It is City staff's recommendation that the City Council consider and approve the proposed ordinance as set forth in the caption above.

ORDINANCE NO. _____

AN ORDINANCE OF THE LEWISVILLE CITY COUNCIL AMENDING CHAPTER 16, UTILITIES, ARTICLE IX, MUNICIPAL SETTING DESIGNATIONS, OF THE LEWISVILLE CITY CODE BY REPEALING AND REPLACING ARTICLE IX IN ITS ENTIRETY; PROVIDING FOR SEVERABILITY; PROVIDING A PENALTY; PROVIDING AN EFFECTIVE DATE; AND DECLARING AN EMERGENCY.

WHEREAS, the City of Lewisville, Texas is a home-rule municipality; and

WHEREAS, Chapter 361, Subchapter W, of the Texas Solid Waste Disposal Act authorizes the Texas Commission on Environmental Quality (TCEQ) to certify Municipal Setting Designations (MSD) for properties upon receipt and approval of a proper application to the TCEQ; and

WHEREAS, due to limited quantity and/or low quality, areas of shallow Groundwater within the City and its extraterritorial jurisdiction are not usable as Potable Water sources; and

WHEREAS, some commercial and industrial properties in Lewisville and its extraterritorial jurisdiction are underlain with unusable Groundwater that has become contaminated by historical on-site or off-site sources; and

WHEREAS, the City does not utilize Groundwater as a source for public drinking water; and

WHEREAS, the use of MSDs within Lewisville and its extraterritorial jurisdiction allows for a state-evaluated corrective action process for Groundwater that is directed toward protection of human health and the environment balanced with the economic welfare of the citizens of the City; and

WHEREAS, where public drinking water is available, the potable use of Groundwater in designated areas should be prohibited to protect public health and welfare when the quality of the Groundwater presents an actual or potential threat to human health.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, THAT:

SECTION I. Lewisville City Code, Chapter 16, Utilities, Article IX, Municipal Setting Designations, is hereby repealed in its entirety and in its place the following new Article IX, Municipal Setting Designations, is inserted:

ARTICLE IX. MUNICIPAL SETTING DESIGNATIONS

Sec. 16.395 – Definitions. The following terms, phrases, words, abbreviations, and their derivations shall have the meaning given herein. Words not defined shall be given their common and ordinary meaning.

Administrator shall mean the Office of Sustainability Manager or other employee designated by the City Manager to enforce and administer this article.

Affected Community or Affected Parties shall mean those persons entitled to notice in Section 16. 397(c)(15), below.

Authorized Representative shall mean, for purposes of signing an application, if the applicant is a corporation, the president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; if the applicant is a partnership or sole proprietorship, a general partner or proprietor, respectively; and if the applicant is a local government, the chief executive officer or his authorized designee.

Contaminant of Concern shall mean any contaminant that has the potential to adversely affect ecological or human receptors due to its concentration, distribution, and mode of toxicity.

Designated Groundwater shall mean Groundwater that will be or is prohibited from use as Potable Water by a MSD.

Designated Property shall mean the property for which a MSD is being sought.

Environmental Protection Agency (EPA) shall mean the agency of the United States federal government created by executive order and any successor agency or department.

Environmental Risk Assessment shall mean the qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of pollutants.

Groundwater shall mean water below the surface of the earth.

Ingestion Protective Concentration Level shall mean the Protective Concentration Level for human ingestion for Contaminants of Concern in Groundwater established by the TCEQ under the Texas Risk Reduction Program, determined as if there were no MSD ordinance.

Ingestion Protective Concentration Level Exceedance Zone shall mean the area where concentrations of Contaminants of Concern from sources on or migrating from or through the Designated Property are greater than the Ingestion Protective Concentration Level in Groundwater, determined as if there were no MSD ordinance.

Municipal Setting Designation (MSD) shall mean a designation as provided by Chapter 361, Subchapter W, of the Texas Health and Safety Code, as may be amended, which authorizes the Executive Director of the TCEQ to certify MSDs in order to limit the scope of or eliminate the need for investigation of or Response Actions addressing contaminant impacts to Groundwater that has been restricted from use as Potable Water by ordinance or restrictive covenant.

