CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

VOLUME 2 OF 3

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
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FIRM REGISTRATION NO. F-256 AND NO. 10194895

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

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PART III
SITE DEVELOPMENT PLAN

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CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

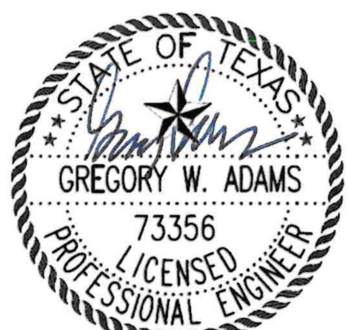
TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT A
SITE DEVELOPMENT PLAN NARRATIVE

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete



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CONTENTS

1 INTRODUCTION

30 TAC §330.63(a)

This site development plan provides the criteria used in the selection and design of this facility for the safeguarding of the health, welfare, and physical property of the public and environment through consideration of the geology, soil conditions, drainage, land use, zoning, adequacy of access roads and highways, and other considerations specific to this facility.

2 GENERAL FACILITY DESIGN

30 TAC §330.63(b)

The general facility design information is included in Attachment B. Attachment B provides details about facility access control as required by §330.63(b)(1), a generalized process design and working plan of the facility that describes waste movement as required by §330.63(b)(2), a description of how solid waste processing facilities will be designed to facilitate proper cleaning as required by §330.63(b)(3), a description of how all liquids resulting from the operation of solid waste processing facilities will be disposed of in a manner that will not cause surface water or groundwater pollution as well as the treatment of wastewaters resulting from the process or from cleaning and washing as required by §330.63(b)(4), and a general discussion of endangered and threatened species as required by §330.63(b)(5).

3 FACILITY SURFACE WATER DRAINAGE REPORT

30 TAC §330.63(c)

The facility surface water drainage design report is included in Attachment C. Attachment C demonstrates how the facility is designed to meet the drainage and flood control requirements of §330.63(c) and §§330.303, 330.305, and 330.307. The surface water drainage design report includes analyses of the existing conditions, postdevelopment conditions, and design of the surface water management system, including final cover drainage facilities, perimeter drainage channels, and ponds, and also includes an erosion and sediment control plan for all phases of landfill development. The facility surface water drainage design report demonstrates that current drainage patterns will not be adversely altered and that the facility is not located within the 100-year floodplain.

4 WASTE MANAGEMENT UNIT DESIGN

30 TAC §330.63(d)

The waste management unit design information is included in Attachment D. Attachment D demonstrates how the facility was designed to meet §330.63(d)(4) for landfill units. The waste management unit design includes provisions for all-weather operations, proposed landfill method, elevation of deepest excavation, maximum elevation of waste and final cover, waste disposal rate and operating life of the landfill, landfill unit cross sections, construction and design details of the landfill unit, and the liner quality control plan. The landfill liner system has been designed to meet the requirements of §330.331(d) and the requirements of §330.337 for special liner design constraints as related to construction of a passive dewatering system to reduce hydrostatic forces on the liner during construction. In addition, Attachment D includes the geotechnical design report for the facility, the liner quality control plan, final cover quality control plan, and contaminated water management plan.

5 GEOLOGY REPORT

30 TAC §330.63(e)

The geology and soil information is included in Attachment E. Attachment E provides the descriptions of the regional geology and hydrogeology, geologic process, regional aquifers, subsurface investigations, geotechnical properties of subsurface soils, and fault and seismic conditions.

6 GROUNDWATER SAMPLING AND ANALYSIS PLAN

30 TAC §330.63(f)

The groundwater sampling and analysis plan is included as Attachment F. Attachment F provides the information required by §330.63(f) and §§330.401 through 330.421. The groundwater monitoring plan includes the point of compliance, contaminant pathway analysis, groundwater monitoring program, detection monitoring program, and groundwater sampling and analysis plan.

7 LANDFILL GAS MANAGEMENT PLAN

30 TAC §330.63(g)

The landfill gas management plan is included as Attachment G. Attachment G provides the information required by §330.63(g) and §330.371. The landfill gas management plan includes the requirements for landfill gas monitoring at the landfill perimeter and in on-site structures, and procedures to be implemented in the event that concentrations of methane in excess of the regulatory limits are measured at the facility permit boundary or in on-site structures.

8 CLOSURE PLAN

30 TAC §330.63(g)

The closure plan is included as Attachment H. Attachment H provides the information required by §330.63(h), §330.453, and §330.457. The closure plan includes the procedures for closure of the facility following final acceptance of waste and certification of final closure. The closure plan describes the final cover system, closure procedures, final cover quality control plan, and a closure schedule.

9 POSTCLOSURE PLAN

30 TAC §330.63(i)

The postclosure plan is included as Attachment I. Attachment I provides the information required by §330.63(i), §330.463, and §330.465. The postclosure plan includes the procedures for postclosure care maintenance and postclosure care certification. The postclosure plan describes the postclosure care activities, persons responsible for conducting postclosure care activities, and postclosure land use.

10 COST ESTIMATES FOR CLOSURE AND POSTCLOSURE CARE

30 TAC §330.63(j)

The cost estimates for closure and postclosure care are included as Attachment J. Attachment J provides the information required by §330.63(j). The detailed cost estimate for closure meets the requirements of §330.503. The detailed cost estimate for postclosure care meets the requirements of §330.507. This plan also provides procedures to adjust the cost estimates during the life of the facility and provides the evidence of financial assurance.

CHISHOLM TRAIL DISPOSAL LANDFILL
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PART III – SITE DEVELOPMENT PLAN
ATTACHMENT B
GENERAL FACILITY DESIGN

Prepared for

Chisholm Trail Disposal, LLC

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STATE OF TEXAS
9/23/2025

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Firm Registration No. F-256

CONTENTS

1 FACILITY ACCESS

30 TAC 330.63(b)(1)

Access to the Chisholm Trail Disposal (CTD) Landfill will be provided by an entrance road from CR 4668 approximately 600 feet west of the intersection of CR 4668 and CR 4659. Access to the facility will be controlled by a perimeter fence along the permit boundary and locking gate at the site entrance. The fence and gate will prevent the entry of livestock, protect the public from exposure to potential health and safety hazards, and discourage unauthorized entry or uncontrolled disposal of solid waste or prohibited materials.

Entry to the active portion of the site will be restricted to designated personnel, approved waste haulers, properly identified persons whose entry is authorized by site management, and TCEQ personnel. Visitors may be allowed on the active area only when accompanied by a site representative. Signs will be located along the entrance road directing traffic to the gatehouse. The gate attendant will restrict site access to authorized vehicles and direct these vehicles appropriately. Waste hauling vehicles will be directed to appropriate fill areas by signs located along the landfill haul road and access road. These vehicles will deposit their loads and depart the site. Private, commercial, or public solid waste vehicles will not be allowed access to any areas other than the active portion of the landfill. Site personnel will provide traffic directions as necessary to facilitate safe movement of vehicles. Within the site, signs will be placed along the landfill haul road and access road at a frequency adequate for users to be able to determine where the disposal area locations are, and which roads are to be used. Roads not being used for access to disposal areas will be blocked or otherwise marked for no entry.

2 WASTE MOVEMENT

30 TAC 330.63(b)(2)

The CTD Landfill will dispose of municipal solid waste and Class 2 and Class 3 industrial solid wastes consisting of construction or demolition waste, brush, and rubbish as defined by §330.3. The landfill will not accept for disposal putrescible wastes, conditionally exempt small-quantity generator waste, household wastes, grease or trap wastes, sludges, septage, or other liquid wastes, lead acid storage batteries, used motor vehicle oil, used oil filters whole used or scrap tires, refrigerators, freezers, air conditioners or other items containing chlorinated fluorocarbons (CFC), bulk or noncontainerized liquid waste from non-household sources, regulated hazardous waste, polychlorinated biphenyls (PCB) waste, radioactive materials, or other wastes prohibited by TCEQ regulations. Procedures for waste acceptance, handling, processing, and disposal are provided in Part IV.

Waste disposal facilities include a waste disposal area, large item staging area, reusable materials staging area, citizen's convenience area, and wood waste mulching area. Appendix B1 includes a waste flow diagram, schematic drawings, and details that depict disposal and materials staging activities.

Waste movement through the facility is depicted on Drawing B.1 and a waste disposal material staging plan is provided on Drawing B.2. As waste enters the facility via the entrance road, the attendant will observe the incoming waste, conduct waste screening and weighing, and document incoming waste. The attendant will be familiar with the rules and regulations governing the various types of waste that can or cannot be accepted into this facility and will direct the waste hauler to the appropriate waste disposal or material staging area. The site personnel will also have the authority to reject prohibited wastes and have the rejected waste removed by the waste haul vehicle or transporter immediately upon discovery. Trained personnel will observe waste unloading at the active working face and large item staging area and will have the authority and responsibility to reject loads which contain prohibited wastes. The working face personnel will also have the authority to have unauthorized and prohibited waste removed by the waste haul vehicle or transporter immediately upon discovery.

The waste disposal area will have a constructed liner system as described in Attachment D. A staging area for large items and white goods and a wood waste mulching area may be provided over lined areas near the active working face. The large item staging area is shown on Drawing B.3. Large items and white goods include items such as ovens, dishwashers, freezers, air conditioners, and other large items. Runon or runoff from the area will be contained within the active area and handled as contaminated water, as discussed in Part IV. These items will be disposed of after CFCs have been removed in accordance with all applicable regulatory requirements and within 10 days of acceptance at the facility. The wood waste mulching area will include source-separated yard trimmings, brush, and clean wood materials. Materials will be chipped and mulched in small piles and will be managed to prevent fire, safety, or health hazards in accordance 30 TAC §330.209(a). Periodically, a third party contractor will be called to the site to grind and transport the wood waste material off-site for re-use. Wood waste mulch will be re-used within the facility or transported for off-site re-use within 90 days of acceptance at the facility.

Source-separated inert materials such as brick, concrete, rubble, aggregate, and reclaimed asphalt pavement may be staged at the facility for use on facility access roads, staging areas, and drainage structures. The reusable materials staging area will be located above existing lined areas and will be relocated periodically as the active working face moves. The size of the stockpiles will vary depending on the amount of materials received. Since brick, concrete, rubble, aggregate materials, and reclaimed asphalt pavement are inert, their staging will not create a public health hazard or nuisance, and separate management of runon and runoff from rainfall in this area will not be required. Since these inert materials will continuously be reused for site operations, there is no time limit on the staging of these materials. Reclaimed asphalt pavement that contains asbestos will not be used and will not be accepted.

The Citizen's Convenience Area will be located within limits of the waste management unit beside the access road. The Citizen's Convenience Area will consist of 30 cy roll off boxes as depicted on Drawing B.4. The roll off boxes will be emptied at the working face.

3 SANITATION

30 TAC §330.63(b)(3)

The solid waste material staging areas include the large item staging area, reusable materials staging area, and wood waste mulching area. Each of these facilities is designed to facilitate proper cleaning and comply with the surface water drainage requirements of §330.303.

Runoff of contaminated water from the large item staging area will be prevented by containment berms as shown on Drawing B.3. Contaminated water will be disposed of in accordance with Attachment D6. Surface water runon and runoff controls are not required for inert materials in the reusable materials staging area. The wood waste mulching area will consist of small piles managed to prevent litter and control fire, health hazards, and safety in accordance with §330.209(a). There are no water runon and runoff control, or additional sanitation controls required.

4 WATER POLLUTION CONTROL

30 TAC 330.63(b)(4)

The material staging areas will be maintained and operated to manage runon and runoff during the peak discharge from the 25-year storm event and will prevent the off-site discharge of waste material. Surface water in and around each material staging area, as applicable, will be controlled to minimize surface water running onto, into, and off these areas. Since all contaminated water will be managed in a controlled manner, as discussed above, surface water and groundwater will be protected. The landfill will not discharge contaminated water off-site or into waters of the United States without obtaining specific written authorization from the TCEQ, prior to any discharge. The landfill and its material staging areas will be operated consistent with §330.15(h)(1)-(4) regarding discharge of solid wastes or pollutants into waters of the United States.

The design of the landfill and the surface water management system for the facility will prevent the discharge of solid waste, pollutants, dredged, or fill material and non-point source pollution that would violate any of the provisions referenced in §330.15(h). The facility has been designed to keep contaminated surface water separated from uncontaminated stormwater runoff. The contaminated water will not be discharged to the surface water management system to be constructed at the site.

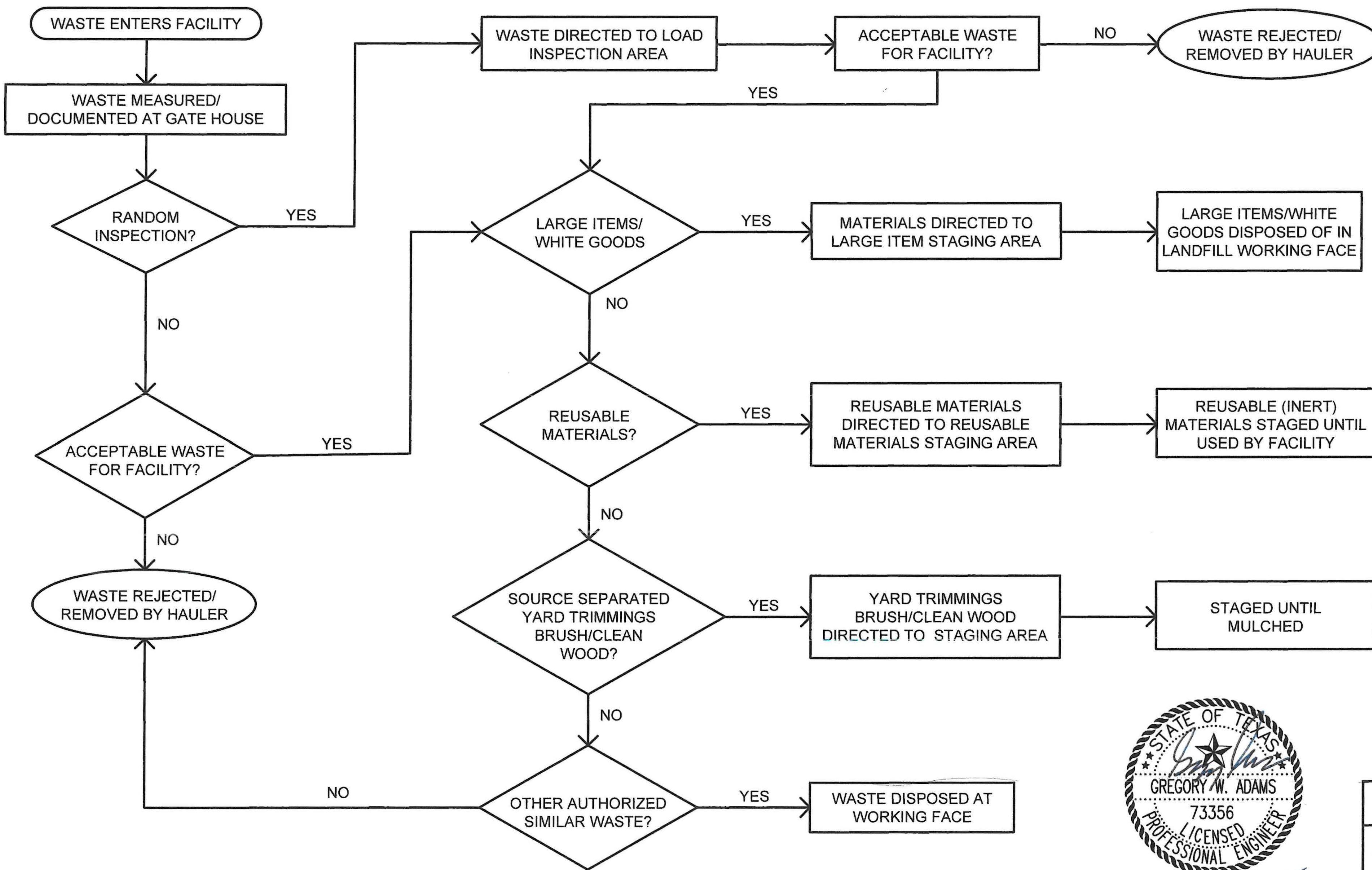
5 ENDANGERED SPECIES PROTECTION

30 TAC §330.639(b)(5)

An evaluation of endangered or threatened species at the site was conducted by Integrated Environmental Solutions, LLC and is provided in Part II, Appendix IIE. Based on the evaluation the facility and operation of the facility will not result in the destruction or adverse modification of the critical habitat of endangered or threatened species and will not cause or contribute to the taking of any endangered or threatened species.

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX B1
DRAWINGS



STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REV	DATE	DESCRIPTION

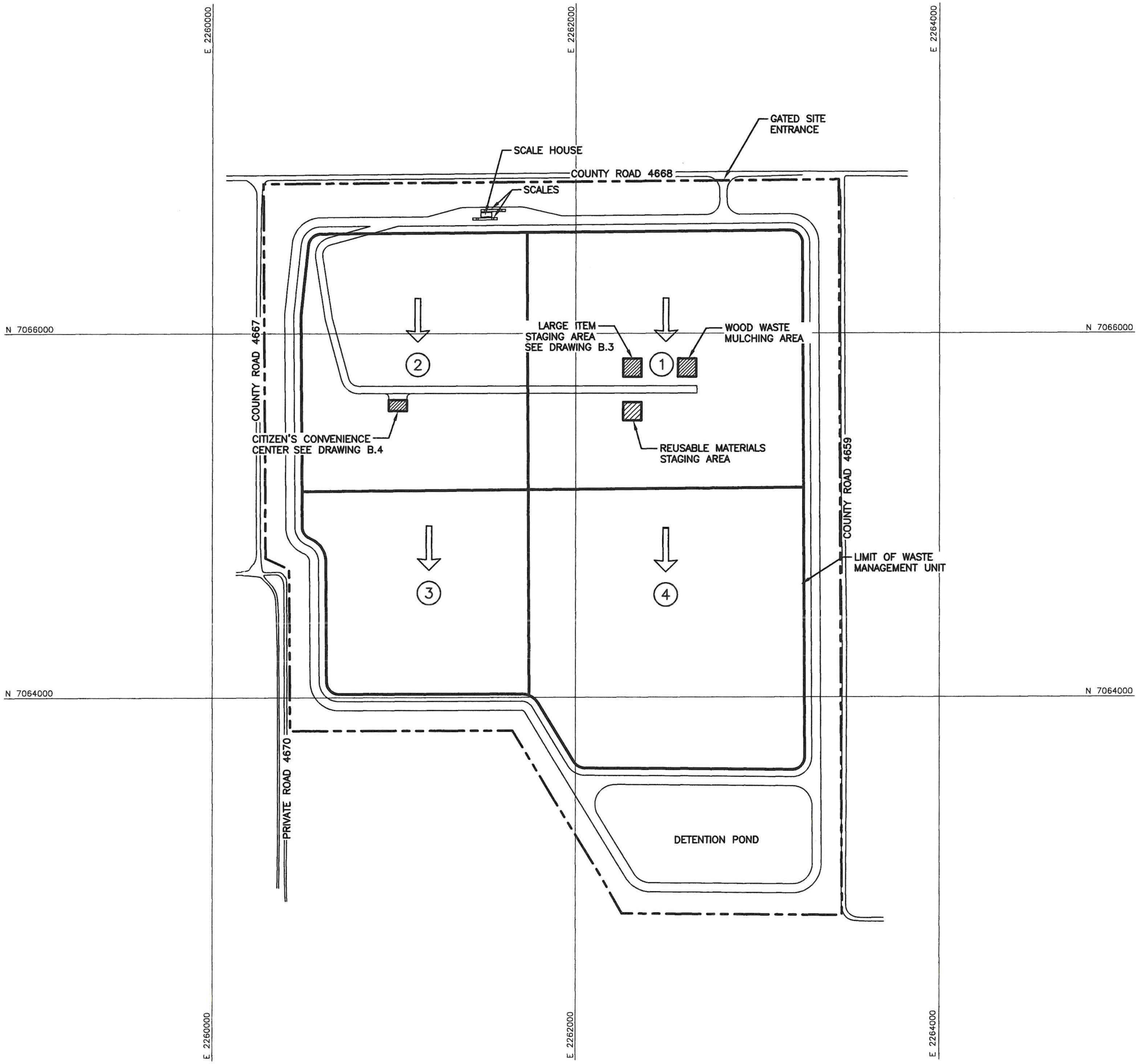
REVISIONS

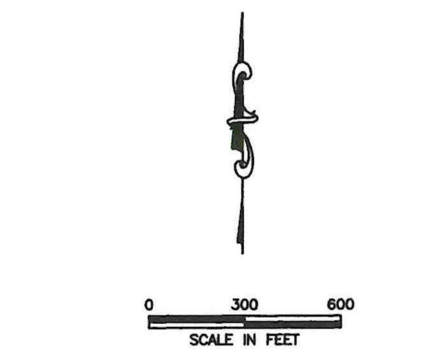
WASTE MOVEMENT FLOW DIAGRAM

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
B.1





LEGEND

— — —	PERMIT BOUNDARY
———	WASTE MANAGEMENT UNIT
N 7062000	STATE PLANE COORDINATES
(1)	SECTOR NUMBER
⇨	DEVELOPMENT DIRECTION

NOTE(S):

1. SECTOR 1, 2, 3 AND 4 WILL BE DEVELOPED IN SEQUENTIAL ORDER.
2. THE LARGE ITEM STAGING AREA WILL BE LOCATED OVER LINED AREAS AND WILL BE RELOCATED PERIODICALLY AS THE SITE IS DEVELOPED.
3. THE REUSABLE MATERIALS STAGING AREA WILL BE LOCATED OVER LINED AREAS AND WILL BE RELOCATED PERIODICALLY AS THE SITE IS DEVELOPED.
4. THE WOOD WASTE MULCHING AREA WILL BE LOCATED WITHIN THE LIMITS OF WASTE MANAGEMENT LIMITS AND WILL BE RELOCATED PERIODICALLY AS THE SITE IS DEVELOPED. REFER TO PART IV FOR OPERATIONAL PROVISIONS.
5. THE CITIZEN'S CONVENIENCE CENTER WILL BE LOCATED WITHIN THE LIMITS OF THE WASTE MANAGEMENT UNIT AND WILL BE RELOCATED AS THE SITE IS DEVELOPED. REFER TO PART IV FOR OPERATIONAL PROVISIONS.

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WASTE DISPOSAL AND MATERIAL STAGING SCHEMATIC PLAN

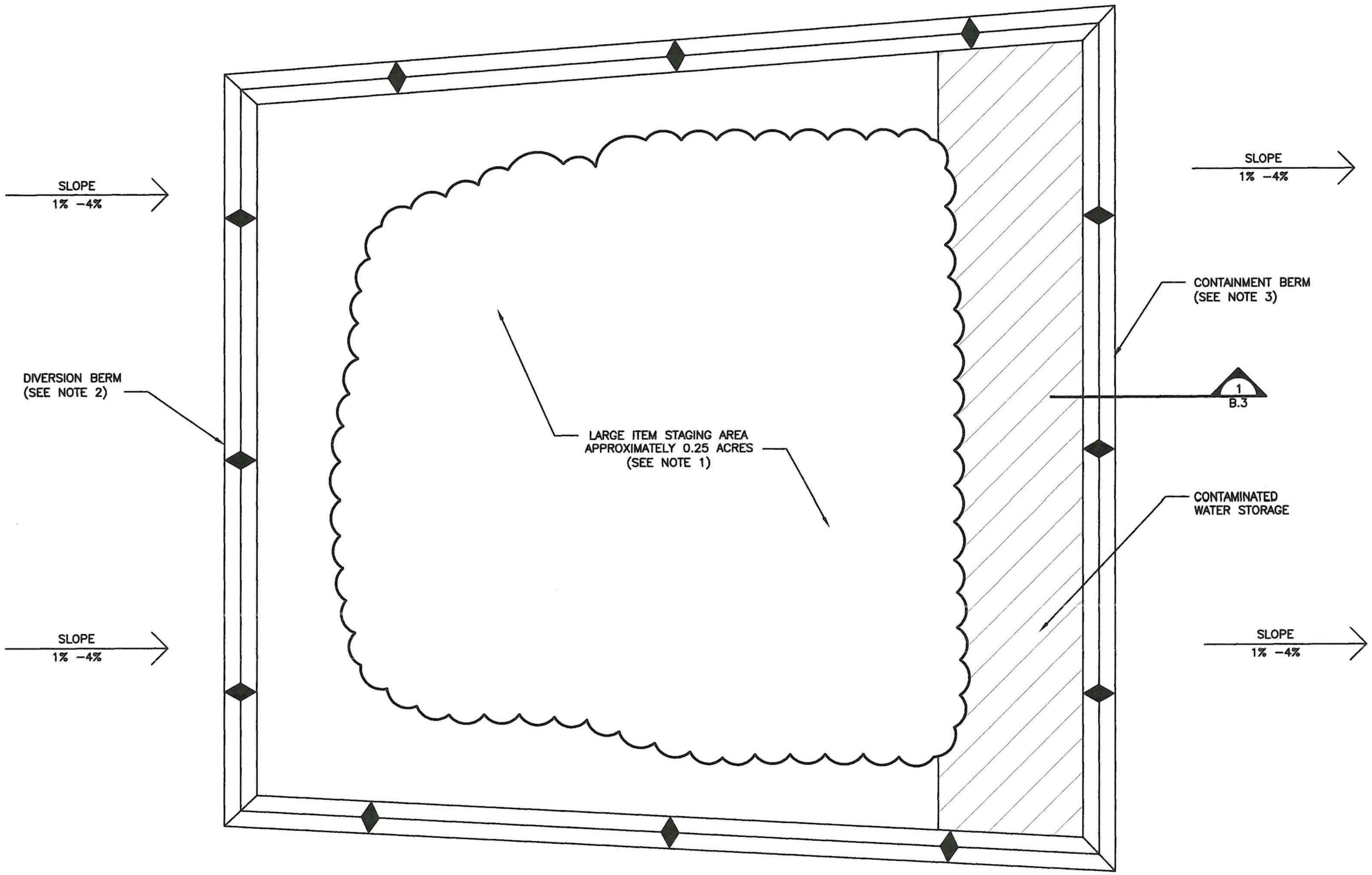
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

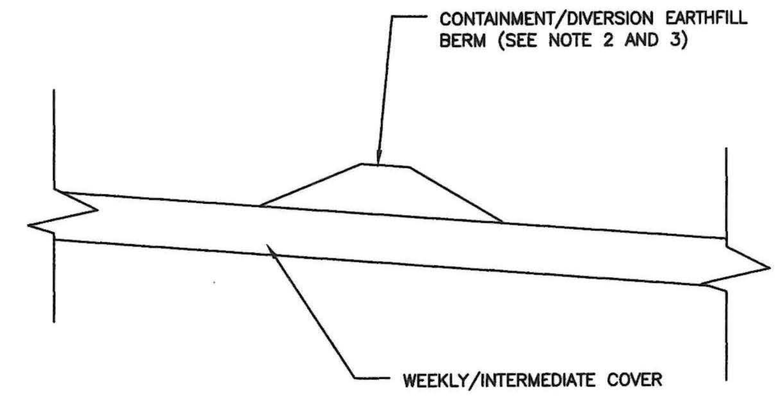
DRAWING
B.2

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT B\B.2-WasteSchematicPlan.dwg Layout: Layout 1 User: awhite



LARGE ITEM STAGING AREA

NOT TO SCALE

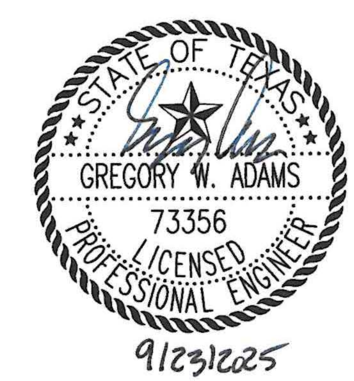


CONTAINMENT BERM SECTION 1 B.3

NTS

NOTES:

1. LARGE ITEMS MAY BE STAGED OVER EXISTING LINED AREAS PRIOR TO RECYCLING OR DISPOSAL. MATERIALS WILL BE PROVIDED WITH RUN ON AND RUN OFF CONTROLS FOR THE 25 YEAR 24 HOUR RAINFALL EVENT.
2. WHEN PRACTICAL, MATERIALS WILL BE STORED IN AREAS WITH POSITIVE DRAINAGE. WHEN NECESSARY DIVERSION BERMS WILL BE PROVIDED TO DIVERT SURFACE WATER. REFER TO PART III, ATTACHMENT D6, FOR DIVERSION BERM SIZING.
3. REFER TO PART III, ATTACHMENT D6, FOR CONTAINMENT BERM SIZING.
4. REFER TO PART IV SECTION 8.26.1 FOR THE DESIGN AND OPERATION PROVISIONS.



FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

LARGE ITEM STAGING AREA

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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1700 ROBERT ROAD, STE. 100
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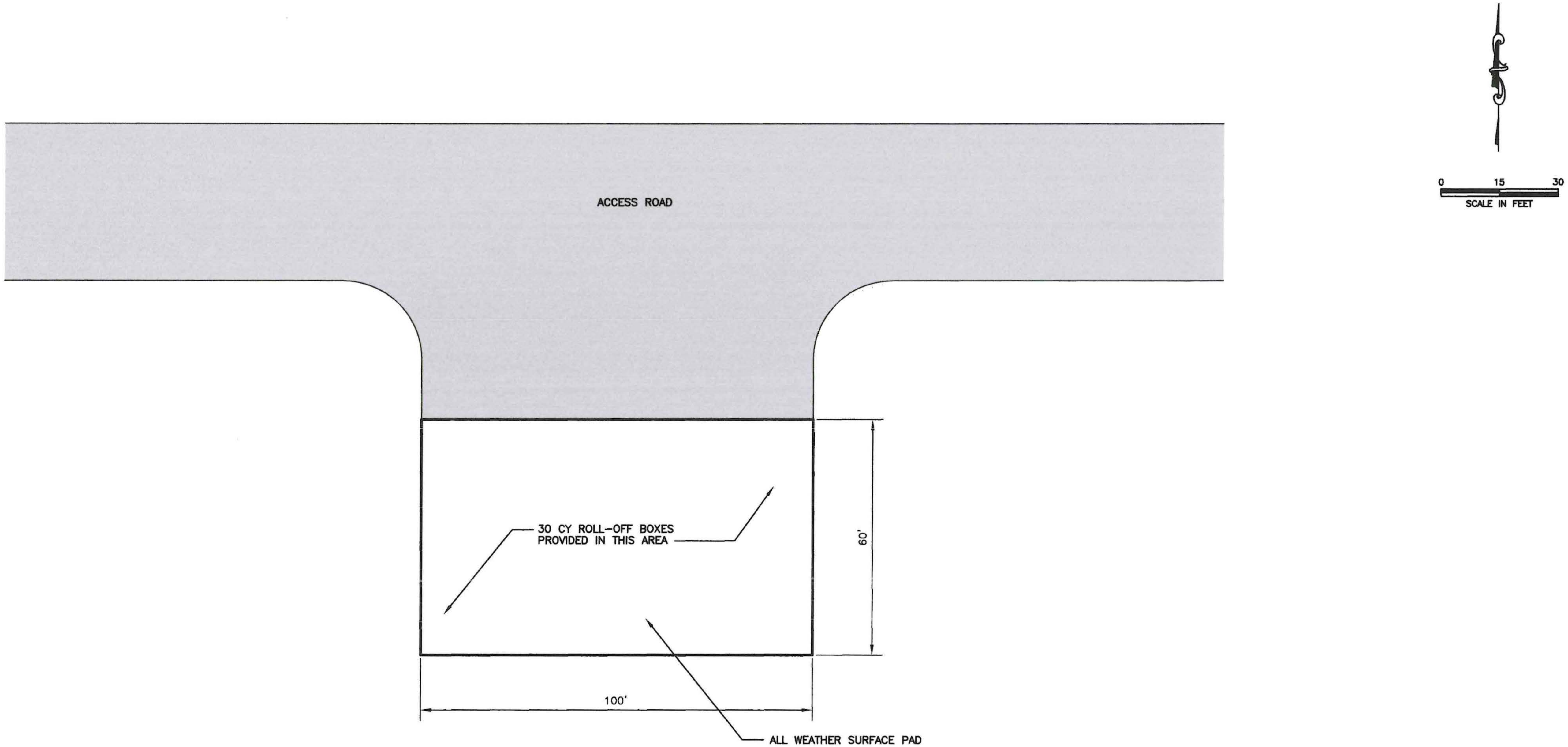
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
B.3



CITIZEN'S CONVENIENCE AREA

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

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REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

CITIZEN'S CONVENIENCE AREA

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME

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TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
B.4

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT B\B.4-CitizensConvenienceArea.dwg Layout: Layout 1 User: awhite

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT C
FACILITY SURFACE WATER DRAINAGE REPORT

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
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STATE OF TEXAS
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CONTENTS

1 FACILITY SURFACE WATER DRAINAGE REPORT

30 TAC §330.63(c) and §§330.301-330.307

The facility surface water drainage report has been prepared consistent with the requirements of §330.63(c) and §330.301 through 330.307. The facility design complies with the requirements of §330.303(a)-(b) concerning the management of runon and runoff during peak discharge of a 25-year rainfall event, the prevention of off-site discharge of waste and feedstock materials, and the control of surface water discharge in and around the facility.

1.1 Drainage Analysis and Design

The drainage analysis and design of the facility includes calculations and demonstrations consistent with the requirements of §330.63(c), and §330.301-330.305. The attachment includes a comparison of surface water runoff from the existing condition to the postdevelopment condition at each location where surface water enters or exits the permit boundary for the 25-year, 24-hour rainfall event. The existing condition for this evaluation is defined as the current existing site conditions. The postdevelopment condition for this evaluation is defined as the landfill completion plan. The comparison between the existing condition and the postdevelopment condition, included in Attachment C1, Section 7, demonstrates that the proposed landfill will not adversely alter the existing drainage patterns. In addition, this attachment includes the drainage design for the final cover system, drainage swales, chutes, perimeter channels, and detention ponds. The drainage analysis is provided in Attachment C1.

1.2 Flood Control Analysis

A flood control analysis consistent with the requirements of §330.63(c)(2) and §§330.301-330.307 demonstrates that the proposed landfill will not adversely impact the flooding conditions of the receiving channel and that the landfill footprint will not be located within the 100-year floodplain. Since the waste management unit will not be located within the 100-year floodplain, the levees referenced in §330.307 are not necessary to protect the facility from a 100-year frequency flood or otherwise prevent the washout of solid waste from the facility. The flood control analysis is provided in Attachment C2.

1.3 Drainage System Plans and Details

Attachment C3 provides the plans and details for the proposed drainage system consistent with §330.63(c) and §§330.301-330.305.

CHISHOLM TRAIL DISPOSAL LANDFILL
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ATTACHMENT C1
DRAINAGE ANALYSIS AND DESIGN

Prepared for

Chisholm Trail Disposal, LLC

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CONTENTS

1 INTRODUCTION

30 TAC §330.63(c) and §§330.301-330.305

The Chisholm Trail Disposal Landfill will be located north of the West Fork Trinity, within the Trinity River Basin.

1.0 Purpose

The drainage analysis and design includes demonstrations consistent with the requirements of 30 TAC Chapter 330, §330.63(c) and §§330.301-305. Drainage calculations are included in the appendices. Drainage design plans and details are included in Attachment C3.

1.1 Existing Condition/Postdevelopment Comparison

Appendix C1A includes drainage area maps that delineate the drainage areas that contribute surface water runoff at the permit boundary and provide a summary of the peak flow rate, volume of runoff, and runoff velocity at locations along the permit boundary for the existing and postdevelopment conditions. Appendix C1A also includes a table summarizing the existing/postdevelopment boundary analysis comparison and a regional analysis of the West Fork Trinity River.

1.2 Existing Condition Hydrologic Calculations

The existing condition hydrologic and hydraulic evaluation included in Appendix C1B represents the existing site conditions. The analysis includes delineation of drainage area CA1, which contributes surface water runoff at CP1. Stormwater from CA2 is retained in onsite ponds and depressions resulting from soil mining operations. Discharge at CP2 is assumed to be zero in the analysis even though the soil mining operation is permitted to discharge at this location by their industrial stormwater permit. The hydrologic analysis presents the hydrologic calculations at the permit boundary.

The results of the existing conditions hydrologic evaluation are provided on the existing condition boundary analysis summary, which shows the 25-year peak flow rate, volume of runoff, and peal runoff velocity at comparison locations along the permit boundary. Comparison point CP3 is a cross-section location on the West Fork Trinity River. A regional analysis of the West Fork Trinity River is provided to establish a baseline for evaluating the relative contribution of postdevelopment stormwater discharges to the river.

1.3 Postdevelopment Hydrologic Calculations

The postdevelopment hydrologic and hydraulic evaluation included in Appendix C1C represents the proposed final closure landfill configuration. The analysis includes delineations of drainage areas that contribute surface water runoff at the comparison points along the proposed permit boundary. The analysis represents the hydrologic calculations as defined by the landfill completion plan.

The results of the evaluation are provided on the postdevelopment boundary analysis summary, which shows the 25-year peak flow rate, volume of runoff, and peak runoff velocity at the comparison locations along the proposed permit boundary. The postdevelopment hydrologic evaluation was incorporated into the regional analysis of the West Fork Trinity River to demonstrate that the postdevelopment drainage condition does not adversely alter existing drainage patterns.

1.4 Perimeter Drainage System Design

Appendix C1D presents the hydraulic design of the perimeter drainage system. The perimeter drainage plan shows the locations of the perimeter drainage channels and the detention pond. The detention pond is designed to provide the necessary storage and outlet control to mitigate impacts to the receiving channels downstream. The perimeter channels are designed for the 25-year, 24-hour storm event.

1.5 Final Cover Drainage Structure Design

Appendix C1E provides the design of the permanent final cover drainage structures (i.e., chute and swale system). The calculations demonstrate that the structures are designed to convey runoff produced from the 25-year storms, to provide erosion protection, and to control sediment loss from the final cover condition.

1.6 Intermediate Cover Erosion and Sedimentation Control Plan

Appendix C1F provides a detailed erosion and sediment control plan during the intermediate cover phase of development.

1.7 Intermediate Cover Erosion Control Structure Design

Appendix C1G provides the supporting documentation to evaluate and design temporary erosion and sediment control structures for the intermediate cover phase of landfill development.

2 METHODOLOGY

30 TAC §330.305(f) and §330.305

2.0 Concepts and Methods

The hydrologic and hydraulic methods employed in this study are consistent with the TCEQ regulations. The United States Army Corps of Engineers (COE) HEC-HMS computer program was used to compute peak flow rates and to determine water surface profiles. The Rational Method and the methods defined in the TxDOT *Hydraulic Design Manual*, September 2019, were used to design the final cover drainage system and erosion control features. Analyses of the peak flow rates, water surface profiles, and drainage design for these conditions proceeded in the following sequence:

- Maps were prepared that provided information about the surface water runoff characteristics of the existing conditions contributing drainage areas. These maps are included in Appendix C1B.

- Surface water runoff hydrographs for the existing condition were developed using HEC-HMS. The existing condition HEC-HMS evaluation is included in Appendix C1B.

- Maps were prepared that provide information about the surface water runoff characteristics of the postdevelopment final cover drainage conditions for the Chisholm Trail Disposal Landfill. These maps are included in Appendix C1C.

- Surface water hydrographs for the postdevelopment condition, including the perimeter drainage channels and detention ponds were evaluated using HEC-HMS. The postdevelopment evaluation is included in Appendix C1C.

- Perimeter channels were modeled using HEC-HMS and Manning's Equation. Runoff hydrographs from drainage areas that contribute surface water runoff to the perimeter drainage system were routed through the perimeter channels, which include ponds, using HEC-HMS. Peak flow rates at specific stations were taken directly from HEC-HMS. Narrative discussing the perimeter drainage system design, which includes the evaluation of the existing and proposed surface water drainage features, is included in Appendix C1D.

- Final cover drainage systems were evaluated for capacity and erosion loss using the Rational Method and the methods defined in the TxDOT *Hydraulic Design Manual*, September 2019. Final cover drainage systems calculations are included in Appendix C1E.

- Intermediate cover erosion and sediment control plan and structure design were evaluated for capacity and erosion loss using the Rational Method and the methods defined in the TxDOT *Hydraulic Design Manual*, September 2019.

Intermediate cover erosion and sediment control plans are included in Appendix C1F and C1G.

2.1 Hydrologic and Hydraulic Modeling

2.1.1 HEC-HMS

The COE HEC-HMS program was developed to simulate the surface water runoff response of a watershed. The HEC-HMS model represents a watershed as a network of hydrologic and hydraulic components. The modeling process results in the computation of stream-flow hydrographs at desired locations in the watershed. The following assumptions were made as part of the hydrologic modeling process:

- Precipitation is distributed uniformly and with constant intensity over the watershed.
- The watershed is divided into three separate processes: loss, transform, and baseflow. Part of the precipitation falling on the land surface is lost due to infiltration and is represented with a loss method. Rainfall that does not infiltrate becomes direct runoff and moves across the watershed surface or through the upper soil horizons and eventually reaches the watershed outlet. All runoff processes are represented as pure surface routing using a transform method. Groundwater contributions to channel flow are called baseflow and are not considered due to the brief duration of the hydrologic modeling simulation.
- The Espey "10-Minute Method" was used to estimate Snyder Parameters for watershed areas.

2.2 Hydrologic Elements Naming Convention

The following naming convention was used in the existing condition and postdevelopment hydrologic evaluations:

CA – drainage area in the existing condition

DA – drainage area within the proposed permit boundary, postdevelopment condition

OS – drainage area outside of the permit boundary

R – designates a reach that conveys runoff through a given drainage area (example: R1 conveys runoff through drainage area DA01)

CP – comparison point where surface water runoff exits the permit boundary

J – junction

POND – designates a pond (example: PA01 is within drainage area Pond in the postdevelopment condition.)

3 EXISTING CONDITION

The permit boundary, as shown in Appendix C1A on Drawing C1A.1, was used to evaluate the existing condition and postdevelopment runoff conditions. The postdevelopment condition runoff summary is shown on Drawing C1A.2. The existing condition hydrology calculations are provided in Appendix C1B. Discharge values at the comparison points along the permit boundary, as shown on Drawing C1A.1, were determined for the existing condition. Under existing conditions, only drainage area CA1 contributes surface runoff to the permit boundary at CP1. Stormwater from drainage area CA2 is retained in onsite ponds and depressions. The industrial stormwater permit for the soil mining operation allows pumping water to the West Fork Trinity River at CP2. The industrial stormwater permit does not specify a maximum discharge flow rate at CP2.

Discharge points CP1 and CP2 are located outside of the 100-year floodplain as shown on Drawings C1A.1 and C1B.1. The facility permit boundary was intentionally established outside of the FEMA-designated 100-year floodplain. Since both discharge points are outside of the 100-year floodplain, site surface discharges will not be hindered by the 100-year flood.

Comparison point CP3 is a cross-section location on the West Fork Trinity River. A regional analysis of the West Fork Trinity River was performed at a section immediately south of the site. This analysis establishes a baseline for evaluating the relative contribution of postdevelopment stormwater discharges to the river.

4 POSTDEVELOPMENT CONDITION

The postdevelopment condition drainage areas that contribute runoff to the permit boundary are delineated in Appendix C1A on Drawing C1A.2. Discharge values at the comparison points along the permit boundary as shown on Drawing C1A.2 were determined for the postdevelopment condition. Postdevelopment hydrology calculations are provided in Appendix C1C.

No stormwater runoff enters the site along the permit boundary. Stormwater runoff exits the permit boundary at two locations CP1 and CP2 on the southern portion of the site. During minor rainfall events Pond 1 retains all surface water runoff from the final cover of the waste disposal areas which is consistent with existing drainage conditions. For the 25-year, 24-hour rainfall event, an 18-inch concrete pipe culvert with an outlet elevation of 668 msl, approximately 9-feet above the Pond 1 bottom, is used to meter runoff to CP2. A 50-foot-wide channel 2-feet deep will route surface water runoff from CP2 to the floodway of the West Fork Trinity River, within the property limits of the Chisholm Trail Disposal Landfill.

The postdevelopment hydrologic evaluation was incorporated into the regional analysis of the West Fork Trinity River at CP3, a cross-section crossing the floodplain of the river, to demonstrate that the postdevelopment drainage condition does not adversely alter existing drainage patterns.

5 PROPOSED DRAINAGE SYSTEM DESIGN

30 TAC §330.63(c)(1), §330.303 and §330.305(a)–(f)

The proposed drainage system will consist of drainage swales, chutes, perimeter channels, detention ponds, and outlet structures. The facility has been designed to prevent discharge of pollutants into waters in the state or waters of the United States, as defined by the Texas Water Code and the Federal Clean Water Act, respectively. Prior to commencement of landfill operations, the facility will submit a notice of intent to qualify for coverage under the Texas Pollutant Discharge Elimination System (TPDES), consistent with General Permit No. TXR050000 relating to stormwater discharges associated with industrial activity. Landfills are authorized under the General Permit.

5.0 Perimeter Drainage System Design

The perimeter drainage system is designed to convey the 25-year runoff from the developed landfill consistent with TCEQ regulations. The perimeter channel system design calculations are referenced in Appendix C1D. The perimeter drainage structure plans are included in Attachment C3.

The detention pond is designed to provide the necessary storage and outlet control to mitigate impacts to the receiving channels downstream of the Chisholm Trail Disposal Landfill. Detention pond design parameters are referenced in Appendix C1D, as included in the hydraulic modeling for postdevelopment conditions in Appendix C1C. The detention pond details are shown in Attachment C3.

5.1 Final Cover Drainage Structure Design

Stormwater runoff will be collected in swales, located near the upper grade break on the landfill and on the 4:1 (horizontal to vertical) side slopes, leading to drainage letdown structures or chutes on the 4:1 side slopes and to the perimeter drainage system. The perimeter drainage system will be constructed as each sector is developed.

The final cover drainage system swales and chutes are designed to convey the 25-year peak flow rate. These swales, channels, and chutes will also reduce maintenance at the site after closure by minimizing erosion. The final cover erosion control design calculations are included in Appendix C1E. The final cover design, showing the locations of the drainage swales, chutes, and final cover drainage structure details, is illustrated in Appendix C1E.