Non-Ingestion Protective Concentration Level shall mean the Protective Concentration Level for dermal contact or inhalation for Contaminants of Concern in Groundwater established by the TCEQ under the Texas Risk Reduction Program.

Non-Ingestion Protective Concentration Level Exceedance Zone shall mean the area where concentrations of Contaminants of Concern from sources on or migrating from or through the Designated Property are greater that the Non-Ingestion Protective Concentration Level in Groundwater.

Potable Water shall mean water that is used for irrigating crops intended for human consumption, as well as water that is used for drinking, showering, bathing, or cooking purposes.

Protective Concentration Level shall mean the concentration of a Contaminant of Concern that the TCEQ has determined can remain within the source medium and not result in a level that exceeds the applicable human health risk-based exposure limit or ecological concentration limits at the point of exposure for all applicable exposure pathways.

Response Action shall mean the control, decontamination or removal from the environment of a hazardous substance or contaminant pursuant to Chapter 361, Subchapter W, of the Texas Health and Safety Code, as may be amended.

Texas Commission on Environmental Quality (TCEQ) shall mean the environmental agency for the state of Texas and any successor agency.

Texas Risk Reduction Program (TRRP) shall mean the rule established in Chapter 350 of the Texas Administrative Code concerning requirements for corrective actions at sites where a release of a Contaminant of Concern has impacted the environment or may pose a threat to human health.

Texas Voluntary Cleanup Program (VCP) shall mean the program established by Chapter 361 of the Texas Health and Safety Code that provides incentives to encourage cleanup of sites burdened by real or reasonably perceived environmental issues that may hamper real estate transactions or redevelopment.

Sec. 16.396 - Use of Groundwater in MSD as a Potable Water Source Prohibited.

(a) A person commits an offense if the person intentionally, knowingly, or with criminal negligence uses Groundwater in a MSD area as a Potable Water source.

(b) A person commits an offense if the person intentionally, knowingly, or with criminal negligence uses Groundwater in a MSD area for any purpose prohibited in the ordinance creating that MSD.

Sec. 16.397 - Application for City Council Approval of MSD.

(a) Before a MSD application will be considered by the City, the Designated Property must meet the eligibility requirements established by TCEQ:

(1) The Designated Property must be within the corporate limits or extraterritorial jurisdiction of the City; and

(2) The Designated Property and all properties within one-half mile of the Designated Property are supplied or are capable of being supplied drinking water from the existing state-approved public water supply system.

(b) A person, including the City, seeking City Council approval of a MSD for property within the corporate limits of the City, or within its extraterritorial jurisdiction, shall file an application with the Administrator. The application shall be in a format determined by the Administrator, with appropriate numbers of copies as determined by the Administrator. An application may be filed in person, by United States mail, or by a document delivery service. If an electronic system for filing MSD applications is available, applicant shall utilize such electronic filing system unless another method of submission is approved by the Administrator.

(c) An application shall contain:

(1) Applicant's name and address, and the name, address, daytime telephone number, and email address of a contact person;

(2) The location and legal description of the proposed outer boundaries of the MSD area for which the designation is sought and a copy of the deed for the Designated Property;

(3) A statement as to whether applicant has filed an application with the TCEQ for an MSD for the property, and a copy of said application, if filed;

(4) A statement as to whether a public drinking water supply system exists that satisfies the requirements of Texas Health and Safety Code Chapter 341 and that supplies or is capable of supplying drinking water to the Designated Property and property within one-half (½) mile of the Designated Property;

(5) Identification of the points of origin of the contamination and identification of the person(s) responsible for the contamination of the Groundwater, to the extent known;

(6) A description of the Groundwater sought to be restricted, including the identified Contaminants of Concern therein and the levels of contamination known to applicant, and the identified vertical and horizontal extent of the contamination. If the applicant has not documented groundwater contamination offsite that originates from the area for which a MSD is sought, the application shall include a statement as to whether contamination more likely than not exceeds residential assessment levels offsite and the basis for that statement;

A. For each Contaminant of Concern within the Ingestion Protective Concentration Level Exceedance Zone, the application shall include (to the extent known):