The chutes are designed to convey the 25-year, 24-hour peak flow rate. The chutes are designed with 40-mil textured FML to minimize erosive conditions along the chute and at swale/chute confluences. The chutes convey stormwater into the perimeter channels or directly into the detention ponds. The chutes are designed using concrete to provide erosion protection where stormwater enters the perimeter channels. The chute design calculations are included in Appendix C1E. Final cover drainage system details including the chute details are shown in Attachment C3.

5.2 Surface Water Runon Controls

There are no locations along the permit boundary where surface water enters the permit boundary in the postdevelopment condition. Surface water drainage in and around the facility will be controlled by the perimeter drainage system described in Section 5.0 and will be prevented from entering the landfill footprint and waste disposal area. The landfill perimeter road, berm, and perimeter drainage channels and detention pond will be constructed as the landfill is developed as depicted in Attachment D3.

Temporary berms will be constructed around the active working face to divert uncontaminated surface water away from the active working face. Temporary containment berms will be constructed around the active working face to collect and contain surface water that has come in contact with the waste. These run-on and runoff controls around the active working face are designed to collect and control surface water generated from a 25-year, 24-hour storm event. Refer to Part III, Attachment D6 for these calculations.

6 EROSION AND SEDIMENTATION CONTROL

30 TAC §330.305

6.0 Final Cover Stormwater System Control Plan

Perimeter drainage channels and detention ponds will be constructed as the development of the landfill progresses. Erosion will be mitigated by vegetation, rock riprap, gabions, or other materials as provided for in the drainage design calculations.

Swales and chutes will be constructed during placement of the final cover. The final cover includes an erosion layer that is a minimum of 12 inches of earthen material with the top 6 inches capable of sustaining native plant life and will be seeded with native and introduced grasses immediately following the application of final cover in order to minimize erosion. A soil loss demonstration for the erosion layer is included in Appendix C1E of this attachment. The swales and chutes include vegetation, rock riprap, gabions, and other materials as provided in the drainage calculations.

6.1 Final Cover Stormwater System Maintenance Plan

Landfill personnel will inspect, restore, and repair channels, drainage swales, chutes, and flood control structures in the event of wash-out or failure. Excessive sediment will be removed, as needed, so that the drainage structures function as designed. Site inspections will be performed weekly or within 48 hours of a rainfall event of 0.5 inches or more. Documentation of the inspection will be included in the site operating record.

The following items will be evaluated during the inspections:

- Erosion of final cover areas, perimeter ditches, chutes, swales, detention ponds, berms, and other drainage features
- Settlement of final cover areas, perimeter ditches, chutes, swales, and other drainage features
- Silt and sediment build-up in perimeter ditches, chutes, swales, and detention ponds
- Obstructions in drainage features
- Presence of erosion or sediment discharge at perimeter stormwater discharge locations
- Presence of sediment discharges along the site boundary in areas that have been disturbed by site activities

Maintenance activities will be performed to correct damaged or deficient items noted during the site inspections. These activities will be performed as soon as reasonably possible after the inspection. The time frame for correction of damaged or deficient items will vary based on weather, ground conditions, and other site-specific conditions.

Maintenance activities will consist of the following, as needed:

- Placement of additional temporary or permanent vegetation
- Placement, grading, and stabilization of additional soils in eroded areas or in areas that have experienced settlement
- Replacement of riprap or other structural lining
- Placement of additional riprap in eroded areas or in areas that have experienced settlement
- Removal of obstructions from drainage features
- Removal of silt and sediment build-up in perimeter ditches, chutes, swales, detention ponds, retention ponds, and other surface water drainage structures.
- Repairs to erosion and sedimentation controls
- Installation of additional erosion and sedimentation controls

6.2 Intermediate Cover Erosion and Sedimentation Control Plan

Erosion and sediment controls have been designed for intermediate cover. The intermediate cover erosion and sedimentation control plan includes temporary structures and vegetation to mitigate erosion. The Intermediate Cover Erosion and Sedimentation Control Plan is provided in Appendix C1F and the Intermediate Cover Erosion Control Structure Design is provided in Appendix C1G.

6.3 Weekly Cover Erosion and Sedimentation Control Plan

Erosion and sediment controls for weekly cover will be consistent with the requirements of Part IV Section 8.18. The weekly cover will be sloped to drain. Runoff from areas that have intact weekly cover is considered uncontaminated stormwater runoff. Erosion and sediment controls for weekly cover will include the following procedures:

- Areas with weekly cover will be inspected daily for erosion that may cause contaminated runoff from the weekly cover.
- After each rainfall event all weekly cover areas will be inspected for erosion or other damage and repaired as necessary. Runoff from damaged or eroded areas will be handled as contaminated water until repairs are completed.
- Weekly cover will be compacted and sloped to drain.
- Should erosion of weekly cover be observed, the weekly cover will be replaced so that no solid waste is exposed at the end of the operating day. In the event that additional soil stabilization or erosion control measures are deemed necessary temporary sediment control fences, swales, or filter berms will be constructed.

7 EXISTING CONDITION /POSTDEVELOPMENT COMPARISON

30 TAC §330.63(c)(1)(D)(iii) and §330.305(a)

Consistent with 30 TAC §330.63(c)(1)(D)(iii) and §330.305(a), the proposed landfill development will not adversely alter existing drainage patterns. A comparison of the existing and postdevelopment drainage conditions is included in Appendix C1A. Supporting calculations are presented in Appendix C1B and C1C.

For the postdevelopment site configuration shown on Drawing C1C.1, the stormwater outfall locations along the proposed permit boundary CP1 and CP2 remain consistent with the existing locations shown on Drawing C1B.1. The existing condition and postdevelopment surface water runoff has been evaluated for the peak flow rate, volume of runoff, and peak velocity at each of these comparison points. A comparison table is included in Appendix C1A. The table also includes a summary of a regional drainage analysis of the West Fork Trinity River at a cross-section located immediately south of the site, shown and identified as CP3.

The existing site is currently being mined for construction materials. While there is evidence of historical discharges from the site at comparison point CP2, for purposes of this evaluation and to demonstrate the proposed landfill will not adversely alter existing drainage patterns, the existing condition discharge at CP2 was assumed to be zero, with all stormwater from a 25-year, 24-hour storm collected on-site in existing ponds and depressions. This represents a conservative approach for this analysis; although, some discharges will continue to occur at this location prior to landfill development, as authorized by the industrial stormwater discharge permit for the mining operation.

Discharges from CP1 maintain the existing overland flow characteristic into the floodplain of the West Fork Trinity River just south of the site in both the existing and postdevelopment conditions. The peak flow rate and volume will increase slightly at CP1. However, this change will not result in adverse alterations because the postdevelopment velocity is maintained at a low, non-erodible velocity, well below the typical erosive threshold of 5 feet per second, and the change in volume is released at a rate that will not adversely alter existing drainage patterns.

In the postdevelopment condition, discharges will occur from CP2 during a 25-year, 24-hour storm event. Such discharges will be routed from CP2 to the floodplain of the West Fork Trinity River in a channel. The velocity in the channel will remain well below an erodible velocity of 5 fps. The channel will be sized to contain the peak flow from a 25 year, 24-hour storm and will be located entirely within property to be owned by Chisholm Trail Disposal, LLC. To further evaluate the impact of postdevelopment condition discharges from the site, a regional hydrologic analysis of the West Fork Trinity River was conducted at cross-section CP3. The analysis shows that the additional postdevelopment discharges from the site will increase the river's 25-year, 24-hour peak flow rate by less than 0.025% and its volume by less than 0.06%. These changes will not adversely alter drainage patterns of the West Fork Trinity River.

Given that the proposed landfill development (1) will not change existing drainage discharge locations and (2) will not significantly increase the peak flow rate or volume in the West Fork Trinity River, and that (3) the postdevelopment discharges from CP1 will continue to flow overland into the floodplain of the West Fork Trinity River and (4) the discharges from CP2 will flow in a channel on property to be owned by Chisholm Trail Disposal, LLC prior to entering the West Fork Trinity River floodplain, it is concluded that the proposed landfill development will not adversely alter existing drainage patterns consistent with §330.305(a).

8 CONCLUSIONS

- The drainage design criteria and analyses used for these drainage analyses satisfy the requirements of 30 TAC Chapter 330.
- The final cover drainage structures (swales, chutes) are designed in accordance with the rules to convey peak flow rates from the 25-year, 24-hour rainfall event.
- Perimeter channels are designed in accordance with the rules for the 25-year, 24-hour rainfall event.
- Detention pond capacity and outlet are designed in accordance with the rules for the 25-year, 24-hour rainfall event.
- Erosion will be minimized by using Best Management Practices.
- The proposed landfill development will not adversely alter existing drainage patterns.

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX C1A
EXISTING CONDITION/POSTDEVELOPMENT COMPARISON

0 300 600
SCALE IN FEET

LEGEND

PERMIT BOUNDARY
10' CONTOUR
STATE PLANE COORDINATES
100-YEAR FLOOD PLAIN
DRAINAGE AREA BOUNDARY
(CA1) DRAINAGE AREA DESIGNATION
CP-1 COMPARISON POINT

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
3. 100-YEAR FLOOD INFORMATION TAKEN FROM FEMA FLOOD INSURANCE RATE MAP (FIRM) OF WISE COUNTY, TEXAS AND INCORPORATED AREAS COMMUNITY PANEL NUMBER 48497C0475D REVISED DECEMBER 16, 2011.

Existing Condition Flow Summary

Watershed Name	Drainage Area (Ac)	Drainage Area (mi2)	25-Year Peak Flow (cfs)	25-Year Volume (Ac-ft)
CA1	10.4	0.0163	27.6	4.0
CA2	241.2	0.3769	0.0	0.0
WFTR-DA	283573.0	443.0828	129140.4	103581.3

Existing Condition Boundary Analysis Summary

Comparison Point	"Total Contributing Drainage Area (mi2)"	"25-Year Peak Flow Rate (cfs)"	"25-Year Volume (ac-ft)"	"25-Year Peak Velocity (fps)"
CP1	0.0163	27.6	4.0	1.38
CP2	0.3769	0.0	0.0	0.00
CP3	443.0991	129142.9	103585.3	

* COMPARISON POINT 3 (CP3) IS A CROSS SECTION LOCATED ON THE WEST FORK TRINITY RIVER

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

EXISTING CONDITIONS
DRAINAGE AREA SUMMARY

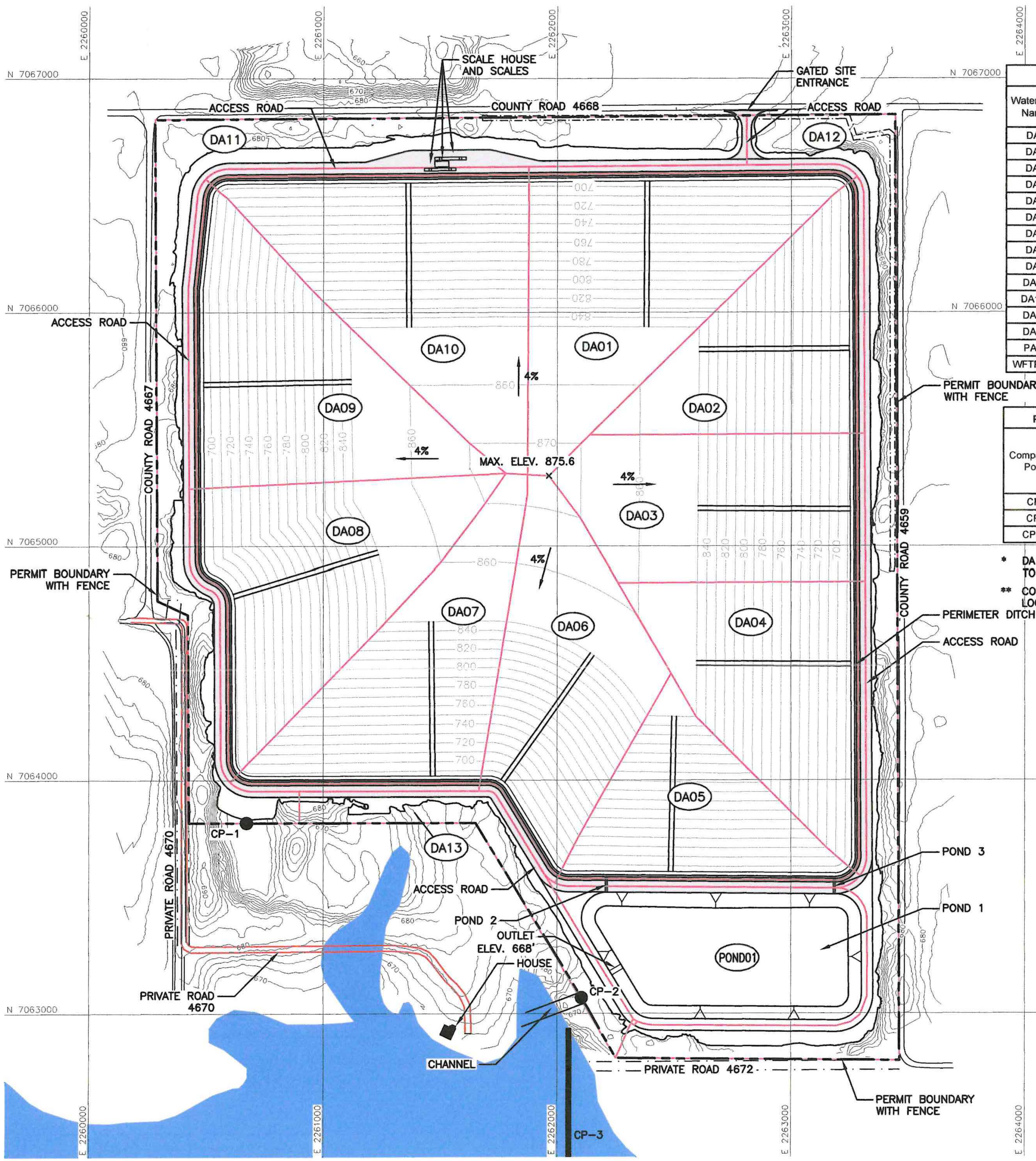
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAINAGE AREA SUMMARY
C1A.1

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C1-B-1 & C1-A-1_ExConditions-DASummary for Second Drainage.dwg Layout: C1A.1 User: awhite



Postdevelopment Flow Summary				
Watershed Name	Drainage Area (Ac)	Drainage Area (mi2)	25-Year Peak Flow (cfs)	25-Year Volume (Ac-ft)
DA1	23.2	0.0362	86.8	10.6
DA2	15.5	0.0242	61.6	7.1
DA3	17.6	0.0275	66.7	8.1
DA4	17.7	0.0277	72.1	8.1
DA5	13.5	0.0210	58.2	6.2
DA6	17.9	0.0279	69.4	8.2
DA7	17.6	0.0275	68.4	8.1
DA8	20.5	0.0321	78.4	9.4
DA9	20.9	0.0326	79.6	9.6
DA10	23.3	0.0364	87.3	10.7
DA11*	23.0	0.0359	33.6	7.8
DA12	19.0	0.0298	26.2	6.5
DA13	6.3	0.0098	18.3	2.1
PA01	15.7	0.0245	30.5	8.9
WFTR-DA	283573.0	443.0828	129140.4	103581.3

Postdevelopment Boundary Analysis Summary				
Comparison Point	"Total Contributing Drainage Area (mi2)"	"25-Year Peak Flow Rate (cfs)"	"25-Year Volume (ac-ft)"	"25-Year Peak Velocity (fps)"
CP1	0.0359	33.6	7.8	1.49
CP2	0.3572	46.1	57.5	1.75
CP3**	443.5	129175.0	103646.5	

* DA11 IS THE ONLY DRAINAGE AREA THAT CONTRIBUTES TO CP1 IN THE POSTDEVELOPMENT CONDITION

** COMPARISON POINT 3 (CP3) IS A CROSS SECTION LOCATED ON THE WEST FORK TRINITY RIVER

0 250 500
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 700 — 10' CONTOUR
- N 7066000 — STATE PLANE COORDINATES
- 900 — LANDFILL 10' CONTOUR
- DRAINAGE AREA BOUNDARY
- DA02 — DRAINAGE AREA DESIGNATION
- CHUTE
- COMPARISON POINT
- 100-YEAR FLOOD PLAIN

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

POSTDEVELOPMENT DRAINAGE AREA SUMMARY

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1A.2

EXISTING CONDITION/POSTDEVELOPMENT BOUNDARY ANALYSIS SUMMARY TABLE

EXISTING CONDITION/POSTDEVELOPMENT BOUNDARY ANALYSIS SUMMARY TABLE

Discharge Point	Total Contributing Drainage Area (ac)			25-Year Peak Flow Rate (cfs)			25-Year Volume (Ac-ft)			25-Year Peak Velocity (fps)		
	Existing	Post-Development	Difference	Existing	Post-Development	Difference	Existing	Post-Development	Difference	Existing	Post-Development	Difference
CP1	10.4	23.0	12.5	27.6	33.6	6.0	4.0	7.8	3.8	1.4	1.5	0.1
CP2	241.2	228.6	-12.6	0.0	46.1	46.1	0.0	57.5	57.5	0.0	1.8	1.8

Note: The postdevelopment drainage design redirects 12.6 acres from CP2's contributing area to CP1, resulting in a corresponding 12.5 acre increase to CP1's drainage area while maintaining overall hydrologic balance between the discharge points.

REGIONAL DRAINAGE ANALYSIS WEST FORK TRINITY RIVER

Discharge Point	Total Contributing Drainage Area (ac)			25-Year Peak Flow Rate (cfs)			25-Year Volume (Ac-ft)		
	Existing	Post-Development	Difference	Existing	Post-Development	Difference	Existing	Post-Development	Difference
CP3	283583.4	283824.6	241.2	129142.9	129175.0	32.1	103585.3	103646.5	61.2

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX C1B
EXISTING CONDITION HYDROLOGIC CALCULATIONS

EXISTING CONDITION NARRATIVE

30 TAC §330.305

This existing condition hydrologic analysis has been prepared for the Chisholm Trail Disposal Landfill, in accordance with §330.305.

EXISTING CONDITION DRAINAGE AREA DRAWINGS

Drawing C1B.1 delineates drainage areas contributing stormwater runoff to the permit boundary under existing site conditions. Only drainage area CA1 generates surface runoff, which flows to comparison point CP1. Stormwater from drainage area CA2 is retained in onsite surface water ponds and depressions.

Drawing C1B.2 shows a drainage analysis of the West Fork Trinity River region just south of the site. The analysis depicts how discharges from points CP1 and CP2 flow into the river upstream of CP3, which is a cross-section location on the river. This analysis evaluates the 25-year, 24-hour flow rate in the river.

Drawing C1B.3 is the soil map that depicts the Chisholm Landfill permit boundary and the existing soil types. The Soil Survey of Wise County, Texas, published by the Soil Conservation Service, is the reference for the base map and soils information.

METHODS USED TO EVALUATE THE EXISTING CONDITION

The US Army Corps of Engineers Hydraulic Engineering Center's Hydraulic Modeling System (HEC-HMS) program was used to perform the hydrologic modeling of the Chisholm Trail Disposal Landfill. HEC-HMS is designed to simulate the precipitation-runoff processes of dendritic watershed systems.

Espey's "10-Minute" Method for estimating Snyder parameters was used to calculate peak discharge for each drainage area for the existing condition configuration. The method is applicable for the steep terrain associated with final cover and for the increased imperviousness related to other landfill improvements.

EXISTING CONDITION WATERSHED CHARACTERISTICS

Watershed characteristics have been developed for the existing condition hydrologic evaluation. The watershed characteristics address drainage area runoff characteristics, unit hydrograph data, and reach characteristics. This information is included on pages C1B.9 and C1B.10.

The first table, titled Existing Condition Watershed Characteristics, page C1B.9, provides the summary of drainage areas, soil types, Curve Numbers (CN) values, initial loss, reach slope calculations, and determination of Manning's n value. The Soil Conservation Service (SCS) CN were derived from watershed characteristic tables from the SCS Technical Report 55 (TR-55), which included evaluation of soil and surface cover/condition characteristics. The second table, titled Unit Hydrograph Data – Snyder's Hydrograph Coefficients, pages C1B.10, provides the determination of the Snyder's Unit Hydrograph parameters.

RAINFALL DATA

The hypothetical precipitation for the storm event for the facility was taken from the National Oceanic and Atmospheric Administration (NOAA) Point Precipitation Frequency Estimates (Atlas 14, Volume 11, Version 2). A return period of 25 years and a duration of 24 hours was used for the design storm. The rainfall data for the facility located in Wise County, Texas is depicted in the table on page C1B.12.

HYDROLOGIC ANALYSIS

For the hydrologic evaluation, HEC-HMS was used for the precipitation-runoff simulation for the existing condition. The following describes the various modeling components. The HEC-HMS hydrologic analysis results begin on page C1B.14.

Watershed Subareas and Schematization

The drainage areas that contribute flow to the permit boundary were delineated into subareas to derive peak flows to determine existing runon and runoff flows. Hydrographs are developed for each subarea and appropriately combined and routed through existing surface drainage features. The subareas are shown on Drawing C1B.1 – Existing Condition Drainage Area Summary, and page C1B.12 for the HEC-HMS schematic of the existing condition.

Time Step

The time step, or the program computation interval, is the duration of the unit hydrograph. The time step selected is 5 minutes, which results in 289 hydrograph ordinates in 24 hours.

Hypothetical Precipitation

A return period of 25 years and a duration of 24 hours was used for the design storm. The rainfall data used is shown in the rainfall data table on page C1B.12. The precipitation is assumed to be evenly distributed over the entire landfill for each time interval.

Precipitation Losses

Precipitation losses (the precipitation that does not contribute to the runoff) are calculated using the Soil Conservation Service (SCS) Curve Number (CN) method. CN is a function of soil cover, land use, and antecedent moisture conditions. The CN values used for each drainage area are shown in the Watershed Characteristics tables on pages C1B.9 and C1B.10.

Synthetic Unit Hydrographs and Flow Routing

The rainfall/runoff transformation was performed with the Unit Hydrograph Method. The synthetic unit hydrographs for each watershed were derived by the Snyder Method and Espey, "10-Minute Method" for estimating Snyder Parameters for the permit boundary. The parameters and input values for this model are included in the Watershed Characteristics tables on pages C1B.9 and C1B.10.

The Kinematic Wave Method was used for routing of the flood wave through the existing drainage channels in the postdeveloped condition. This method is capable of accounting for hydrograph attenuation based on physical channel properties such as length, bottom slope, channel shape, bottom width, and channel roughness. In the existing condition, drainage areas contributed directly to the permit boundary and no channel routing analysis was required.

EXISTING CONDITION VELOCITY SUMMARY

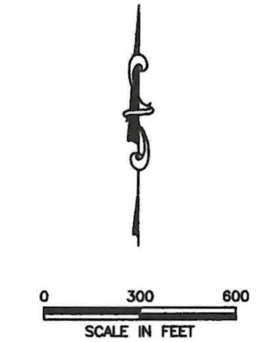
Surface water velocities were determined for each discharge point where the surface water exits the permit boundary. The 25-year, 24-hour peak flow rate was used to determine the velocity at the permit boundary. Manning's Equation was used to evaluate the velocities at the discharge points. Refer to Drawing C1B.1 for the locations of the discharge points and peak flow rate. Refer to page C1B.17 for the existing condition velocity calculations.

EXISTING CONDITION FLOW AND BOUNDARY ANALYSIS SUMMARY

The existing condition flow summary table on page C1B.18 lists the peak flow rate for each drainage area for the 25-year rainfall event. This table summarizes the results of the hydrologic evaluation.

The analysis summary for the existing condition is provided on page C1B.19. The table provides for each comparison point, the peak flow rate, velocity, and volume resulting from the HEC-HMS evaluation for the 25-year, 24 hour rainfall.

EXISTING CONDITION DRAINAGE AREA DRAWINGS



LEGEND

- PERMIT BOUNDARY
- 10' CONTOUR
- STATE PLANE COORDINATES
- 100-YEAR FLOOD PLAIN
- DRAINAGE AREA BOUNDARY
- (CA1) DRAINAGE AREA DESIGNATION
- CP-1 COMPARISON POINT

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
3. 100-YEAR FLOOD INFORMATION TAKEN FROM FEMA FLOOD INSURANCE RATE MAP (FIRM) OF WISE COUNTY, TEXAS AND INCORPORATED AREAS COMMUNITY PANEL NUMBER 48497C0475D REVISED DECEMBER 16, 2011.

Existing Condition Flow Summary

Watershed Name	Drainage Area (Ac)	Drainage Area (mi2)	25-Year Peak Flow (cfs)	25-Year Volume (Ac-ft)
CA1	10.4	0.0163	27.6	4.0
CA2	241.2	0.3769	0.0	0.0
WFTR-DA	283573.0	443.0828	129140.4	103581.3

Existing Condition Boundary Analysis Summary

Comparison Point	"Total Contributing Drainage Area (mi2)"	"25-Year Peak Flow Rate (cfs)"	"25-Year Volume (ac-ft)"	"25-Year Peak Velocity (fps)"
CP1	0.0163	27.6	4.0	1.38
CP2	0.3769	0.0	0.0	0.00
CP3	443.0991	129142.9	103585.3	

* COMPARISON POINT 3 (CP3) IS A CROSS SECTION LOCATED ON THE WEST FORK TRINITY RIVER

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

EXISTING CONDITIONS DRAINAGE AREA SUMMARY

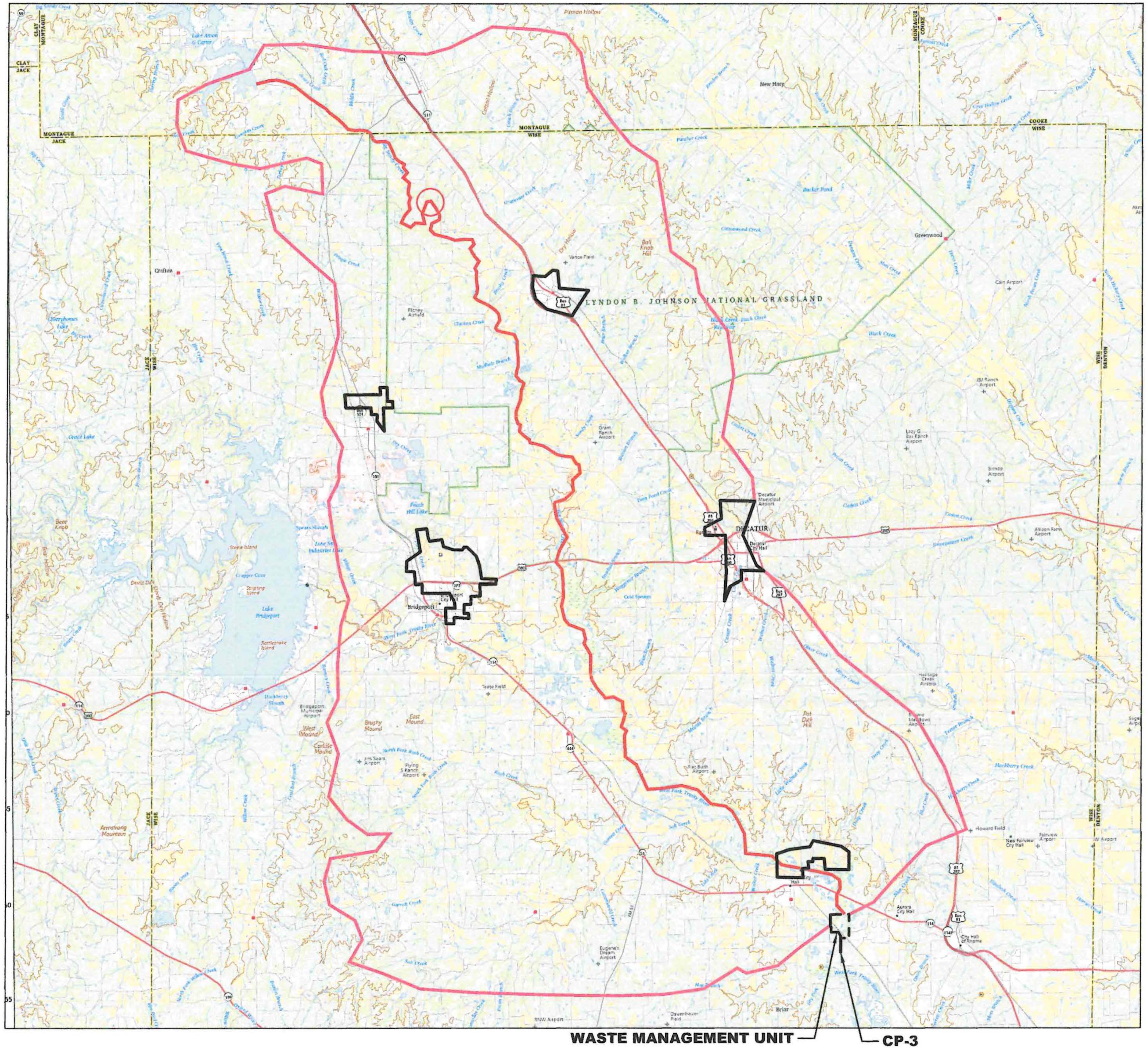
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

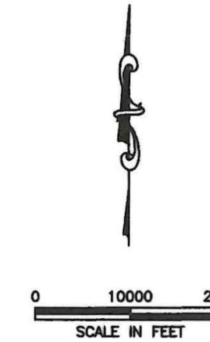
BME

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1B.1





LEGEND

(dash line)	PERMIT BOUNDARY
(pink line)	DRAINAGE AREA BOUNDARY
(red line)	REACH
(outline)	URBAN AREA

BOYD, TEX
2024

ROAD CLASSIFICATION: Expressway; Secondary Hwy; Local Connector; Local Road; Tunnel (Highway); Tunnel (Connector); Tunnel (Local)
AIR TRANSPORTATION: Heliport; Seaplane; Small Airport; Large Airport Runway
TRAILS: Standard; Snow; Water
HYDROGRAPHY: Perennial Stream; Intermittent Stream; Spring; Waterfall; Rock; Well; Flume; Reef; Levee; Tunnel; Emergent Wetlands; Forested Wetlands; Perennial Lake; Intermittent Lake; Reservoir; Nonearthen Reservoir; Foreshore; Rapids; Ice Mass; Area of Complex Channels; Wash; Inundation Area
STRUCTURES: Fire Station; Hospital; Law Enforcement; Campground/Shelter; Trailhead; Cabin/Guard Station/Lookout
FEDERAL ADMINISTRATED LANDS: U.S. Forest Service; National Park Service; U.S. Fish and Wildlife Service; Department of Defense; National Cemetery; National Monument; Wilderness; Bureau of Land Management

NOTES:

1. 100K TOPOGRAPHIC BASE MAPS WISE COUNTY, TEX DOWNLOADED FROM USGS WEBSITE ON MAY 15, 2023.
2. REFER TO DRAWING IA.5–AERIAL PHOTOGRAPH FOR GENERAL CHARACTER OF AREAS ADJACENT TO THE FACILITY.

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

REGIONAL DRAINAGE MAP

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME

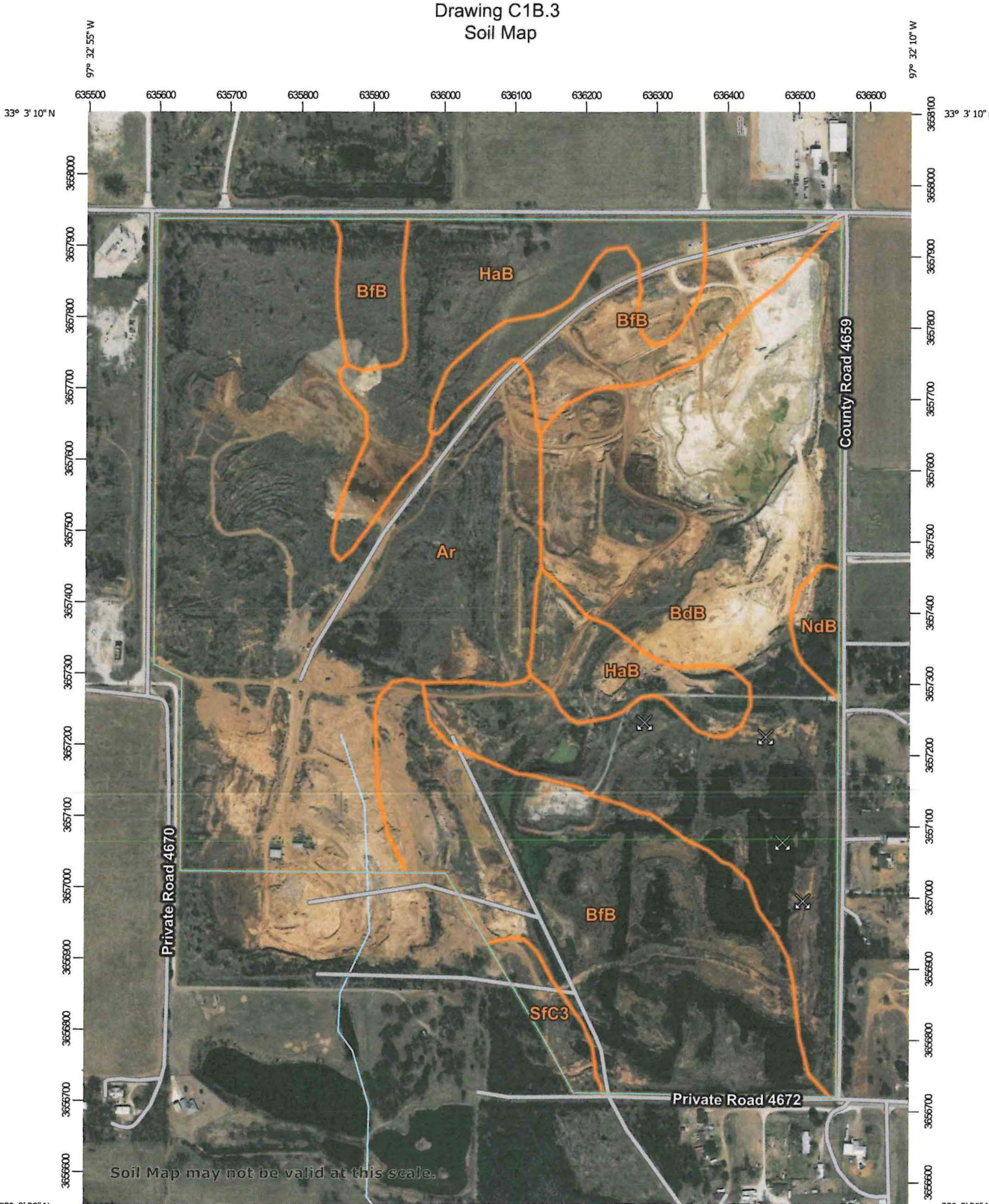
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1B.2

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C1-B-2_RegionDrainPlan.dwg Layout: Layout2 User: awhite

Drawing C1B.3
Soil Map



Map Scale: 1:7,480 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 350, 700, 1400, 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

EXISTING CONDITION WATERSHED CHARACTERISTICS

UNIT HYDROGRAPH DATA

Existing Condition Watershed Characteristics

			CN Determination					Main Reach Slope Calculation (for Espey Method)					Mannings "n" Determination			
Watershed Name	Watershed Area (ac)	Watershed Area (sq mi)	Hydrologic Soils Group "B" (ac) CN = 69	Hydrologic Soils Group "C" (ac) CN = 79	Hydrologic Soils Group "D" (ac) CN = 84	Pond Area (ac) CN = 98	CN	Longest Reach (ft)	20% of Reach Length (ft)	Elevation @ 20% Reach Length from Upstream	Downstream Elevation	Slope (ft/ft)	Sheet Flow % of n = 0.070	Shallow Concentrated or Swale Flow % of n = 0.050	Channelized Flow % of n = 0.035	Composite n
CA1	10.40	0.0163	0.0	10.4	0.0	0.0	79	1021.1	204	688.0	670.0	0.0220	9.8	49.0	41.2	0.046
CA2	241.2	0.3769	0.0	0.0	0.0	0.0	0									

UNIT HYDROGRAPH DATA

Regional Watershed Characteristics

			CN Determination					Main Reach Slope Calculation (for Espey Method)					Mannings "n" Determination			
Watershed Name	Watershed Area (ac)	Watershed Area (sq mi)	Hydrologic Soils Group "B" (ac) CN = 69	Hydrologic Soils Group "C" (ac) CN = 79	Hydrologic Soils Group "D" (ac) CN = 84	Urban (ac) CN = 94	CN	Longest Reach (ft)	20% of Reach Length (ft)	Elevation @ 20% Reach Length from Upstream	Downstream Elevation	Slope (ft/ft)	Sheet Flow % of n = 0.070	Shallow Concentrated or Swale Flow % of n = 0.050	Channelized Flow % of n = 0.035	Composite n
WFTR-DA	283573.0	443.0828	83370.5	138093.2	55580.3	6529.0	77	234792	46958	980.0	660.0	0.0017	0.0	0.0	100.0	0.035

UNIT HYDROGRAPH DATA

Snyder's Hydrograph Coefficients (Espey's 10-Minute Method)

Existing Condition

Watershed Name	Longest Reach (ft)	Slope (ft/ft)	Impervious Cover %	Manning's "n"	Eff. Coeff.	Tr (min)	Tlag (min)	Area (sq mi)	qp (cfs/sq mi)	Tlag (hr)	Cp
					(A)	(B)	(C)		(D)		(E)
CA1	1021.1	0.0220	2.0	0.046	0.90	29.5	27.0	0.0163	995.9	0.45	0.70
WFTR-DA	234792	0.0017	2.0	0.035	0.85	180.4	177.9	443.0828	95.4	2.96	0.44

(A) Conveyance efficiency from Dodson & Associates, Inc. Hands-On HEC-1, February 1999, pgs 6-19.

(B) $Tr=3.1(L^{0.23})(S^{-0.25})(I^{-0.18})(Effcoef^{-1.57})$

(C) $Tlag=Tr-(5/2)$

(D) $qp=31600(A^{-0.04})(Tr^{-1.07})$

(E) $Cp=49.375(A^{-0.04})(Tr^{-1.07})(Tlag)$

Tr = surface runoff to unit hydrograph peak (min)
L = distance along main channel from study point to watershed boundary
S = main channel slope (ft/ft)
I = impervious cover within the watershed
Tlag = watershed lag time (min)
qp = Hydrograph peak discharge (cfs/sq. mi.)
Cp = Snyder's peaking coefficient

RAINFALL DATA

NOAA Atlas 14, Volume 11, Version 2
Location name: Rhome, Texas, USA*
Latitude: 33.047°, Longitude: -97.5439°
Elevation: 673 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.403 (0.305-0.532)	0.470 (0.359-0.616)	0.580 (0.442-0.763)	0.672 (0.504-0.894)	0.798 (0.581-1.09)	0.895 (0.634-1.25)	0.992 (0.684-1.42)	1.09 (0.733-1.60)	1.22 (0.792-1.85)	1.32 (0.834-2.04)
10-min	0.646 (0.489-0.853)	0.755 (0.576-0.988)	0.932 (0.710-1.22)	1.08 (0.810-1.44)	1.28 (0.934-1.76)	1.44 (1.02-2.02)	1.60 (1.10-2.29)	1.75 (1.18-2.57)	1.94 (1.26-2.94)	2.09 (1.32-3.24)
15-min	0.802 (0.607-1.06)	0.935 (0.715-1.22)	1.15 (0.879-1.52)	1.34 (1.00-1.78)	1.58 (1.15-2.16)	1.78 (1.26-2.49)	1.97 (1.36-2.82)	2.16 (1.45-3.17)	2.41 (1.57-3.65)	2.60 (1.65-4.03)
30-min	1.11 (0.840-1.46)	1.29 (0.987-1.69)	1.59 (1.21-2.09)	1.84 (1.38-2.45)	2.18 (1.58-2.98)	2.44 (1.73-3.42)	2.70 (1.86-3.87)	2.97 (1.99-4.36)	3.32 (2.16-5.03)	3.59 (2.27-5.56)
60-min	1.44 (1.09-1.90)	1.68 (1.28-2.20)	2.07 (1.58-2.72)	2.40 (1.80-3.19)	2.85 (2.07-3.89)	3.19 (2.26-4.47)	3.54 (2.44-5.08)	3.90 (2.62-5.73)	4.38 (2.85-6.64)	4.76 (3.01-7.36)
2-hr	1.76 (1.34-2.30)	2.07 (1.59-2.68)	2.58 (1.98-3.35)	3.00 (2.27-3.95)	3.59 (2.63-4.85)	4.05 (2.88-5.60)	4.52 (3.13-6.40)	5.00 (3.38-7.25)	5.67 (3.70-8.47)	6.19 (3.94-9.45)
3-hr	1.96 (1.50-2.54)	2.32 (1.78-2.97)	2.89 (2.22-3.74)	3.38 (2.56-4.42)	4.06 (2.98-5.46)	4.60 (3.28-6.32)	5.15 (3.58-7.24)	5.73 (3.88-8.24)	6.52 (4.27-9.67)	7.15 (4.56-10.8)
6-hr	2.31 (1.78-2.97)	2.76 (2.14-3.50)	3.47 (2.69-4.44)	4.08 (3.11-5.28)	4.93 (3.65-6.56)	5.61 (4.03-7.62)	6.31 (4.42-8.77)	7.06 (4.81-10.0)	8.08 (5.32-11.8)	8.89 (5.70-13.3)
12-hr	2.71 (2.10-3.45)	3.26 (2.54-4.09)	4.14 (3.23-5.24)	4.89 (3.76-6.27)	5.94 (4.42-7.81)	6.78 (4.90-9.10)	7.64 (5.38-10.5)	8.55 (5.86-12.0)	9.81 (6.48-14.1)	10.8 (6.95-15.9)
24-hr	3.16 (2.46-3.98)	3.82 (3.00-4.74)	4.86 (3.82-6.09)	5.76 (4.46-7.31)	7.02 (5.26-9.12)	8.02 (5.84-10.6)	9.05 (6.41-12.3)	10.1 (6.99-14.0)	11.6 (7.74-16.6)	12.8 (8.30-18.6)
2-day	3.66 (2.88-4.56)	4.41 (3.48-5.42)	5.59 (4.42-6.93)	6.61 (5.15-8.29)	8.04 (6.06-10.3)	9.18 (6.72-12.0)	10.4 (7.36-13.9)	11.6 (8.07-15.9)	13.4 (8.97-18.8)	14.8 (9.64-21.2)
3-day	4.00 (3.16-4.95)	4.80 (3.80-5.85)	6.05 (4.80-7.45)	7.14 (5.59-8.90)	8.69 (6.58-11.1)	9.94 (7.31-12.9)	11.3 (8.04-14.9)	12.7 (8.79-17.1)	14.6 (9.79-20.3)	16.2 (10.6-22.9)
4-day	4.24 (3.36-5.23)	5.09 (4.04-6.18)	6.42 (5.11-7.87)	7.58 (5.95-9.41)	9.24 (7.01-11.7)	10.6 (7.79-13.7)	12.0 (8.58-15.8)	13.5 (9.40-18.2)	15.6 (10.5-21.6)	17.3 (11.3-24.4)
7-day	4.76 (3.79-5.82)	5.74 (4.58-6.90)	7.26 (5.81-8.82)	8.59 (6.78-10.6)	10.5 (8.00-13.2)	12.0 (8.90-15.4)	13.7 (9.82-17.8)	15.4 (10.8-20.5)	17.9 (12.1-24.4)	19.9 (13.1-27.7)
10-day	5.20 (4.16-6.33)	6.28 (5.03-7.50)	7.94 (6.38-9.60)	9.40 (7.44-11.5)	11.5 (8.78-14.3)	13.1 (9.77-16.7)	14.9 (10.8-19.4)	16.9 (11.8-22.3)	19.6 (13.2-26.5)	21.8 (14.3-30.1)
20-day	6.67 (5.37-8.02)	7.93 (6.42-9.42)	9.93 (8.04-11.9)	11.6 (9.29-14.1)	14.1 (10.8-17.3)	16.0 (11.9-20.0)	18.0 (13.0-23.0)	20.2 (14.2-26.3)	23.3 (15.9-31.1)	25.9 (17.1-35.1)
30-day	7.88 (6.38-9.42)	9.30 (7.58-11.0)	11.6 (9.42-13.8)	13.5 (10.8-16.2)	16.2 (12.5-19.8)	18.3 (13.7-22.8)	20.5 (14.9-26.0)	23.0 (16.3-29.7)	26.4 (18.0-34.9)	29.2 (19.4-39.3)
45-day	9.56 (7.77-11.4)	11.3 (9.20-13.2)	14.0 (11.4-16.5)	16.3 (13.1-19.4)	19.5 (15.1-23.7)	22.1 (16.6-27.3)	24.7 (18.1-31.1)	27.6 (19.6-35.3)	31.6 (21.6-41.4)	34.9 (23.1-46.4)
60-day	11.0 (9.00-13.1)	13.0 (10.7-15.2)	16.1 (13.2-19.0)	18.8 (15.2-22.3)	22.6 (17.6-27.3)	25.6 (19.3-31.5)	28.7 (21.0-35.9)	32.0 (22.8-40.7)	36.5 (25.0-47.5)	40.1 (26.7-53.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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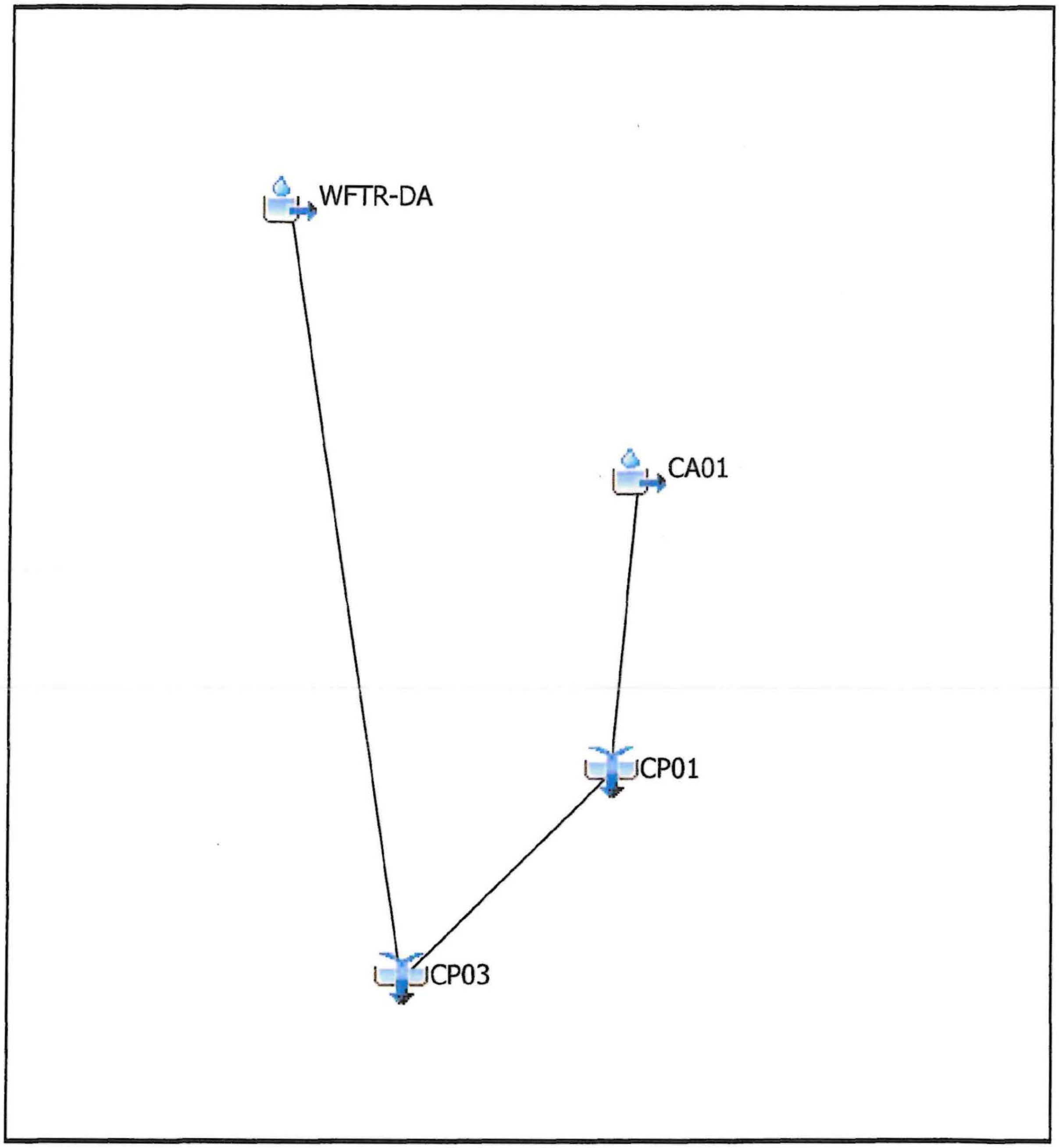
PF graphical

EXISTING CONDITION HYDROLOGIC ANALYSIS

25-YEAR, 24-HOUR STORM EVENT


WFTR-DA
CA01
CP01
CP03

Project:	Chisholm Trail Disposal	Simulation Run:	South CP
Start of Run:	01Jan2024, 00:00	Basin Model:	South CP
End of Run:	03Jan2024, 00:00	Meteorologic Model:	25-Year
Compute Time:	10JDec2024, 11:53:33	Control Specifications	Control 1

Hydrologic Element	Drainage Area (MI^2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
WFTR-DA	443.0828	129140.4	1 January 2024, 15:05	103581.3
CA01	0.0163	27.6	1 January 2024, 12:30	4
CP01	0.0163	27.6	1 January 2024, 12:30	4
CP03	443.0991	129142.9	1 January 2024, 15:05	103585.3

EXISTING CONDITION VELOCITY SUMMARY

Existing Condition 25-Peak Year Velocity Calculations at Permit Boundary Comparison

Required: Determine the 25-year flow depths and velocities at the permit boundary.