1. A description of the Ingestion Protective Concentration Level Exceedance Zone and the Non-Ingestion Protective Concentration Level Exceedance Zone, including a specification of the horizontal area and the minimum and maximum depth below ground surface;

2. The level of contamination, the Ingestion Protective Concentration Level, and the Non-Ingestion Protective Concentration Level, all expressed as mg/L units;

3. Its basic geochemical properties (e.g., whether the Contaminant of Concern migrates with Groundwater, floats or is soluble in water);

4. A digital file in a format acceptable to the Administrator that summarizes this information.

B. For each Contaminant of Concern within the Designated Groundwater, the application shall include (to the extent known):

1. A description of the Ingestion Protective Concentration Level Exceedance Zone and the Non-Ingestion Protective Concentration Level Exceedance Zone, including a specification of the horizontal area and the minimum and maximum depth below ground surface;

2. The level of contamination, the Ingestion Protective Concentration Level, and the Non-Ingestion Protective Concentration Level, all expressed as mg/L units; and

3. Its basic geochemical properties (e.g., whether the Contaminant of Concern migrates with Groundwater, floats or is soluble in water);

4. A digital file in a format acceptable to the Administrator that summarizes this information.

(7) A description of the current use, and to the extent known, the anticipated uses of the Designated Property and properties within 500 feet of the boundary of the Designated Property;

(8) A statement as to whether the plume of contamination is stable, expanding, or contracting, with the basis for that statement. If this is not known, a statement of why the information is not known.

(9) A statement as to whether contamination on and off the Designated Property without a MSD exceeds a residential assessment level as defined in the Texas Risk Reduction Program or analogous residential level set by EPA, if known, and the basis for that statement;

(10) A statement as to whether contamination on and off the Designated Property with a MSD will exceed a residential assessment level as defined in the Texas Risk Reduction Program or analogous residential level set by the EPA, if known, and the basis for that statement;

(11) A description of any environmental regulatory actions that have been taken within the past five (5) years in connection with the Designated Property, to the extent known;

(12) A listing of all existing state or EPA registrations, permits, and identification numbers that apply to the Designated Property;

(13) A statement as to whether the Designated Property has been admitted to the Texas Voluntary Cleanup Program or similar state or federal program, and a description of the status of the Designated Property in the identified program;

(14) A summary of any environmental site assessment reports filed regarding any site investigations or Response Actions that are planned, ongoing or completed related to the Designation Property;

(15) A listing of:

A. All state-registered private water wells within five (5) miles from the boundary of the property for which the designation is sought, including a notation of those wells that are used for Potable Water purposes (if known), and a statement as to whether applicant has provided the owners with notice as provided in Texas Health and Safety Code Section 361.805;

B. Each retail public utility that owns or operates a Groundwater supply well located not more than five (5) miles from the property for which the MSD is sought, and a statement as to whether applicant has provided the utilities with notice as provided in Texas Health and Safety Code Section 361.805;

C. Each municipality, other than the City, with a boundary located not more than one-half (½) mile from the property for which the MSD is sought; or that owns or operates a Groundwater supply well located not more than five (5) miles from the property for which the MSD is sought; and a statement as to whether applicant has provided the municipalities with notice as provided in Texas Health and Safety Code Section 361.805;

(16) A site map, drawn to scale, including a metes and bounds description of the property, the boundary of the proposed MSD, the location of Groundwater on the property, and the extent of Groundwater contamination to the limits that it has been defined.

A. The site map shall note the watershed and identify whether the Designated Property is located in a floodplain or floodway.

B. The location of all soil sampling locations, all Groundwater monitoring wells and Groundwater gradients shall be noted on the site map.

C. The Ingestion Protective Concentration Level Exceedance Zone for each Contaminant of Concern shall be noted on the site map.

D. The site map shall include a statement by a professional land surveyor registered by the Texas Board of Professional Surveying attesting to the accuracy of the metes and bounds property description.