Method: Calculate the flow depths and velocities using Manning's Equation.

Solution:

		Velocity Calculations						
Comparison Point	Q (cfs)	Width[1] (ft)	Bottom Slope[2] (%)	Side Slopes[3] (h:v)	Manning's n	Depth (ft)	Peak Velocity (fps)	Shear Stress (psf)
CP01	26.8	80	0.7	50.0	0.030	**0.21**	**1.38**	**0.09**

Notes:

1. Comparison points where surface water runoff exits the permit boundary in established natural or constructed channels; width refers to the bottom width of the channel.
   Comparison points where surface water runoff exits the permit boundary as sheet flow or not well established channels; width refers to the sheet flow width.
2. For channels, bottom slope is the slope of the channel bottom where surface water exits the permit boundary.
   For sheet flow, bottom slope is the slope of the ground where surface water exits the permit boundary.
3. For channels, side slope is the average side slope of the channel where surface water exits the permit boundary.
   For sheet flow, there are no side slopes and are represented by 0.0 in this table.

EXISTING CONDITION FLOW AND BOUNDARY ANALYSIS SUMMARY

Existing Condition Flow Summary

Watershed Name	Drainage Area (Ac)	Drainage Area (mi^2)	25-Year Peak Flow (cfs)	25-Year Volume (Ac-ft)
CA1	10.4	0.0163	27.6	4.0
CA2	241.2	0.3769	0.0	0.0
WFTR-DA	283573.0	443.0828	129140.4	103581.3

Existing Condition Boundary Analysis Summary

Comparison Point	Total Contributing Drainage Area (mi^2)	25-Year Flow Rate (cfs)	25-Year Volume (ac-ft)	25-Year Velocity (fps)
CP1	0.0163	27.6	4.0	1.38
CP2	0.3769	0	0.0	
CP3*	443.0991	129142.9	103585.3	

* Comparison Point 3 (CP3) is a cross section located on the West ForkTrinity River

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX C1C
POSTDEVELOPMENT HYDROLOGIC CALCULATIONS

POSTDEVELOPMENT NARRATIVE

30 TAC §330.305(a)

The postdevelopment hydrologic analysis represents the hydrologic calculations as defined by the landfill completion plan for the Chisholm Trail Disposal Landfill in accordance with §330.305(a)-(d).

POST DEVELOPMENT DRAINAGE AREA DRAWINGS

Drawing C1C.1 delineates drainage areas contributing stormwater runoff to the permit boundary under postdeveloped site conditions. Drainage area DA11 generates surface runoff, which flows to comparison point CP1. Drainage area DA12 generates surface runoff, which flows to comparison point CP2. Drainage areas DA01 through DA10 generate surface water runoff, which flows to Pond 1 where it is retained on-site during minor rainfall events, consistent with existing drainage conditions. For the 25-year, 24-hour rainfall event, an 18-inch concrete pipe culvert with an outlet elevation of 668 msl, approximately 9-feet above the Pond 1 bottom, is used to meter runoff to CP2. A 50-foot-wide channel 2-feet deep will route surface water runoff from CP2 to the floodway of the West Fork Trinity River, within the property limits of the Chisholm Trail Disposal Landfill.

POSTDEVELOPMENT WATERSHED CHARACTERISTICS

Watershed characteristics have been developed for the postdevelopment hydrologic evaluation. The watershed characteristics address drainage area runoff characteristics, unit hydrograph data, reach characteristics, existing culverts, and the proposed final condition drainage system including the detention ponds. This information is included on pages C1C.7 and C1C.8.

The first table, titled Postdevelopment Watershed Characteristics, on page C1C.7, provides the summary of drainage areas, soil types, Curve Numbers (CN) values, initial loss, reach slope calculations, and determination of Manning's n value. The Soil Conservation Service (SCS) CN were derived from watershed characteristic tables from the SCS Technical Report 55 (TR-55), which included evaluation of anticipated postdevelopment soil and surface cover/condition characteristics. The second table, titled Snyder's Hydrograph Coefficients, on page C1C.8, provides the determination of the Espey's 10-Minute Method. The runoff characteristics for the off-site drainage areas did not change from the current permitted condition.

POSTDEVELOPMENT DRAINAGE STRUCTURE DESIGN PARAMETERS

Page C1C.9 includes drainage structure data for the proposed the surface impoundments incorporated into the hydrologic model. The postdevelopment hydrologic model is defined by the landfill completion plan for the Chisholm Trail Disposal Landfill. The existing drainage structures are incorporated as part of the drainage system for the landfill.

HYDROLOGIC ANALYSIS

For the hydrologic evaluation, HEC-HMS was used for the precipitation runoff simulation for the postdevelopment condition. The following describes the various modeling components. The HEC-HMS hydrologic analysis results begin on page C1C.13.

Watershed Subareas and Schematization

The drainage areas that contribute flow to the permit boundary were delineated into subareas to derive peak flows to determine current permitted runon and runoff flows. Hydrographs are developed for each subarea and appropriately combined and routed through the swales and perimeter channels. The subareas are shown on Attachment C1C.1 – Postdevelopment Drainage Area Summary and page C1C.14 for the HEC-HMS Schematic of the postdevelopment condition.

Time Step

The time step, or the program computation interval, is the duration of the unit hydrograph. The time step is selected as 5 minutes, which results in 289 hydrograph ordinates in 24 hours.

Hypothetical Precipitation

A return period of 25 years and a duration of 24 hours was used for the design storm. The rainfall data used is shown in the rainfall data table on page C1B.12. The precipitation is assumed to be evenly distributed over the entire landfill for each time interval.

Precipitation Losses

Precipitation losses (the precipitation that does not contribute to the runoff) are calculated using the Soil Conservation Service (SCS) Curve Number (CN) method. CN is a function of soil cover, land use, and antecedent moisture conditions. The CN values used for each drainage area are shown in the Watershed Characteristic tables on pages C1C.7 and C1C.8.

Synthetic Unit Hydrographs and Flow Routing

The rainfall/runoff transformation was performed with the Unit Hydrograph Method. The synthetic unit hydrographs for each watershed were derived by the Snyder Method and Espey's "10-Minute Method" for estimating Snyder Parameters for the landfill permit boundary. The parameters and input values for this model are included in the Watershed Characteristics tables on pages C1C.7 and C1C.8.

The Kinematic Wave Method was used for routing of the flood wave through the drainage channels. This method is capable of accounting for hydrograph attenuation based on physical channel properties such as length, bottom slope, channel shape, bottom width, and channel roughness.

Postdevelopment Velocity Summary

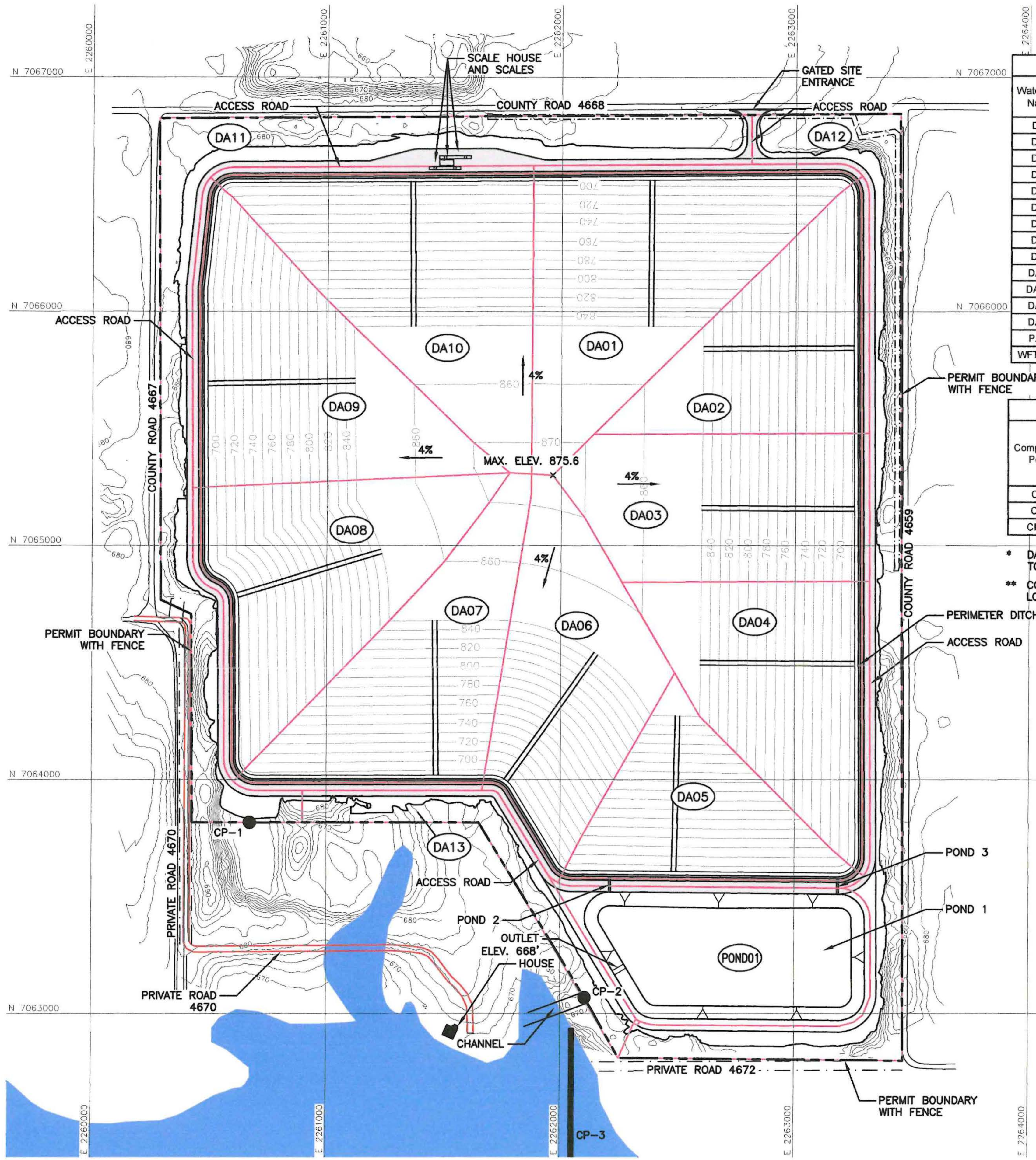
Surface water velocities were determined for each discharge point where the surface water enters or exits the permit boundary. The 25-year, 24-hour peak flow rate was analyzed to determine the velocity at the permit boundary. Manning's Equation was used to evaluate the velocities at the discharge points. Refer to Drawing C1C.1 for location of discharge points and peak flow rates. Refer to the postdevelopment velocity summary on page C1C.20 for postdeveloped velocity calculations.

POSTDEVELOPMENT FLOW AND BOUNDARY ANALYSIS SUMMARY

The postdevelopment flow summary table on page C1C.22 lists the postdevelopment runoff for each drainage area for the 25-year rainfall event. This table summarizes the results of the postdevelopment hydrologic evaluation. The analysis summary for the postdevelopment condition is provided on page C1C.22. The table provides for each comparison point (CP1 and CP2) the peak flow rate, peak velocity, and volume resulting from the HEC-HMS evaluation for the 25-year, 24 hour rainfall.

POSTDEVELOPMENT DRAINAGE AREA DRAWINGS

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C1-A-2 & C1-C-1 Post Developed Drainage Area Summary.dwg Layout: C1-C-1 User: awhite



Postdevelopment Flow Summary				
Watershed Name	Drainage Area (Ac)	Drainage Area (mi2)	25-Year Peak Flow (cfs)	25-Year Volume (Ac-ft)
DA1	23.2	0.0362	86.8	10.6
DA2	15.5	0.0242	61.6	7.1
DA3	17.6	0.0275	66.7	8.1
DA4	17.7	0.0277	72.1	8.1
DA5	13.5	0.0210	58.2	6.2
DA6	17.9	0.0279	69.4	8.2
DA7	17.6	0.0275	68.4	8.1
DA8	20.5	0.0321	78.4	9.4
DA9	20.9	0.0326	79.6	9.6
DA10	23.3	0.0364	87.3	10.7
DA11*	23.0	0.0359	33.6	7.8
DA12	19.0	0.0298	26.2	6.5
DA13	6.3	0.0098	18.3	2.1
PA01	15.7	0.0245	30.5	8.9
WFTR-DA	283573.0	443.0828	129140.4	103581.3

Postdevelopment Boundary Analysis Summary				
Comparison Point	"Total Contributing Drainage Area (mi2)"	"25-Year Peak Flow Rate (cfs)"	"25-Year Volume (ac-ft)"	"25-Year Peak Velocity (fps)"
CP1	0.0359	33.6	7.8	1.49
CP2	0.3572	46.1	57.5	1.75
CP3**	443.5	129175.0	103646.5	

* DA11 IS THE ONLY DRAINAGE AREA THAT CONTRIBUTES TO CP1 IN THE POSTDEVELOPMENT CONDITION

** COMPARISON POINT 3 (CP3) IS A CROSS SECTION LOCATED ON THE WEST FORK TRINITY RIVER

0 250 500
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 700 — 10' CONTOUR
- N 7066000 — STATE PLANE COORDINATES
- 900 — LANDFILL 10' CONTOUR
- DRAINAGE AREA BOUNDARY
- DA02 — DRAINAGE AREA DESIGNATION
- CHUTE
- COMPARISON POINT
- 100-YEAR FLOOD PLAIN

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

POSTDEVELOPMENT DRAINAGE AREA SUMMARY

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1C.1

POSTDEVELOPMENT WATERSHED CHARACTERISTICS

UNIT HYDROGRAPH DATA

Postdevelopment Watershed Characteristics

			CN Determination				Main Reach Slope Calculation (for Espey Method)					Mannings "n" Determination			
Watershed Name	Watershed Area (ac)	Watershed Area (sq mi)	Final Cover Sideslope Area (ac) CN = 87	Non-Final Cover Area (ac) CN = 74	Pond Area (ac) CN = 98	CN	Longest Reach (ft)	20% of Reach Length (ft)	Elevation @ 20% Reach Length from Upstream	Downstream Elevation	Slope (ft/ft)	Sheet Flow % of n = 0.070	Shallow Concentrated or Swale Flow	Channelized Flow % of n = 0.035	Composite n
DA1	23.2	0.0362	23.16	0.0	0.0	87	1670	334	861.0	694.0	0.1250	5	25	70	0.041
DA2	15.5	0.0242	15.46	0.0	0.0	87	1382	276	855.8	689.3	0.1506	5	30	65	0.041
DA3	17.6	0.0275	17.6	0.0	0.0	87	1763	353	867.1	687.2	0.1276	5	25	70	0.041
DA4	17.7	0.0277	17.7	0.0	0.0	87	1259	252	852.7	685.2	0.1663	10	30	60	0.043
DA5	13.5	0.0210	13.5	0.0	0.0	87	936	187	850.1	683.6	0.2223	10	45	45	0.045
DA6	17.9	0.0279	17.87	0.0	0.0	87	1557	311	862.0	684.0	0.1429	5	25	70	0.041
DA7	17.6	0.0275	17.63	0.0	0.0	87	1546	309	861.0	684.9	0.1424	5	25	70	0.041
DA8	20.5	0.0321	20.52	0.0	0.0	87	1546	309	863.0	689.7	0.1401	5	25	70	0.041
DA9	20.9	0.0326	20.88	0.0	0.0	87	1594	319	864.0	692.6	0.1344	5	25	70	0.041
DA10	23.3	0.0364	23.3	0.0	0.0	87	1623	325	862.6	695.8	0.1285	5	25	70	0.041
DA11	23.0	0.0359	0	23.0	0.0	74	5846	1169	689.0	663.0	0.0056	0	5	95	0.036
DA12	19.0	0.0298	0	19.0	0.0	74	5946	1189	689.0	670.0	0.0040	0	5	95	0.036
DA13	6.3	0.0098	0	6.3	0.0	74	2053	411	890.0	670.0	0.1340	5	20	75	0.040
PA01	15.7	0.0245	0.0	0.0	15.7	98	1443	289	868.0	867.0	0.0009	5	30	65	0.041

UNIT HYDROGRAPH DATA

Regional Postdevelopment Watershed Characteristics

			CN Determination					Main Reach Slope Calculation (for Espey Method)					Mannings "n" Determination			
Watershed Name	Watershed Area (ac)	Watershed Area (sq mi)	Hydrologic Soils Group "B" (ac) CN = 69	Hydrologic Soils Group "C" (ac) CN = 79	Hydrologic Soils Group "D" (ac) CN = 84	Urban (ac) CN = 94	CN	Longest Reach (ft)	20% of Reach Length (ft)	Elevation @ 20% Reach Length from Upstream	Downstream Elevation	Slope (ft/ft)	Sheet Flow % of n = 0.070	Shallow Concentrated or Swale Flow % of n = 0.050	Channelized Flow % of n = 0.035	Composite n
WFTR-DA	283573.0	443.0828	83370.5	138093.2	55580.3	6529.0	77	234792	46958	980.0	660.0	0.0017	0.0	0.0	100.0	0.035

UNIT HYDROGRAPH DATA

Snyder's Hydrograph Coefficients (Espey's 10-Minute Method)

Postdevelopment Conditions

Watershed Name	Longest Reach (ft)	Slope (ft/ft)	Impervious Cover %	Manning's "n"	Eff. Coeff.	Tr (min)	Tlag (min)	Area (sq mi)	qp (cfs/sq mi)	Tlag (hr)	Cp
					(A)	(B)	(C)		(D)		(E)
DA1	1670	0.1250	2.0	0.041	0.88	20.6	18.1	0.0362	1420.0	0.30	0.67
DA2	1382	0.1506	2.0	0.041	0.88	18.8	16.3	0.0242	1589.3	0.27	0.67
DA3	1763	0.1276	2.0	0.041	0.88	20.7	18.2	0.0275	1424.4	0.30	0.68
DA4	1259	0.1663	2.0	0.043	0.88	17.9	15.4	0.0277	1660.8	0.26	0.67
DA5	936	0.2223	2.0	0.045	0.90	16.2	13.7	0.0210	1868.7	0.23	0.67
DA6	1557	0.1429	2.0	0.041	0.88	19.6	17.1	0.0279	1513.0	0.28	0.67
DA7	1546	0.1424	2.0	0.041	0.88	19.6	17.1	0.0275	1515.1	0.28	0.67
DA8	1546	0.1401	2.0	0.041	0.88	19.6	17.1	0.0321	1499.4	0.29	0.67
DA9	1594	0.1344	2.0	0.041	0.88	20.0	17.5	0.0326	1470.7	0.29	0.67
DA10	1623	0.1285	2.0	0.041	0.88	20.3	17.8	0.0364	1440.2	0.30	0.67
DA11	5846	0.0056	2.0	0.036	0.85	57.4	54.9	0.0359	473.7	0.91	0.68
DA12	5945.8	0.0040	2.0	0.036	0.85	62.6	60.1	0.0298	435.0	1.00	0.68
DA13	2053	0.1340	2.0	0.040	0.85	20.4	17.9	0.0098	1512.0	0.30	0.70
PA01	1442.8	0.0009	2.0	0.041	0.88	68.9	66.4	0.0245	395.5	1.11	0.68
WFTR-DA	234792	0.0017	2.0	0.035	0.85	180.4	177.9	443.0828	95.4	2.96	0.44

(A) Conveyance efficiency from Dodson & Associates, Inc. Hands-On HEC-1, February 1999, pgs 6-19.

(B) $Tr=3.1(L^{0.23})(S^{-0.25})(I^{-0.18})(Effcoef^{1.57})$

(C) $Tlag=Tr-(5/2)$

(D) $qp=31600(A^{-0.04})(Tr^{-1.07})$

(E) $Cp=49.375(A^{-0.04})(Tr^{-1.07})(Tlag)$

Tr = Surface runoff to unit hydrograph peak (min)
L = Distance along main channel from study point to watershed boundary
S = Main channel slope (ft/ft)
I = Impervious cover within the watershed
Tlag = Watershed lag time (min)
qp = Hydrograph peak discharge (cfs/sq. mi.)
Cp = Snyder's peaking coefficient

POSTDEVELOPMENT DRAINAGE STRUCTURE DESIGN PARAMETERS

Pond Data for HEC-HMS
Pond 01

Reservoir

Description:	
Downstream:	CP01
Method:	Outflow Structures
Storage Method:	Elevation-Storage
Elev-Stor Function:	Pond 01
Initial Condition:	Elevation
Initial Elevation:	Inflow Outflow
Main Tailwater:	Assume None
Auxiliary:	--None--
Time Step Method:	Automatic Adaption
Outlets:	1
Spillways:	1
Dam Tops:	1
Pumps:	0
Dam Break:	No
Dam Seepage:	No
Release:	No
Evaporation:	No

Outlet

Method:	Culvert Outlet
Direction:	Main
Number Barrels:	1
Solution Method:	Automatic
Shape:	Circular
Chart:	1: Concrete Pipe Culvert
Scale:	1: Square edge entrance with headwall
Length:	150 ft
Diameter:	1.5 ft
Inlet Elevation:	668 ft
Entrance Coefficient:	0.5
Outlet Elevation:	667
Exit Coefficient:	1
Mannings n:	0.013

Spillway

Method:	Broad-Crested Spillway
Direction:	Main
Elevation:	681 ft
Length:	100 ft
Coefficient:	2.6
Gates:	0

Dam Tops

Method:	Level Overflow
Direction:	Main
Elevation:	682
Length:	1000
Coefficient:	2.6

Paired Data

Elevation Storage Functions
Pond 01

Elevation (ft)	Storage (ac-ft)	Storage (cy)
668.0	0.000	0
669.0	9.669	15,599
670.0	19.595	31,614
671.0	29.782	48,048
672.0	40.231	64,906
673.0	50.945	82,191
674.0	61.926	99,907
675.0	73.176	118,058
676.0	84.698	136,646
677.0	96.494	155,677
678.0	108.566	175,154
679.0	120.917	195,080
680.0	133.549	215,460
681.0	146.464	236,296
682.0	159.665	257,593
683.0	173.080	279,236

Pond Data for HEC-HMS
Pond 2

Reservoir

Description:	
Downstream:	Pond 1
Method:	Outflow Structures
Storage Method:	Elevation-Storage
Elev-Stor Function:	Pond 2
Initial Condition:	Elevation
Initial Elevation:	678.63
Main Tailwater:	Assume None
Auxiliary:	--None--
Time Step Method:	Automatic Adaption
Outlets:	1
Spillways:	1
Dam Tops:	1
Pumps:	0
Dam Break:	No
Dam Seepage:	No
Release:	No
Evaporation:	No

Outlet

Method:	Culvert Outlet
Direction:	Main
Number Barrels:	1
Solution Method:	Automatic
Shape:	Box
Chart:	8: Flared Wingwalls
Scale:	1: Wingwalls flared 30 to 75 degrees
Length:	90 ft
Rise:	4 ft
Span:	6 ft
Inlet Elevation:	678.63
Entrance Coefficient:	0.5
Outlet Elevation:	677
Exit Coefficient:	1
Mannings n:	0.013

Spillway

Method:	Broad-Crested Spillway
Direction:	Main
Elevation:	681 ft
Length:	100 ft
Coefficient:	2.6
Gates:	0

Dam Tops

Method:	Level Overflow
Direction:	Main
Elevation:	682
Length:	1000
Coefficient:	2.6

Paired Data

Elevation Storage Functions
Pond 2

Elevation (ft)	Storage (ac-ft)	(cy)
678.6	0.000	0
679.0	0.018	29
680.0	0.223	360
681.0	0.663	1,070
682.0	1.297	2,093
683.0	2.179	3,516

Pond Data for HEC-HMS
Pond 3

Reservoir

Description:	
Downstream:	Pond 1
Method:	Outflow Structures
Storage Method:	Elevation-Storage
Elev-Stor Function:	Pond 3
Initial Condition:	Elevation
Initial Elevation:	678.6
Main Tailwater:	Assume None
Auxiliary:	--None--
Time Step Method:	Automatic Adaption
Outlets:	1
Spillways:	1
Dam Tops:	1
Pumps:	0
Dam Break:	No
Dam Seepage:	No
Release:	No
Evaporation:	No

Outlet

Method:	Culvert Outlet	
Direction:	Main	
Number Barrels:	1	
Solution Method:	Automatic	
Shape:	Box	
Chart:	8: Flared Wingwalls	
Scale:	1: Wingwalls flared 30 to 75 degrees	
Length:	90	ft
Rise:	4	ft
Span:	6	ft
Inlet Elevation:	678.6	
Entrance Coefficient:	0.5	
Outlet Elevation:	677	
Exit Coefficient:	1	
Mannings n:	0.013	

Spillway

Method:	Broad-Crested Spillway
Direction:	Main
Elevation:	681 ft
Length:	100 ft
Coefficient:	2.6
Gates:	0

Dam Tops

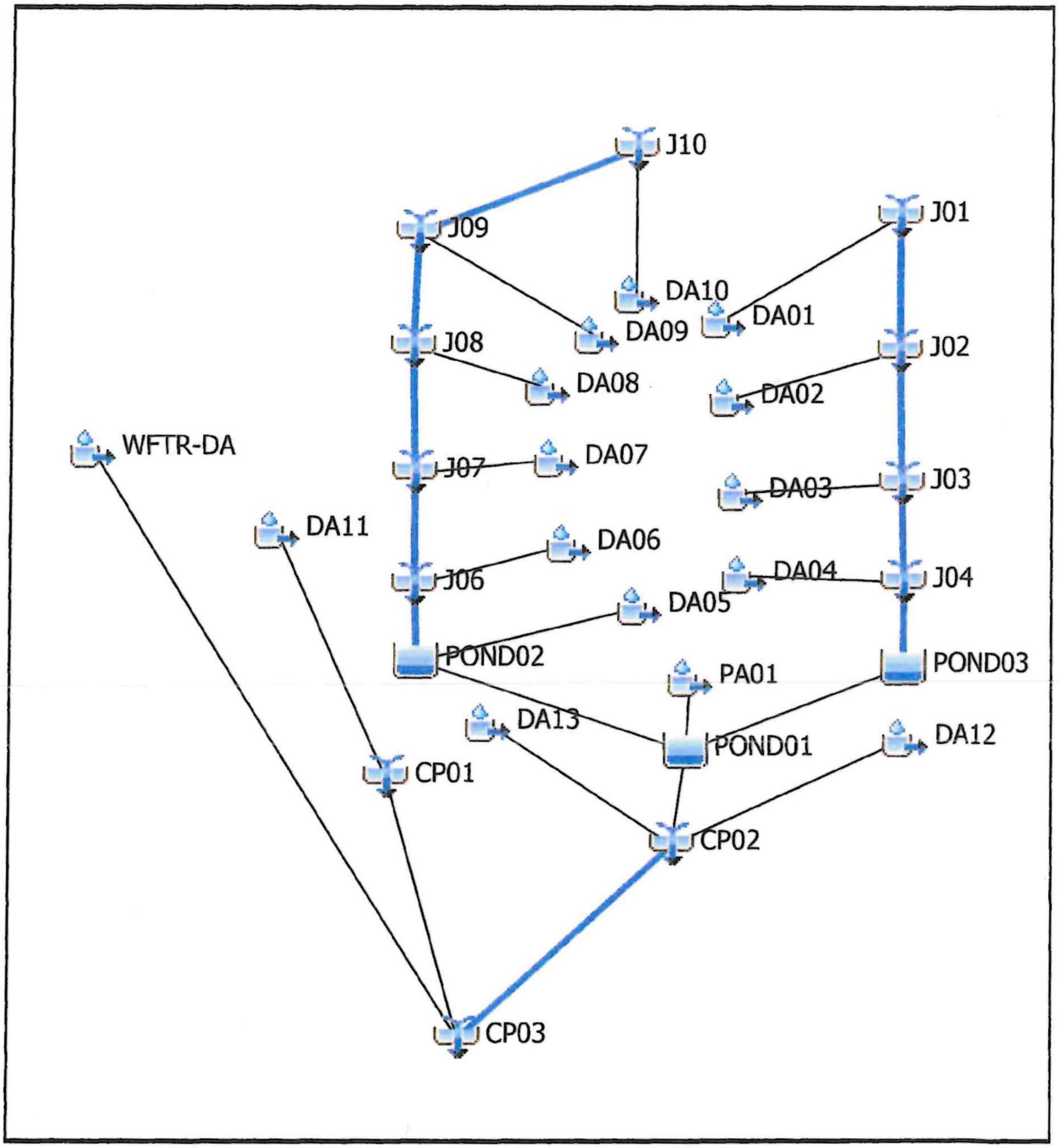
Method:	Level Overflow
Direction:	Main
Elevation:	682
Length:	1000
Coefficient:	2.6

Paired Data
Elevation Storage Functions
Pond 3

Elevation (ft)	Storage (ac-ft)	Storage (cy)
678.6	0.000	0
679.0	0.016	25
680.0	0.197	318
681.0	0.599	966
682.0	1.181	1,905
683.0	1.941	3,131

POSTDEVELOPMENT HYDROLOGIC ANALYSIS

25-YEAR, 24-HOUR STORM EVENT


J10
J09
J01
DA10
DA01
DA09
J08
J02
DA08
DA02
WFTR-DA
J07
DA07
DA03
J03
DA11
DA06
DA04
J06
J04
DA05
POND02
PA01
POND03
DA13
POND01
DA12
CP01
CP02
CP03

	Project:	Chisholm Trail Disposal	Simulation Run:	South Post
	Start of Run:	01Jan2024, 00:00	Basin Model:	South Post
	End of Run:	03Jan2022, 00:00	Meteorologic Model:	25-Year
	Compute Time:	10Dec2024, 15:55:11	Control Specifications	Control 1

Hydrologic Element	Drainage Area (MI^2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
WFTR-DA	443.0828	129140.4	1 January 2024, 15:05	103581.3
DA11	0.0359	33.6	1 January 2024, 13:00	7.8
DA01	0.0362	86.8	1 January 2024, 12:20	10.6
J01	0.0362	86.8	1 January 2024, 12:20	10.6
R01	0.0362	84.7	1 January 2024, 12:25	10.6
DA02	0.0242	61.6	1 January 2024, 12:20	7.1
J02	0.0604	140.5	1 January 2024, 12:25	17.7
R02	0.0604	137.7	1 January 2024, 12:25	17.7
DA03	0.0275	66.7	1 January 2024, 12:20	8.1
J03	0.0879	200.5	1 January 2024, 12:25	25.8
R03	0.0879	195.6	1 January 2024, 12:25	25.8
DA04	0.0277	72.1	1 January 2024, 12:20	8.1
J04	0.1156	259.7	1 January 2024, 12:25	33.9
R04	0.1156	254.5	1 January 2024, 12:30	33.8
DA10	0.0364	87.3	1 January 2024, 12:20	10.7
J10	0.0364	87.3	1 January 2024, 12:20	10.7
R10	0.0364	85.3	1 January 2024, 12:30	10.7
DA09	0.0326	79.6	1 January 2024, 12:20	9.6
J09	0.069	156.1	1 January 2024, 12:25	20.2
R09	0.069	153.6	1 January 2024, 12:30	20.2
DA08	0.0321	78.4	1 January 2024, 12:20	9.4
J08	0.1011	221.7	1 January 2024, 12:25	29.6
R08	0.1011	221.6	1 January 2024, 12:30	29.6
DA07	0.0275	68.4	1 January 2024, 12:20	8.1
J07	0.1286	274.7	1 January 2024, 12:30	37.7
R07	0.1286	273.2	1 January 2024, 12:30	37.7
DA06	0.0279	69.4	1 January 2024, 12:20	8.2
J06	0.1565	327.1	1 January 2024, 12:30	45.9
R06	0.1565	325.4	1 January 2024, 12:30	45.9
DA05	0.021	58.2	1 January 2024, 12:15	6.2
POND02	0.1775	357	1 January 2024, 12:30	52
POND03	0.1156	252.8	1 January 2024, 12:30	33.8
PA01	0.0245	30.5	1 January 2024, 13:05	8.9
POND01	0.3176	17.9	1 January 2024, 21:40	48.9
DA12	0.0298	26.2	1 January 2024, 13:05	6.5
DA13	0.0098	18.3	1 January 2024, 12:20	2.1
CP02	0.3572	46.1	1 January 2024, 13:00	57.5
R11	0.3572	46.1	1 January 2024, 13:00	57.4
CP01	0.0359	33.6	1 January 2024, 13:00	7.8
CP03	443.4759	129175	1 January 2024, 15:05	103646.5

Project: CHISHOLM TRAIL DISPOSAL, LCC Simulation Run: South Post
Reservoir: POND01

Start of Run:	01Jan2024, 00:00	Basin Model:	South Post
End of Run:	03Jan2024, 00:00	Meteorologic Model:	25-Years
Compute Time:	10Dec2024, 15:55:11	Control Specifications:	Control 01

Volume Units: ACRE-FT

Computed Results

Peak Inflow:	629.5 (CFS)	Date/Time of Peak Inflow:	01Jan2024, 12:30
Peak Discharge:	17.9 (CFS)	Date/Time of Peak Discharge:	01Jan2024, 21:40
Inflow Volume:	94.7 (ACRE-FT)	Peak Storage:	76.5 (ACRE-FT)
Discharge Volume:	48.9 (ACRE-FT)	Peak Elevation:	675.3 (FT)

Project: CHISHOLM TRAIL DISPOSAL, LCC   Simulation Run: South Post

Reservoir: POND02

Start of Run:	01Jan2024, 00:00	Basin Model:	South Post
End of Run:	03Jan2024, 00:00	Meteorologic Model:	25-Years
Compute Time:	10Dec2024, 15:55:11	Control Specifications:	Control 01

Volume Units: ACRE-FT

Computed Results

Peak Inflow:	361.7 (CFS)	Date/Time of Peak Inflow:	01Jan2024, 12:30
Peak Discharge:	357.0 (CFS)	Date/Time of Peak Discharge:	01Jan2024, 12:30
Inflow Volume:	52.0 (ACRE-FT)	Peak Storage:	1.3 (ACRE-FT)
Discharge Volume	52.0 (ACRE-FT)	Peak Elevation:	682.0 (FT)

Project: CHISHOLM TRAIL DISPOSAL, LCC Simulation Run: South Post
Reservoir: POND03

Start of Run:	01Jan2024, 00:00	Basin Model:	South Post
End of Run:	03Jan2024, 00:00	Meteorologic Model:	25-Years
Compute Time:	10Dec2024, 15:55:11	Control Specifications:	Control 01

Volume Units: IN

Computed Results

Peak Inflow:	254.5 (CFS)	Date/Time of Peak Inflow:	01Jan2024, 12:30
Peak Discharge:	252.8 (CFS)	Date/Time of Peak Discharge:	01Jan2024, 12:30
Inflow Volume:	5.49 (IN)	Peak Storage:	1.0 (ACRE-FT)
Discharge Volume	5.49 (IN)	Peak Elevation:	681.8 (FT)

POSTDEVELOPMENT PEAK VELOCITY SUMMARY

Postdevelopment 25-Year Peak Velocity Calculations at Permit Boundary Comparison

Required: Determine the 25-year flow depths and velocities at the permit boundary.

Method: Calculate the flow depths and velocities using Manning's Equation.

Solution:

		Velocity Calculations						
Comparison Point	Q (cfs)	Width[1] (ft)	Bottom Slope[2] (%)	Side Slopes[3] (h:v)	Manning's n	Depth (ft)	Peak Velocity (fps)	Shear Stress (psf)
CP01	33.6	80	0.70	50.0	0.030	**0.24**	**1.49**	**0.11**
CP02	46.1	50	0.3	0.0	0.030	**0.53**	**1.75**	**0.10**

Notes:

1. Comparison points where surface water runoff exits the permit boundary in established natural or constructed channels; width refers to the bottom width of the channel.
   Comparison points where surface water runoff exits the permit boundary as sheet flow or not well established channels; width refers to the sheet flow width.
2. For channels, bottom slope is the slope of the channel bottom where surface water exits the permit boundary.
   For sheet flow, bottom slope is the slope of the ground where surface water exits the permit boundary.
3. For channels, side slope is the average side slope of the channel where surface water exits the permit boundary.
   For sheet flow, there are no side slopes and are represented by 0.0 in this table.

POSTDEVELOPMENT FLOW AND BOUNDARY ANALYSIS SUMMARY

Postdevelopment Flow Summary

Watershed Name	Drainage Area (Ac)	Drainage Area (mi^2)	25-Year Peak Flow (cfs)	25-Year Volume (Ac-ft)
DA1	23.2	0.0362	86.8	10.6
DA2	15.5	0.0242	61.6	7.1
DA3	17.6	0.0275	66.7	8.1
DA4	17.7	0.0277	72.1	8.1
DA5	13.5	0.0210	58.2	6.2
DA6	17.9	0.0279	69.4	8.2
DA7	17.6	0.0275	68.4	8.1
DA8	20.5	0.0321	78.4	9.4
DA9	20.9	0.0326	79.6	9.6
DA10	23.3	0.0364	87.3	10.7
DA11	23.0	0.0359	33.6	7.8
DA12	19.0	0.0298	26.2	6.5
DA13	6.3	0.0098	18.3	2.1
PA01	15.7	0.0245	30.5	8.9
WFTR-DA	283573.0	443.0828	129140.4	103581.3

Postdevelopment Boundary Analysis Summary

Comparison Point	Total Contributing Drainage Area (mi^2)	25-Year Peak Flow Rate (cfs)	25-Year Volume (ac-ft)	25-Year Peak Velocity (fps)
CP1	0.0359	33.6	7.8	1.49
CP2	0.3572	46.1	57.5	1.75
CP3*	443.5	129175.0	103646.5	

* Comparison Point 3 (CP3) is a cross section located on the West Fork Trinity River

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX C1D
PERIMETER DRAINAGE SYSTEM DESIGN

NARRATIVE

30 TAC §§330.303 and 330.305

This appendix presents the design of the Chisholm Trail Disposal Landfill perimeter drainage channels and detention ponds in accordance with §330.305(a)-(d).

PERIMETER DRAINAGE PLAN

Drawing C1D.1 depicts the perimeter drainage system and detention pond location for the Chisholm Trail Disposal Landfill. The plan reflects the perimeter channel design and stationing. The perimeter channel hydraulic analysis is included for the 25-year rainfall event.

PERIMETER CHANNEL DESIGN

The perimeter channels are designed for peak discharge resulting from the 25-year storm event. The perimeter channel depths and calculated normal depths are summarized in the table below. In several locations along the perimeter channel, the depths are much greater than necessary to convey the predicted stormwater flow rates; however, minimum channel slopes were maintained to help prevent excessive velocity and erosion. The perimeter channel design calculations are shown on page C1D.5. Perimeter channel profiles are included in Attachment C3.

DETENTION POND ANALYSIS

Detention Pond 1 was designed to provide the necessary storage and outlet control to mitigate impacts to the receiving channels downstream of the Chisholm Trail Disposal Landfill. Ponds 2 and 3 function as intermediate stormwater collection and conveyance structures that capture runoff from their respective drainage areas and transfer it via culverts to Pond 1, which serves as the primary detention basin for mitigating downstream impacts. The hydraulic design parameters for the detention pond is provided on page C1C.10. Pond 1 is designed as a wet-bottom detention pond with its bottom elevation at approximately 660 feet, as illustrated on drawing C3.2 in Attachment C3. For conservative modeling purposes, the hydrologic and hydraulic analysis used an initial water surface elevation of 668 feet, which corresponds to the inlet elevation of the pond's outlet structure. This approach effectively excludes the bottom 8 feet of storage volume from the detention calculations. Detention pond design information is included in Attachment C3. The following table provides storage volume and surface elevation for the 25-year storm event.

25-Year, 24-Hour Storm Events Analysis

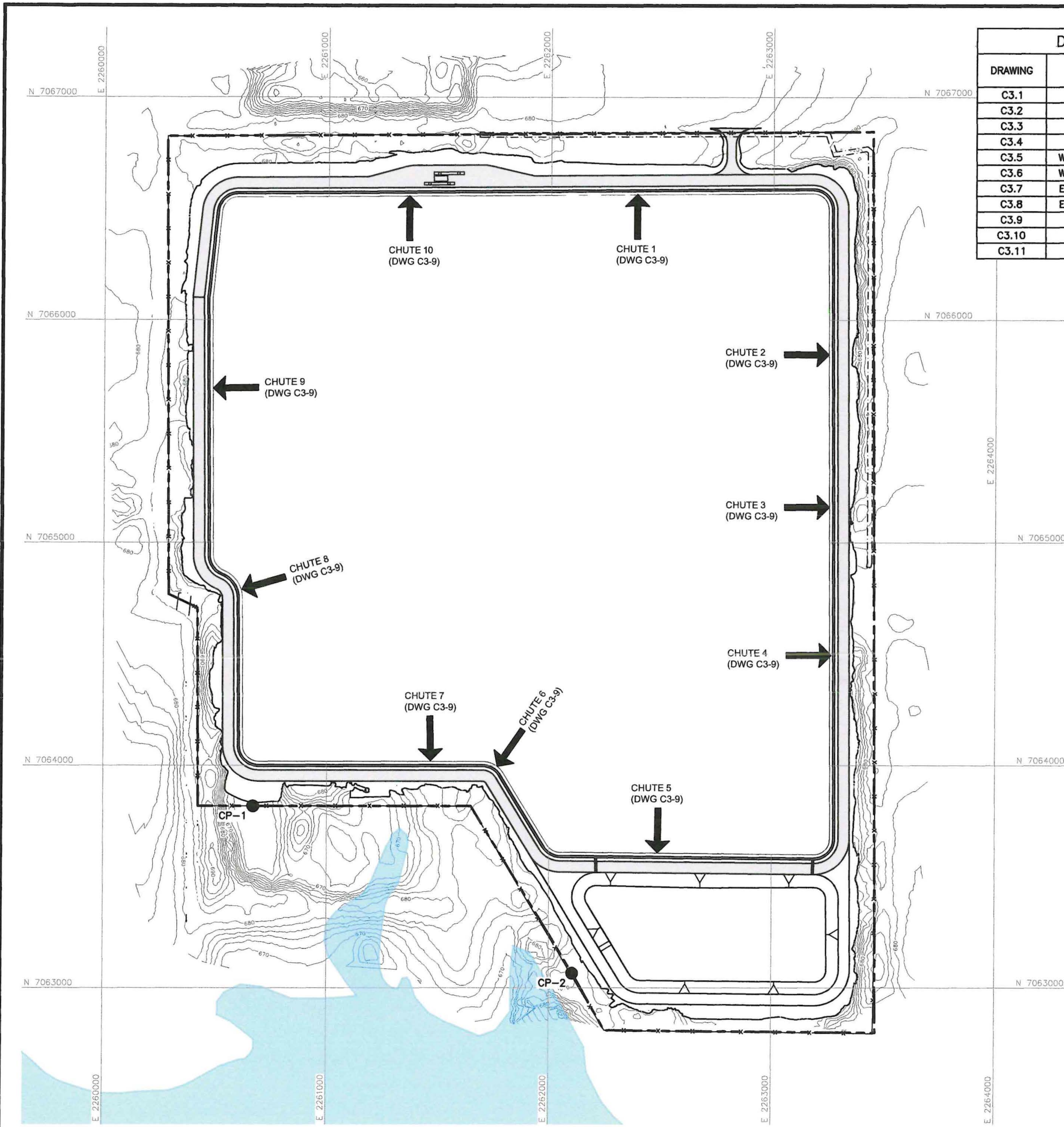
Detention Pond	Maximum Water Surface Elevation	Perimeter Pond Berm Elevation	Freeboard (feet)	Access Road Elevation
Pond 1	675.3	682	6.7	682

EROSION PROTECTION

Pond 1 will be inspected annually to assess sediment accumulation and overall condition. Maintenance excavation will be performed when sediment buildup reduces the operational storage capacity below design specifications. This proactive maintenance schedule ensures the pond maintains its designed detention volume and continues to effectively mitigate downstream impacts as required by permit conditions.