(17) The following statement signed and sealed by a licensed professional engineer or licensed professional geoscientist authorized to practice in the State of Texas with expertise in environmental remediation:

> "To the best of my knowledge and belief, based upon a review of all public and private records and other information sources available to me in the exercise of due diligence, the opinions stated and conclusions made in this application are supported by such information, and the technical and scientific information submitted with the application is true, accurate and complete. Based on such review, the Contaminants of Concern from sources on the Designated Property or migrating from or through the Designated Property more likely than not **(do exceed)** or **(do not exceed)** a Non-Ingestion Protective Concentration Level on property beyond the boundaries of the Designated Property."

(18) If the licensed professional engineer or licensed professional geoscientist determines that Contaminants of Concern from sources on the Designated Property or migrating from or through the Designated Property more likely than not **do exceed** a Non-Ingestion Protective Concentration Level on property beyond the boundary of the Designated Property, then the applicant must:

A. Specify the name and address of the owner of each property impacted by such migration of said Contaminants of Concern;

B. Send a copy of the application to the owner of the impacted property with notice of the public meeting;

C. Provide documentation that the Designated Property has been included in a state or federal program that requires that the entire Non-Ingestion Protective Concentration Level Exceedance Zone be addressed to the satisfaction of the agency administering the program, along with documentation of the estimated time period in which it is to be addressed. An example of such a program is the Texas Voluntary Cleanup Program;

D. Provide documentation upon completion of the state or federal program showing that the Non-Ingestion Protective Concentration Level exceedances have been addressed to the satisfaction of the agency administering the program;

(19) Any other information that the Administrator deems pertinent.

(d) The application shall be signed by the applicant or an Authorized Representative of the applicant and shall contain the following certification statement:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in a manner designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the

person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

(e) The signature of the applicant or Authorized Representative of the applicant indicates he/she has legal authority to restrict the use of Groundwater on the Designated Property.

(f) An application shall be accompanied by:

(1) Two (2) hard copies of the application and an electronic portable digital file (pdf) of the application and all supporting material;

(2) An electronic file of the names and addresses of persons listed in Subsection (c)(15) above, in a format acceptable to the Administrator and compatible with City information systems; and if requested by the Administrator, a set of printed mailing labels with the names and addresses of persons listed in Subsection (c)(15); and

(3) A non-refundable application fee as set forth in Section 2-201, Fee Schedule, of this code.

(g) An applicant may withdraw its application in writing by letter sent certified mail, return receipt requested, to the Administrator, and shall forfeit the application fee. If the Administrator has not issued public notice prior to the receipt of the withdrawal letter, the applicant may reapply at any time. If public notice has issued, a new application is subject to the limitations of Section 16.402 below.

Sec. 16.398 - Staff Review.

(a) The date that an application is deemed to have been received by the City is the date the application was received by the Administrator, as indicated by the file date stamped on the application package by the City.

(b) Upon receiving an application for MSD approval, the Administrator will distribute the application for staff review. The purpose of the review is to determine whether the application is complete, and whether any current or future City property or other interests have the potential to be impacted by the proposed MSD. City staff shall not be tasked with conducting an environmental risk assessment of the application.

(c) City staff shall send a written report to the Administrator noting any discrepancies in the application, and advising of any City interests that may potentially be impacted by the proposed MSD.

(d) If City staff determines it is likely that a source of a Contaminant of Concern originated on the Designated Property, and that the Contaminant of Concern extends to the public right of way adjacent to the Designated Property, the Administrator may recommend that the MSD granted by the City include a condition that the public right of way adjacent to the Designated Property be included in the application to the TCEQ for MSD certification at no cost to the City.

(e) Within thirty (30) days of receipt of the application by the City, the Administrator shall notify the applicant that the application is complete or notify the applicant in writing of any deficiencies in the application and of any additional documentation required. The applicant shall have sixty (60) days from the date of the deficiency letter to correct the deficiencies or submit additional documentation. The Administrator may, for good cause, extend the deadline to correct or supplement the application. If the applicant fails to correct or supplement the application within sixty (60) days or the extended period, the application shall be deemed withdrawn and the initial application fee forfeited. No application shall be deemed complete until all supporting documentation is supplied. The Administrator shall notify the applicant in writing when the application is deemed complete.

(f) Should the City determine that third party review of the application is necessary to ensure containment of contaminants on the property for which the MSD is sought, applicant shall be responsible for the costs for such third party review.

Sec. 16.399 - Notice of Public Meeting and Public Hearing.

(a) Once the Administrator determines that the application is complete and notifies the applicant in writing the application is deemed complete, Administrator will schedule a public meeting and a public hearing. The public meeting must be held prior to the public hearing.

(1) A public meeting will be scheduled approximately sixty (60) days following the date the application was deemed complete by the City.

(2) The Administrator shall publish notice of the public meeting at least fifteen (15) days before the public meeting. Notice shall also be mailed to all Affected Parties.

(3) The applicant may not alter, change, amend or enlarge the application after notices of the public meeting have been mailed by the Administrator.

(4) A public hearing of the City Council will be scheduled approximately thirty (30) days following the date of the public meeting.

(5) The Administrator shall publish notice of the public hearing at least fifteen (15) days before the public hearing. Notice shall also be mailed to all Affected Parties.

(b) Notice of the public meeting and the public hearing on an MSD application may be combined and must include the date, time and location of the two (2) events, the identity of the applicant, the location and legal description of the property for which the MSD is sought, the purpose of the MSD, the type of contamination identified in the Groundwater of the property for which the MSD is sought, and a statement that a copy of the application is available for public viewing at City Hall. Notice will be made as follows:

(1) The Administrator will publish notice of a public meeting and a public hearing in the official newspaper of the City not less than fifteen (15) days before the public meeting;

(2) The Administrator will provide posted notice of a public meeting and a public hearing by requesting that the City Secretary post the notice at City Hall, in a place readily accessible to the general public at all times, not less than fifteen (15) days before the public meeting; and

(3) The Administrator will serve written notice of a public meeting and a public hearing for a proposed MSD not less than fifteen (15) days before the date set for the public meeting by properly addressed and regular postage paid letter, in the United States mail. Notice will be mailed to:

A. The applicant;

B. All owners of real property lying within 1,000 feet of the subject property, as the ownership appears on the last approved City tax roll; and

C. The Affected Community.

(c) The Administrator will direct the posting of at least one (1) sign upon the area for which a MSD has been requested. Posting shall be in the same manner as zoning amendments. The sign(s) must state that a MSD has been requested for the area and that additional information can be acquired by telephoning the number listed thereon or visiting the web site address listed thereon. The erection and/or the continued maintenance of any such sign shall not be deemed a condition precedent to the holding of any public meeting or public hearing or to any official action concerning the MSD application.

Sec. 16.400 - Public Meeting.

(a) The purpose of a public meeting is for the applicant to provide information to the Affected Community about MSDs and the application, and to obtain input on the application prior to a formal hearing before the City Council.

(b) The public meeting will be held in the evening at a location convenient to the Affected Community.

(c) The applicant or applicant's representative must appear at the public meeting. If the applicant fails to appear at the public meeting either in person or by representative, the application shall be deemed withdrawn and the application fee forfeited.

(d) The Administrator will conduct the meeting. The Administrator will give the applicant or the applicant's representative the opportunity to present its reasons for requesting a MSD, and will give members of the Affected Community the opportunity to ask the applicant questions or make oral comments on the application.

(e) The City will make a recording of the public meeting available for the public.

Sec. 16.401 - Public Hearing.

(a) Prior to the hearing, the Administrator will provide the City Council with a written report summarizing the request for the MSD approval, including any staff comments and comments from members of the public from the public meeting.

(b) The applicant or applicant's representative must appear at the hearing and present the request for MSD approval. If the applicant fails to appear at the hearing either in person or by representative, the application shall be deemed withdrawn and the application fee forfeited.

(c) Persons wishing to speak either in favor of or against the application will be provided the opportunity in accordance with City Council rules or guidelines for public hearings.

(d) Following the conclusion of the public hearing, the City Council may deliberate the matter of the application, and then may either:

(1) Approve or disapprove the application; or

(2) Postpone action on the application to a future date.

(e) In order to approve an application, the City Council shall:

(1) Enact an ordinance prohibiting the potable use of Designated Groundwater from beneath the MSD property.