Concrete will be used at all pond inlets and outlets to prevent scour and maintain structural integrity of the spillways and culverts as shown on Detail 8 on page C3.11 of Attachment C3. The concrete aprons shall extend sufficiently beyond the inlet/outlet structures to adequately dissipate flow energy and prevent undermining of the pond embankments. The grass-lined outlet channel at CP2, located downstream of Pond 1, has a width of 100-feet and 0.7% slope specifically designed to maintain low flow velocities. Due to these design parameters, additional erosion protection measures are not required for this channel.

PERIMETER DRAINAGE PLANS



O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C1-D-1_Perim.dwg Layout: C1-D-1 User: TWescoup

DRAWING INDEX

DRAWING	DESCRIPTION
C3.1	DRAINAGE PLAN
C3.2	POND 1
C3.3	POND 2
C3.4	POND 3
C3.5	WEST PERIMETER CHANNEL PROFILE
C3.6	WEST PERIMETER CHANNEL PROFILE
C3.7	EAST PERIMETER CHANNEL PROFILE
C3.8	EAST PERIMETER CHANNEL PROFILE
C3.9	CHUTE & PROFILES
C3.10	DRAINAGE DETAILS
C3.11	DRAINAGE DETAILS

0 250 500
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 700 — 10' CONTOUR
- N 7062000 — STATE PLANE COORDINATES
- — x — x — FENCE
- 100–YEAR FLOOD PLAIN
- COMPARISON POINT–POINT DISCHARGE

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

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LICENSED PROFESSIONAL ENGINEER
9/23/2025

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PERIMETER DRAINAGE PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
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1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817–563–1144

TBPE FIRM NO. F–256
TBPG FIRM NO. 50222

DRAWING
C1D.1

PERIMETER CHANNEL DESIGN CALCULATIONS

Depth and Velocity Calculations for the Perimeter Channels for the 25-Year Peak Runoff

Required: Determine the velocity and depth for the perimeter channels and compare to the permissible non-erodible flow velocity.

Method: Manning's Equation for flow velocity.

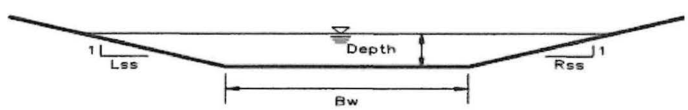
References:

1. Texas Department of Transportation, *Hydraulic Design Manual,* March 2004.

Solution:

Manning's Equation V = (k/n)(R^2/3)(S^1/2)

V = Velocity (fps)
k = Conversion Factor = 1.486
n = Manning's Roughness Coefficient = 0.03 Grass lined channel
R = Hydraulic Radius = A/Pw
A = Cross-Sectional Area (ft^2)
Pw = Wetted Perimeter (ft)
S = Channel Slope (ft/ft)
Bw = Bottom Width (ft)



Channel	Channel Station		Q (cfs)	S (ft/ft)	BW (ft)	Rss (H:V)	Lss (H:V)	D (ft)	R (ft)	A (sf)	PW (ft)	V (fps)	Shear Stress (psf)
							West Ditch						
R10	0+00	6+65	327.1	0.0030	8	4.0	4.0	3.43	2.05	74.60	36.31	4.38	0.64
R9	6+65	9+56	274.0	0.0030	8	4.0	4.0	3.17	1.92	65.42	34.11	4.19	0.59
R8	9+56	25+64	221.0	0.0030	8	4.0	4.0	2.87	1.76	55.80	31.64	3.96	0.54
R7	25+64	35+64	156.1	0.0030	8	4.0	4.0	2.43	1.54	43.18	28.07	3.62	0.46
R6	35+64	52.+23	87.3	0.0040	8	4.0	4.0	1.71	1.15	25.40	22.11	3.44	0.43
							East Ditch						
R4	0+00	9+370	259.7	0.0030	8	4.0	4.0	3.09	1.88	62.87	33.47	4.13	0.58
R3	9+370	16+31	200.5	0.0030	8	4.0	4.0	2.74	1.70	51.93	30.59	3.86	0.51
R2	16+31	23+20	140.5	0.0030	8	4.0	4.0	2.32	1.48	39.96	27.09	3.52	0.43
R1	23+20	39+05	86.8	0.0030	8	4.0	4.0	1.83	1.22	28.09	23.11	3.09	0.34

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX C1E
FINAL COVER DRAINAGE STRUCTURE DESIGN

NARRATIVE

30 TAC §§330.303 and 330.305

This appendix presents the supporting documentation for evaluation of the final cover erosion layer and drainage structures. Appendix C1E addresses the requirements of 30 TAC §330.305(d) and (e) related to the final condition of final cover areas. The requirements of 30 TAC §330.305(d) and (e) related to intermediate phases are addressed in Appendix C1G.

1.0 FINAL COVER PLANS

The final cover plans depict the final cover drainage system consisting of a series of swales and chutes. The drainage area for the largest area contributing to a side slope swale is shown on Drawing C1E.1. Drainage areas for each downchute are shown on Drawing C1E.2. Final cover details are included in Attachment C3.

2.0 EROSION LAYER EVALUATION

The erosion layer evaluation is based on the Universal Soil Loss Equation (USLE) following Soil Conservation Service (SCS) procedures. The evaluation is based on a 25-year event. The 12-inch-thick Subtitle D layer is sufficient. Calculations are included beginning on page C1E.8.

3.0 SHEET FLOW VELOCITY

The sheet flow velocity calculations are presented for the 4 percent top slope and the 25 percent side slope configurations. The procedures outlined in the TxDOT *Hydraulic Design Manual*, May 2014, were used to determine velocities. Maximum lengths of runoff for both final cover conditions were evaluated. Calculations are shown on page C1E.15.

4.0 DRAINAGE SWALE DESIGN

The drainage swale design calculations are presented for the typical swale flowline slope of 0.5 percent. The procedures in the TxDOT *Hydraulic Design Manual*, September 2019, were used to determine the flow depth, swale capacity, and contributing drainage area. Calculations are shown beginning on page C1E.17.

5.0 DRAINAGE LETDOWN (OR CHUTE) DESIGN

The drainage letdown or chutes have been evaluated to determine critical velocities, flow depths in the chute, and receiving perimeter channel. Calculations are shown beginning on page C1E.20. Erosion protection within each chute is provided by 40-mil textured FML. Drainage chute profile is included in Attachment C3.

Chutes are designed to provide sufficient flow depth for the peak flow rate from the design storm. The design storm for chutes is the 25-year, 24-hour rainfall event. Chutes are designed to provide 2 feet of flow depth. The maximum calculated flow depth for any chute is 0.26 feet; therefore, the chutes provide a minimum of 1.74 feet of freeboard.

FINAL COVER PLANS

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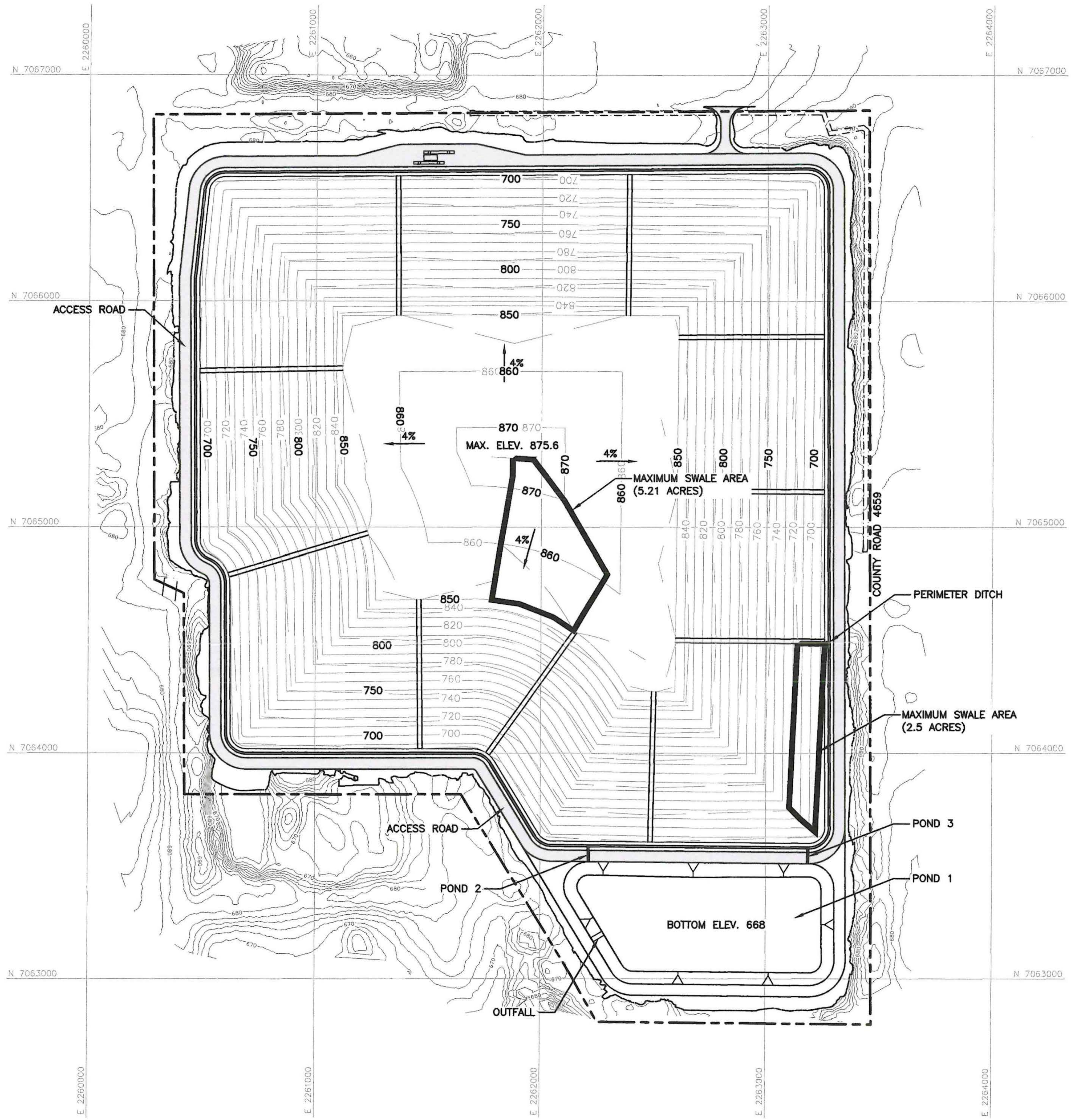

0 250 500
SCALE IN FEET

LEGEND

PERMIT BOUNDARY
10' CONTOUR
STATE PLANE COORDINATES
LANDFILL 10' CONTOUR
SWALE AREA BOUNDARY
SWALE

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

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MAXIMUM SWALE AREA

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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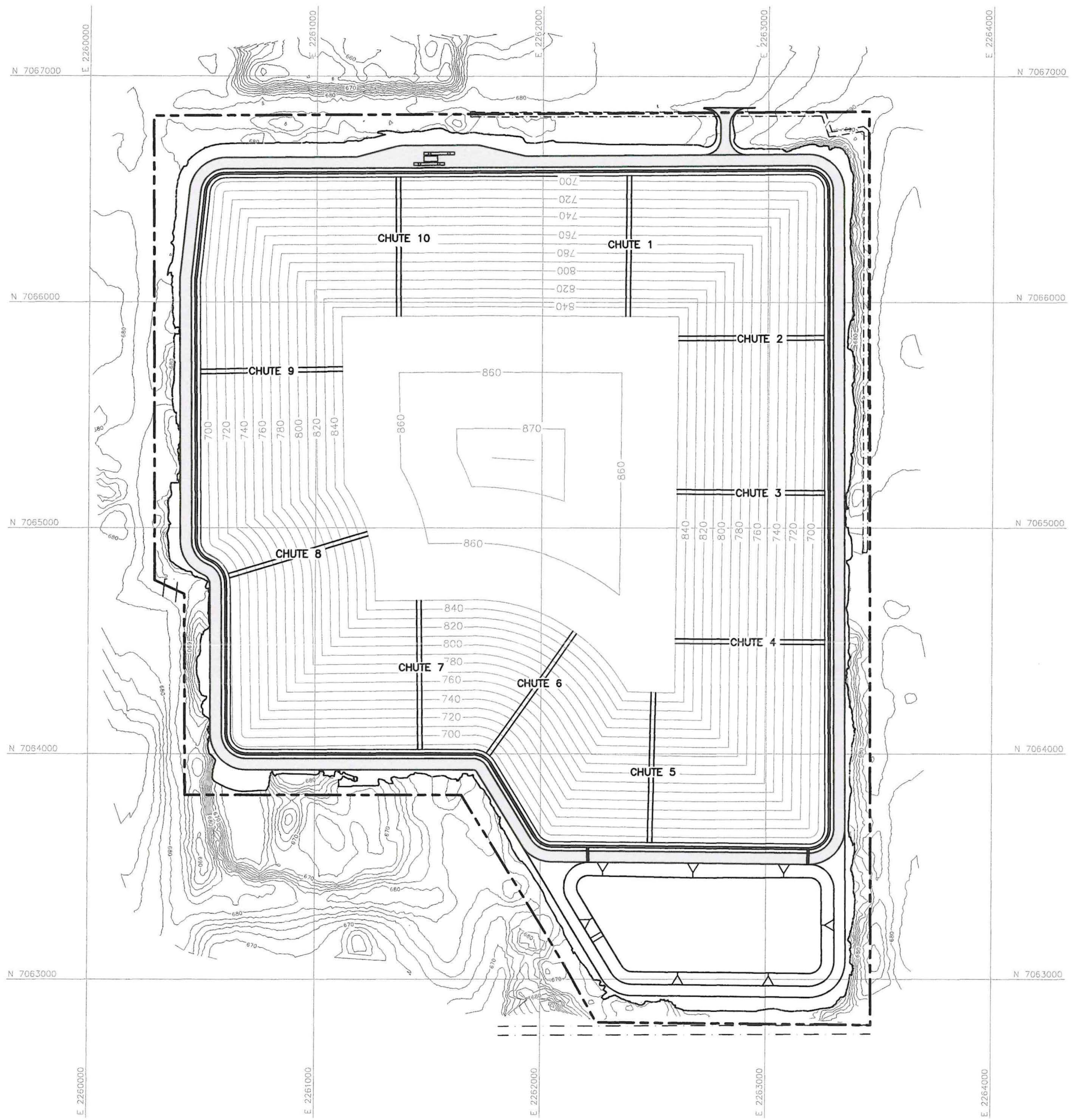
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1E.1

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C1-E-2_ChuteArea.dwg Layout: LAYOUT 1 User: awhite



0 250 500
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 10' CONTOUR
- STATE PLANE COORDINATES
- LANDFILL 10' CONTOUR
- CHUTE AREA BOUNDARY

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

Chute Drainage Area

Chute	Chute Area (acre)	"25-Year Peak Flow Rate (cfs)"
1	23.2	125
2	15.5	83
3	17.6	95
4	17.7	95
5	13.5	72
6	17.9	96
7	17.6	95
8	20.5	110
9	20.9	112
10	23.3	125

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CHUTE AREA

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CHISHOLM TRAIL DISPOSAL LANDFILL

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TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1E.2

EROSION LAYER EVALUATION

EROSION LAYER EVALUATION

This appendix presents the supporting documentation for evaluation of the thickness of the erosion layer for the final cover system at the Chisholm Trail Disposal Landfill. The evaluation is based on the premise of adding excess soil to increase the time required before maintenance is needed as recommended in the EPA Solid Waste Disposal Facility Criteria Technical Manual (EPA 530-R-93-017, November 1993).

The design procedure is as follows:

1. The minimum thickness of the erosion layer is based on the depth of frost penetration, or 10 inches, whichever is greater. For Wise County, the approximate depth of frost penetration is less than 10 inches.

2. Soil loss is calculated using the Universal Soil Loss Equation (USLE) by following SCS procedures. Based on 85% vegetative cover, the calculated soil loss from final cover will not exceed 3 tons per acre per year. Soil loss thickness is calculated by multiplying the soil loss by the postclosure year period (30 years), multiplying by a safety factor of 2, and then converting the soil loss to a thickness. The USLE, with a safety factor of 2, calculates the soil loss of the 4 percent top slopes to be 0.05 inches and the side slopes to be 0.64 inches. These thicknesses are then compared to the actual soil thickness of the erosion layer, which is 12 inches. These calculations begin on page C1E.8.

	4% slope	25% slope
Maximum Sheet Flow Length	820 ft	120 ft
Soil Loss	0.05 tons/acre/year	0.64 tons/acre/year

3. Sheet flow velocities for a 25-year storm event are calculated to be less than permissible nonerodible velocities. The supporting calculations are presented on page C1E.15.

4. Vegetation for the site will be native and introduced grasses with root depths of 6 inches to 8 inches.

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 may 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.

6. Slope stability information is included in Attachment D5 – Geotechnical Design.

Erosion Loss Evaluation

Required: Determine the required soil thickness and compare to the actual soil thickness.

Method: Expected soil loss is calculated using the Universal Soil Loss Equation. Minimum erosion layer thickness is determined by adding the minimum thickness allowed by TCEQ to the expected thickness of soil loss.

References: 1. TNRCC, *Use of the Universal Soil Loss Equation in Final Cover/Configuration Design Procedural Handbook,* October 1993.

Solution: Annual Soil Loss in tons/acre/year (A) = RKLSCP

Design Parameters	Top Slope (4%)	Perimeter Slope (25%)	
Rainfall Factor (R) =	250	250	Wise County
Soil Erodibility Factor (K) =	0.25	0.25	(Loam)
Longest Run =	820	120	ft
Slope =	4.0	25	%
Topographic Factor (LS) =	0.93	6.45	
Crop Management Factor (C) =	0.006	0.006	(tall grass with 85% cover)
Erosion Control Practice Factor (P) =	0.50	1.00	(Contouring)
Soil Loss (A) =	0.17	2.42	tons/acre/yr.

Erosion Layer Thickness Evaluation:

Required Thickness (T) = AYF/w

	Top Slope (4%)	Perimeter Slope (25%)	
Soil Loss (A) =	0.17	2.42	tons/acre/yr.
Postclosure Period =	30	30	years
Factor of Safety (F) =	2	2	
Specific Weight of Soil (w) =	125	125	pcf
Required Soil Thickness (T)	**0.05**	**0.64**	**inches**
Actual Soil Thickness	12.00	12.00	inches

Summary: As noted in the permit drawings, the erosion layer will be a minimum of 12 inches thick. As shown above, this is a conservative design considering the maximum expected soil loss for a 30 year period is 0.64 inches.

LS Factor Calculations

Required: Determine the length slope factor based on slope length and slope gradient.

References: 1. TNRCC, *Use of the Universal Soil Loss Equation in Final Cover/Configuration Design Procedural Handbook,* October 1993.

Solution: Length/Slope Factor (LS) = $((L/72.6)^{m})*((65.41*\sin^{2}(S))+(4.56*\sin(S))+0.065)$

LS = Length Slope Factor
L = Slope Length (ft)
S = Slope (%)
m = exponent dependent on the slope gradient

m =	0.2	for S <= 1.0%
	0.3	for 1.0% < S <= 3.5%
	0.4	for 3.5% < S < 5.0%
	0.5	for S => 5.0%

L (ft)	S (%)	S (ft/ft)	S (radians)	S (degrees)	m	LS
820	4.0	25.00	0.040	2.291	0.4	0.928
120	25	4	0.245	14.036	0.5	6.452

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

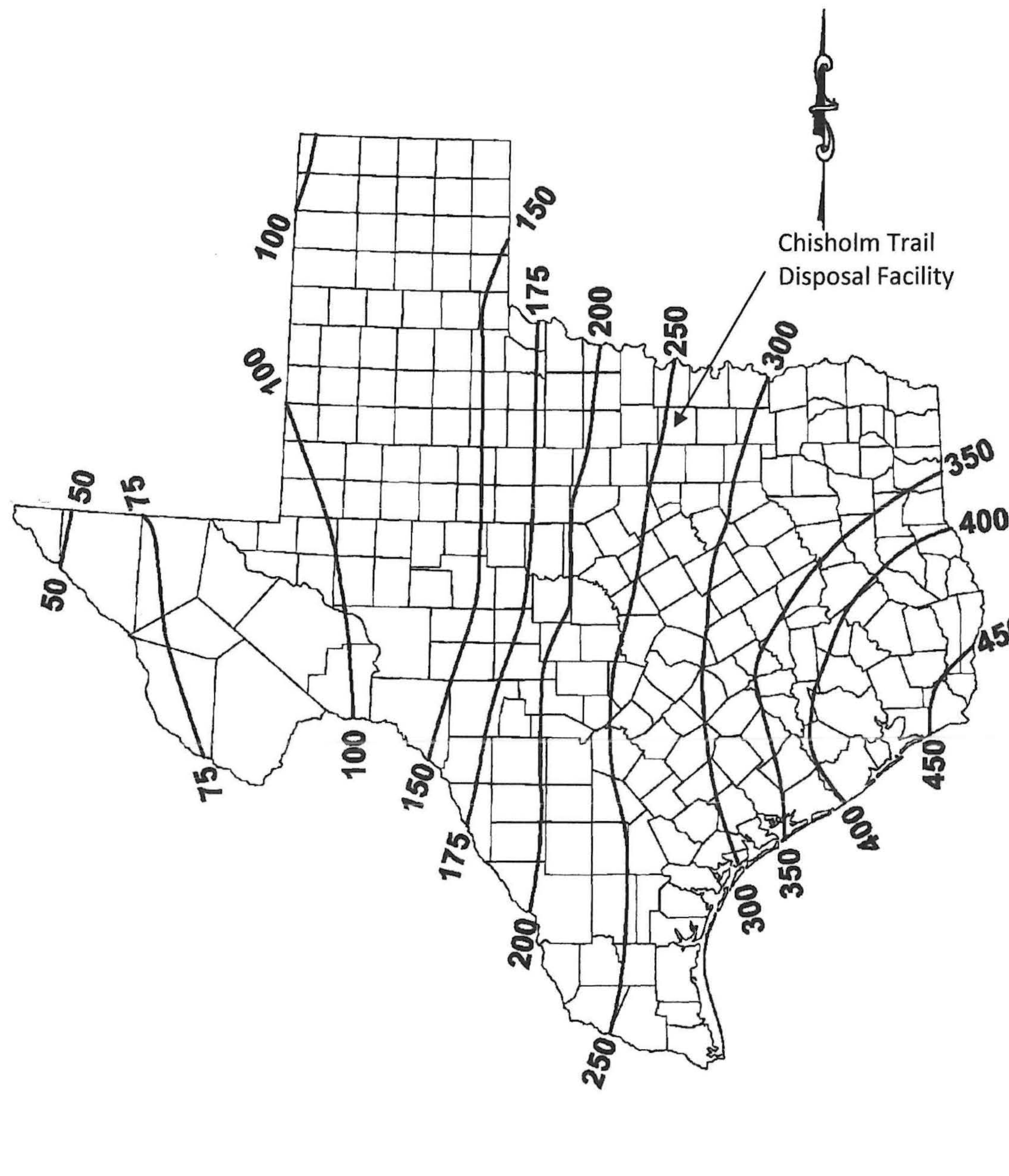


FIGURE 1 - AVERAGE ANNUAL VALUES OF THE RAINFALL EROSION INDEX

Table 1: Approximate Values of Factor K for USDA Textural Classes

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

Texture Class	Organic Matter Content		
	<0.5%	2%	4%
	K	K	K
Sand	0.05	0.03	0.02
Fine Sand	0.16	0.14	0.10
Very Fine Sand	0.42	0.36	0.28
Loamy Sand	0.12	0.10	0.08
Loamy Fine Sand	0.24	0.20	0.16
Loamy Very Fine Sand	0.44	0.38	0.30
Sandy Loam	0.27	0.24	0.19
Fine Sandy Loam	0.35	0.30	0.24
Very Fine Sandy Loam	0.47	0.41	0.33
Loam	0.38	0.32	0.29
Silt Loam	0.48	0.42	0.33
Silt	0.60	0.52	0.42
Sandy Clay Loam	0.27	0.25	0.21
Clay Loam	0.28	0.25	0.21
Silty Clay Loam	0.37	0.32	0.26
Sandy Clay	0.14	0.13	0.12
Silty Clay	0.25	0.23	0.19
Clay	0.13 - 0.29		

The values shown are estimated averages of broad ranges of specific soil values. When a texture is near the borderline of two texture classes, use the average of the two K values.