(2) The ordinance shall include the following:

a. a metes and bounds description of the property to which the ordinance applies, and include the maximum depth of the Designated Groundwater, which shall not exceed 200 feet below ground surface level unless specifically requested by applicant and approved by City Council;

b. a listing of the Contaminants of Concern, and a statement that the ordinance is necessary because the Contaminants of Concern concentrations exceed TCEQ Potable Water standards; and

c. any other reasonable restrictions placed on the use of Designated Groundwater from beneath the property, including but not limited to specification of underground construction materials to be used in the MSD area.

(f) City Council approval of an application shall not be deemed to waive the City's right to comment on a MSD application that has been filed with the Executive Director of the TCEQ as provided by Texas Health and Safety Code Section 361.805.

(g) City Council approval of a MSD ordinance does not change any environmental assessment or cleanup requirements applicable to the Designated Property as required by TCEQ or EPA.

(h) City Council approval of a MSD ordinance shall not be construed to subject the City to any responsibility or liability for any injury to persons or damage to property caused by any Contaminant of Concern.

Sec. 16.402 - Limitation on Re-Application.

If after the public hearing the City Council disapproves an application, or if the applicant has withdrawn its application after public notice has issued, no new MSD applications for the property shall be accepted by the City or scheduled for a hearing by the City Council within a period of twelve (12) months of the date of disapproval or withdrawal.

Sec. 16.403 - Additional Requirements.

(a) A person who has received approval of a MSD from the City shall, upon issuance from the TCEQ, provide the Administrator with a copy of the certificate of completion or other documentation issued for the Designated Property showing that any site investigations and Response Actions required pursuant to Section 361.808 of the Texas Health and Safety Code have been completed to the satisfaction of TCEQ or EPA within the time period required.

(b) The applicant shall provide the Administrator with a copy of the MSD certificate issued by the TCEQ within thirty (30) days after issuance of the certificate.

(c) Within thirty (30) days after approval of a MSD from the City, the applicant shall provide the Administrator with an electronic file showing the location of the Designated Property and the Designated Groundwater in a format compatible with the City’s geographic information system.

(d) Within thirty (30) days after issuance of MSD certification by TCEQ, applicant shall deliver to the Administrator a file-stamped and recorded copy of a deed restriction prohibiting the use of Designated Groundwater on the Designated Property for potable water purposes.

(e) A person commits an offense if they fail to provide the Administrator with the documentation required in this section within thirty (30) days of its issuance of MSD certification by the TCEQ.

SECTION 2. PENALTY. Any person, firm, corporation, agent or employee thereof who violates any of the provisions of this ordinance shall be guilty of a misdemeanor and upon conviction thereof shall subject to a fine not to exceed Two Thousand Dollars ($2,000.00) for each offense. Each day that a violation is permitted to exist shall constitute a separate offense.

SECTION 3. REPEALER. Every ordinance or parts of ordinances found to be in conflict herewith are hereby repealed.

SECTION 4. SEVERABILITY. If any section, subsection, sentence, clause or phrase of this ordinance shall for any reason held to be invalid, such decision shall not affect the validity of the remaining sections, sentences, clauses, or phrases of this ordinance, but they shall remain in effect.

SECTION 5. REMEDIES. Any violation of this ordinance can be enjoined by a suit filed in the name of the City of Lewisville in a court of competent jurisdiction, and this remedy shall be in addition to any penal provision in this ordinance or in the Lewisville City Code.

SECTION 6. EFFECTIVE DATE. This ordinance shall become effective immediately upon its passage and publication as required by law.

SECTION 8. EMERGENCY. It being for the public welfare that this Ordinance be passed creates an emergency and public necessity and the rule requiring this Ordinance be read on three separate occasions be, and the same is hereby, waived and this Ordinance shall be in full

force and effect from and after its passage and approval and publication, as the law in such cases provides.

DULY PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF LEWISVILLE, TEXAS, BY A VOTE OF _____ TO _____, ON THIS THE 17th DAY OF OCTOBER, 2016.

APPROVED:

_____
Rudy Durham, MAYOR

ATTEST:

_____
Julie Heinze, CITY SECRETARY

APPROVED AS TO FORM:

_____
Lizbeth Plaster, CITY ATTORNEY