Table 2: Factor C for Permanent Pasture, Range, and Idle Land[1]

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

Vegetative Canopy		Cover that Contacts the Soil Surface					
Type and Height[2]	Percent Cover[3]	Percent Ground Cover					
		0	20	40	60	80	95+
No Appreciable Canopy		0.45	0.20	0.10	0.042	0.013	0.003
Tall weeds or short brush with average drop fall height of 20 in.	25	0.36	0.17	0.09	0.038	0.013	0.011
	50	0.26	0.13	0.07	0.035	0.012	0.003
	75	0.17	0.10	0.06	0.032	0.011	0.003

Extracted from: United States Department of Agriculture, AGRICULTURE HANDBOOK NUMBER 537

[1] The listed C values assume that the vegetation and mulch are randomly distributed over the entire area.

[2] Canopy height is measured as the average fall height of water drops falling from the canopy to the ground. Canopy effect is inversely proportional to drop fall height and is negligible if fall height exceeds 33 feet.

[3] Portions of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's eye view).

Table 3: P Factors for Contouring, Contour Stripcropping and Terracing

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

Land Slope	P Values		
%	Contouring†	Contour Stripcropping	Terracing†
2.0 to 7	0.50	0.25	0.50
8.0 to 12	0.60	0.30	0.60
13.0 to 18	0.80	0.40	0.80
19.0 to 24	0.90	0.45	0.90

(This table appeared in SCS (5), p.9)

† Contouring and terracing columns are suitable for MSWLF cover. Contour stripcropping is not suitable for the type of vegetative cover normally practiced at municpal landfills.

Table 4: Guide for Assigning Soil Loss Tolerance Values (T) to Solid Having Different Rooting Depths

Rooting Depth	Soil Loss Tolerance Values Annual Soil Loss (Tons/Acre)	
Inches	Renewable Soil a/	Renewable Soil b/
0 - 10	1	1
10 - 20	2	1
20 - 40	3	2
40 - 60	4	3
60	5	4

(This table appeared in SCS (6), p.4)

a/ Soil with favorable substrata that can be renewed by tillage, fertilizer, organic matter, and other management practices. This column does not represent MSWLF final covers under normal conditions.

b/ Soil with unfavorable substrata such as rock or soft rock that cannot be renewed by economical means. Most of the MSWLF covers with constructed clay cap and/or flexible membrane should use this performance criteria.

SHEET FLOW VELOCITY

Sheet Flow Velocity

Required: Determine the sheet flow velocity for the final cover system design and compare to the permissable non-erodible flow velocity.

Method:
1. Determine the 25-year peak flow rate using the Rational Method.
2. Calculate flow depth using Manning's Equation.
3. Calculate sheet flow velocity and compare to permissible non-erodible velocity.

References:
1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised May 2014. (Note: The Hydraulic Design Manual, Revised September 2019, uses a different equation to calculate rainfall intensity which is not consistent with Reference 2.)
2. NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 11 Version 2.0: Texas, 2018.

Solution:

1. Determine the 25-year peak flow rate (Q) using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.28 in	(ref 2)
Time of Concentration (tc) =	10.0 min	(conservative minimum value)
Rainfall Intensity (I) =	7.7 in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70	(typical value for final cover systems)
25-Year Peak Flow Rate (Q) =	CIA cfs	

	Top Slope (4%)	Perimeter Slope (25%)	
Longest Run =	820	120 ft	(longest sheet flow distance to swale)
Width =	1.00	1.00 ft/ft	(unit width of flow)
Area =	0.0188	0.0028 acre	
Q	0.101	0.015 cfs	

2. Calculate the flow depth using Manning's Equation.
   - Rearrange Manning's Equation for wide and shallow flow to calculate flow depth:

$$y = (Qn/1.49S^{0.5})^{0.6}$$

Manning's Roughness (n) =		0.03	(typical value for vegetated final cover)
Slope =	0.040	0.250 ft/ft	(final cover design slopes)
Depth (y) =	0.0639	0.0116 ft	

3. Calculate sheet flow velocity and compare to permissible non-erodible velocity.
   - A permissible non-erodible velocity of 5 ft/sec is typical for vegetated final covers.
   - Refer to page C3-A-8 for soil loss calculations.

$$V = Q / (y * width)$$

Sheet flow velocity	**1.58**	**1.27 ft/sec**

Summary: Permissable non-erodible velocity is 5.0 ft/sec with vegetated final cover. Therefore, the expected sheet flow velocity is acceptable on the final cover system top and side slopes with vegetation provided.

DRAINAGE SWALE DESIGN

Drainage Swale Analysis - Topslopes

Required: Determine the topslope drainage swale capacity.

Method:

1. Calculate the topslope swale's flow capacity using Manning's Equation.
2. Determine the maximum allowable topslope drainage area using the Rational Method.
3. Provide the maximum proposed topslope drainage area for comparison.

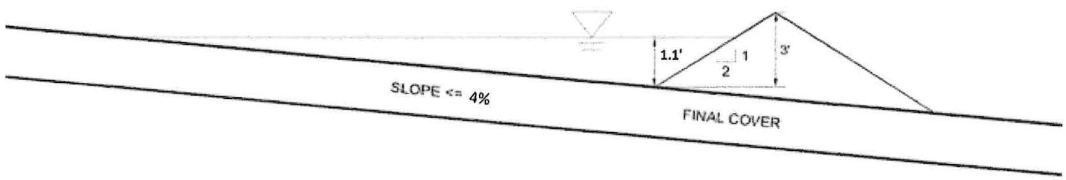
References:

1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised May 2014. (Note: The Hydraulic Design Manual, Revised September 2019, uses a different equation to calculate rainfall intensity which is not consistent with Reference 2.)
2. NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 11 Version 2.0: Texas, 2018.

Solution:

1. Calculate flow capacity using Manning's Equation.

- Swale Characteristics:



Max swale flow depth (D) =	1.10 ft	
Running swale slope (S) =	0.5 %	
Manning's Roughness (n) =	0.03	(typical value for vegetated final cover)
Left slope (LS) =	25.00 :1	
Right slope (RS) =	2 :1	
Flow Area (A) =	((LS+RS)*D^2)/2	
Wetted Perimeter (WP) =	((LS*D)^2+D^2)^(0.5) + ((RS*D)^2+D^2)^(0.5)	
Hydraulic Radius (R) =	A / WP	
Flow Area (A) =	16.335 sf	
Wetted Perimeter (WP) =	29.982 ft	
Hydraulic Radius (R) =	0.545 ft	

- Use Manning's Equation to determine the flow velocity in the swale.

Velocity (V) = 1.49*R^(2/3)*S^(1/2)/n

Velocity (V) = 2.343 ft/sec

- Calculate the swale's flow capacity.

Swale capacity (Q) = V * A

Q = 38.3 cfs

2. Determine the maximum allowable drainage area using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.28 in	(ref 2)
Time of Concentration (tc) =	10 min	(conservative minimum value)
Rainfall Intensity (I) =	7.7 in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70	(typical value for final cover systems)
25-Year Peak Flow Rate (Q) =	CIA cfs	

- Rearrange the Rational Formula to calculate allowable drainage area:

Drainage Area = Q / (CI)

Maximum Allowable Swale Drainage Area = 7.12 acres

3. Provide the maximum proposed topslope drainage area for comparison.

Maximum Proposed Swale Drainage Area = 5.21 acres

Summary: The maximum proposed topslope swale drainage area is 5.21 acres. This is less than the maximum allowable drainage area of 7.12 acres for the proposed swale configuration.

Drainage Swale Analysis - Sideslopes

Required: Determine the sideslope drainage swale capacity.

Method:

1. Calculate the sideslope swale's flow capacity using Manning's Equation.
2. Determine the maximum allowable sideslope drainage area using the Rational Method.
3. Provide the maximum proposed sideslope drainage area for comparison.

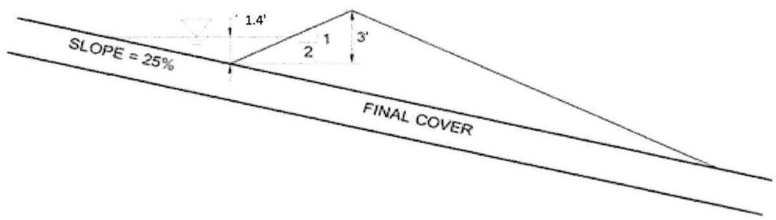
References:

1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised May 2014. (Note: The Hydraulic Design Manual, Revised September 2019, uses a different equation to calculate rainfall intensity which is not consistent with Reference 2.)
2. NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 11 Version 2.0: Texas, 2018.

Solution:

1. Calculate flow capacity using Manning's Equation.

- Swale Characteristics:



Max swale flow depth (D) =	1.40	ft	
Running swale slope (S) =	0.5	%	
Manning's Roughness (n) =	0.03		(typical value for vegetated final cover)
Left slope (LS) =	4.00	:1	
Right slope (RS) =	2	:1	
Flow Area (A) =	((LS+RS)*D^2)/2		
Wetted Perimeter (WP) =	((LS*D)^2+D^2)^(0.5) + ((RS*D)^2+D^2)^(0.5)		
Hydraulic Radius (R) =	A / WP		
Flow Area (A) =	5.880	sf	
Wetted Perimeter (WP) =	8.903	ft	
Hydraulic Radius (R) =	0.660	ft	

- Use Manning's Equation to determine the flow velocity in the swale.

Velocity (V) = 1.49*R^(2/3)*S^(1/2)/n

Velocity (V) = 2.663 ft/sec

- Calculate the swale's flow capacity.

Swale capacity (Q) = V * A

Q = 15.7 cfs

2. Determine the maximum allowable drainage area using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.28	in	(ref 2)
Time of Concentration (tc) =	10	min	(conservative minimum value)
Rainfall Intensity (I) =	7.7	in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70		(typical value for final cover systems)
25-Year Peak Flow Rate (Q) =	CIA	cfs	

- Rearrange the Rational Formula to calculate allowable drainage area:

Drainage Area = Q / (CI)

Maximum Allowable Swale Drainage Area = 2.91 acres

3. Provide the maximum proposed sideslope drainage area for comparison.

Maximum Proposed Swale Drainage Area = 2.50 acres

Summary: The maximum proposed sideslope swale drainage area is 2.5 acres. This is less than the maximum allowable drainage area of 2.91 acres for the proposed swale configuration.

CHUTE DESIGN

Chute Design

Required: Determine final cover collection channel and chute flowrates.

Method:

1. Determine the flow from each chute drainage area using the Rational Method

Reference

1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised May 2014.
   (Note: The Hydraulic Design Manual, Revised September 2019, uses a different equation to calculate rainfall intensity which is not consistent with Reference 2.)
2. NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 11 Version 2.0: Texas, 2018.

Solution:

1. Determine the 25-Year Peak Flow Rate using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.28	in	(ref 2)
Time of Concentration (tc) =	10	min	(conservative minimum value)
Rainfall Intensity (I) =	7.7	in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70		(typical value for final cover systems)
25-Year Peak Flow Rate (Q) =	CIA	cfs	

Chute	Chute Area (acre)	25-Year Peak Flow Rate (cfs)
1	23.2	125
2	15.5	83
3	17.6	95
4	17.7	95
5	13.5	72
6	17.9	96
7	17.6	95
8	20.5	110
9	20.9	112
10	23.3	125

Downchute Calculations

Required: Determine the flow depth and velocity in the chutes.

Method: Calculate the flow depth and velocity using Manning's Equation.

Solution:

		Chute					
Chute	Q (cfs)	Width (ft)	Slope (%)	Side Slopes (h:v)	Manning's n	Depth (ft)	Velocity (fps)
1	125	20	25	4	0.013	**0.26**	**22.60**
2	83	20	25	4	0.013	**0.21**	**19.39**
3	95	20	25	2	0.013	**0.22**	**20.69**
4	95	20	25	4	0.013	**0.22**	**20.41**
5	72	20	25	4	0.013	**0.19**	**18.39**
6	96	20	25	4	0.013	**0.22**	**20.49**
7	95	20	25	4	0.013	**0.22**	**20.38**
8	110	20	25	4	0.013	**0.24**	**21.59**
9	112	20	25	4	0.013	**0.25**	**21.73**
10	125	20	25	4	0.013	**0.26**	**22.65**

Notes:

1. Flow rates were calculated using the Rational Method for the 25-year rainfall event.
2. Erosion protection on downchute will be 40-mil textured flexible membrane liner (FML).

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX C1F

INTERMEDIATE COVER
EROSION AND SEDIMENTATION CONTROL PLAN

NARRATIVE

This appendix presents temporary erosion and sediment control structures for the intermediate cover phase of landfill development. Temporary means the time between the construction of intermediate cover and the construction of final cover or the placement of additional waste, as the case may be. Appendix C1F addresses the requirements of 30 TAC §330.305(d) and (e) related to the intermediate cover phase of the landfill.

As defined in the guidance document RG-417 issued by TCEQ dated May 2018; intermediate topslope surfaces and external sideslopes, for the purposes of compliance with 30 TAC §330.305(d), are:

a) those above grade slopes that directly drain to the site perimeter stormwater management system (i.e., areas where the stormwater directly flows to a perimeter channel or detention pond)

b) those that have received intermediate or final cover

c) those that have either reached their permitted elevation, or will subsequently remain inactive for longer than 180 days

Slopes that drain to ongoing waste placement, pre-excavated areas, areas that have received only Weekly cover, or areas under construction that have not received waste are not covered under this appendix. Areas that have received final cover are not covered in this appendix. This appendix addresses only intermediate cover slopes.

EROSION AND SEDIMENT CONTROL LANDFILL COVER PHASES

The purpose of this section is to define the landfill cover phases and where they are addressed throughout the Chisholm Trail Disposal Landfill permit:

Weekly Cover – Weekly cover is defined in §330.165(a). Weekly cover consists of 6 inches of well compacted earthen material not previously mixed with garbage, rubbish, or other solid waste applied at the end of each operating day. The placement and erosion control practices for Weekly cover areas are defined in Part IV – Site Operating Plan and in the Best Management Practices Section of this appendix.

Intermediate Cover – Intermediate cover is defined in §330.165(c). Intermediate cover consists of at least 12 inches of suitable earthen material and is graded and maintained to prevent erosion and ponding of water. The placement requirements and erosion control practices for intermediate cover areas are defined in this appendix.

Final Cover – Final cover is defined in Subchapter K. The placement and erosion control practices for final cover areas are defined in Attachment C1, Appendix C1E. Final cover at the Chisholm Trail Disposal Landfill will be managed as provided for in the closure and postclosure plan required by 30 TAC 330 Subchapter K, Closure and Post-Closure.

BEST MANAGEMENT PRACTICES

Vegetation and temporary erosion control structures provide the most effective means to reduce the amount of soil loss during operation of the landfill. Best management practices utilized for erosion and sediment control may be broadly categorized as nonstructural and structural controls. Nonstructural controls addressing erosion include the following:

- Minimization of the disruption of the natural features, drainage, topography, or vegetative cover features
- Phased development to minimize the area of bare soil exposed at any given time
- Plans to disturb only the smallest area necessary to perform current activities
- Plans to confine sediment to the construction area during the construction phase
- Scheduling of construction activities during the time of year with the least erosion potential, when applicable
- Specific plans for the stabilization of exposed surfaces in a timely manner

Structural controls are preventative and also mitigative since they control erosion and sediment movement. Structural controls addressing erosion include the following:

- Vegetative and Non-Vegetative Stabilization. A soil stabilization and vegetation schedule is provided in this appendix.
- Check Dams. Check dams may be constructed using gravel, rock, gabions, compost socks, or sandbags to reduce flow velocity and therefore erosion in a perimeter channel or detention pond.
- Filter Berms. Filter berms may be constructed of mulch, woodchips, brush, compost, shredded woodwaste, or synthetic filter materials. Mesh socks may be filled with compost, mulch, woodchips, brush, or shredded woodwaste. Filter berms or filled mesh socks may be installed at the bottom of slopes, throughout the perimeter drainage system, and on sideslopes. The maximum drainage area to the filter berm or filled mesh sock will not exceed 2 acres. Specifications for the filter berms are provided on Drawing C1F.3, Detail TD11.

- Baled Hay. Hay bales, straw bales, or baled hay shall be approximately 30 inches in length and be composed entirely of vegetable matter. Hay bales shall be embedded in the soil a minimum of 4 inches and where possible one-half the height of the hay bale.

- Sediment Traps. Sediment traps are small, excavated areas that function as a sediment basin. Sediment traps allow for the settling of suspended sediment in stormwater runoff. Sediment traps may be constructed in perimeter channels, temporary internal channels, and at entrances to detention ponds. The maximum drainage area contributing to a sediment trap will not exceed 10 acres.

- Temporary Sediment Control Fence or Silt Fence. Silt fences or fabric filter fences may be used where there is sheet flow. The maximum drainage area to the silt fence will not exceed the manufacturer's specification, but in no case be greater than 0.5 acre per 100 feet of fence. To ensure sheet flow, a gravel collar or level spreader may be used upslope of the silt fence.

- Swales. These structures will be constructed of a material with the top 6 inches capable of sustaining native plant growth. Rolled erosion control mats or blankets made from natural materials or synthetic fiber, grass, or compost/mulch/straw may be used as erosion protection along the flowline. These structures direct the flow to the drainage system. These structures decrease downslope velocities of runoff that could cause erosion on the intermediate cover slopes.

- Letdown Chutes. Letdown chutes are bermed conveyance structures constructed on the intermediate cover slopes. Flow will be directed to the letdown chutes via swales, then conveyed to the perimeter drainage system. The letdown chutes will be lined with an FML geomembrane, turf reinforcement mats, riprap, concrete, gabions, crushed concrete, or stone.

Erosion will be controlled by vegetation on topslopes, sideslopes, swales, and in drainage conveyance structures with flow velocities less than or equal to 5 fps. For drainage conveyance structures with flow velocities greater than 5 fps, turf reinforcement, rock riprap, concrete, gabions, or other appropriate materials will be used for surface reinforcement.

Intermediate cover erosion and sediment control structures are shown on Drawings C1F.2 through C1F.4. During site development, both structural and non-structural BMPs will be employed to control erosion.

The potential for wind erosion of the intermediate cover surface will be mitigated through the placement of temporary intermediate cover erosion control measures and establishment of vegetative cover. Temporary erosion control measures include surface roughening, surface wetting, application of tackifiers, or hydromulching the intermediate cover surface.

SOIL STABILIZATION AND VEGETATION SCHEDULE

The soil stabilization and vegetation schedule is as follows:

- Areas that will remain inactive for periods greater than 180 days will receive intermediate cover.
- Intermediate cover on slopes will be stabilized by tracking into the slope. Soil stabilization can be enhanced by mulching, the addition of soil tackifiers, soil treatment, or any combination of these measures. The intermediate cover will be graded to provide positive drainage.
- Temporary erosion control structures will be installed within 180 days from when intermediate cover is constructed.
- The intermediate cover area will be seeded or sodded as soon as practical, following placement of intermediate cover and will be documented in the site operating record. All intermediate cover areas will be managed to control erosion and achieve a predicted soil loss of less than 50 tons per acre per year. A 60 percent vegetative cover will be established over the intermediate cover areas within 180 days from intermediate cover construction unless prevented by climatic events (e.g., drought, rainfall, etc.). Additional temporary erosion control measures will be implemented during these events to facilitate the establishment of vegetative cover.
- Mulch, woodchips, or compost may be used as a layer placed over the intermediate cover to protect the exposed soil surface from erosive forces and conserve soil moisture until vegetation can be established. The mulch, woodchips, or compost will be used to stabilize recently graded or seeded areas. The mulch, woodchips, or compost will be spread evenly over a recently seeded area and tracked into the surface to protect the soil from erosion and moisture loss, if required to promote the establishment of vegetation. These materials are not required for the establishment of vegetation on the intermediate cover; however, they may be used if the Chisholm Trail Disposal Landfill determines they are needed to promote vegetative growth or to provide additional erosional stability to the intermediate cover surface. These materials will vary in thickness but will not be placed to a thickness to inhibit vegetative growth.
- The intermediate cover and temporary erosion control structures will be maintained as detailed in the Stormwater System Maintenance Plan.
- Final cover will be constructed as the site develops. Temporary erosion control features will be removed as permanent erosion control structures are constructed.

STORMWATER SYSTEM MAINTENANCE PLAN

The Chisholm Trail Disposal Landfill will restore and repair temporary stormwater systems such as channels, drainage swales, chutes, and flood control structures in the event of wash-out or failure. In addition, the BMPs discussed in this appendix will also be replaced or repaired in the event of failure. Excessive sediment will be removed, as needed, so that the drainage structures function as designed. Site inspections by landfill personnel will be performed weekly or within 48 hours of a rainfall event of 0.5 inches or more.

The following items will be evaluated during the inspections:

- Erosion of intermediate cover areas, perimeter ditches, temporary chutes, swales, detention ponds, berms, and other drainage features
- Settlement of intermediate cover areas, final cover areas, perimeter ditches, chutes, swales, and other drainage features
- Silt and sediment build-up in perimeter ditches, chutes, swales, and detention ponds
- Presence of ponded water on intermediate cover or behind temporary erosion control structures
- Obstructions in drainage features
- Presence of erosion or sediment discharge at offsite stormwater discharge locations
- Temporary erosion and sediment control features

Maintenance activities will be performed to correct damaged or deficient items noted during the site inspections. These activities will be performed as soon as possible after the inspection. The time frame for correction of damaged or deficient items will vary based on weather, ground conditions, and other site-specific conditions.

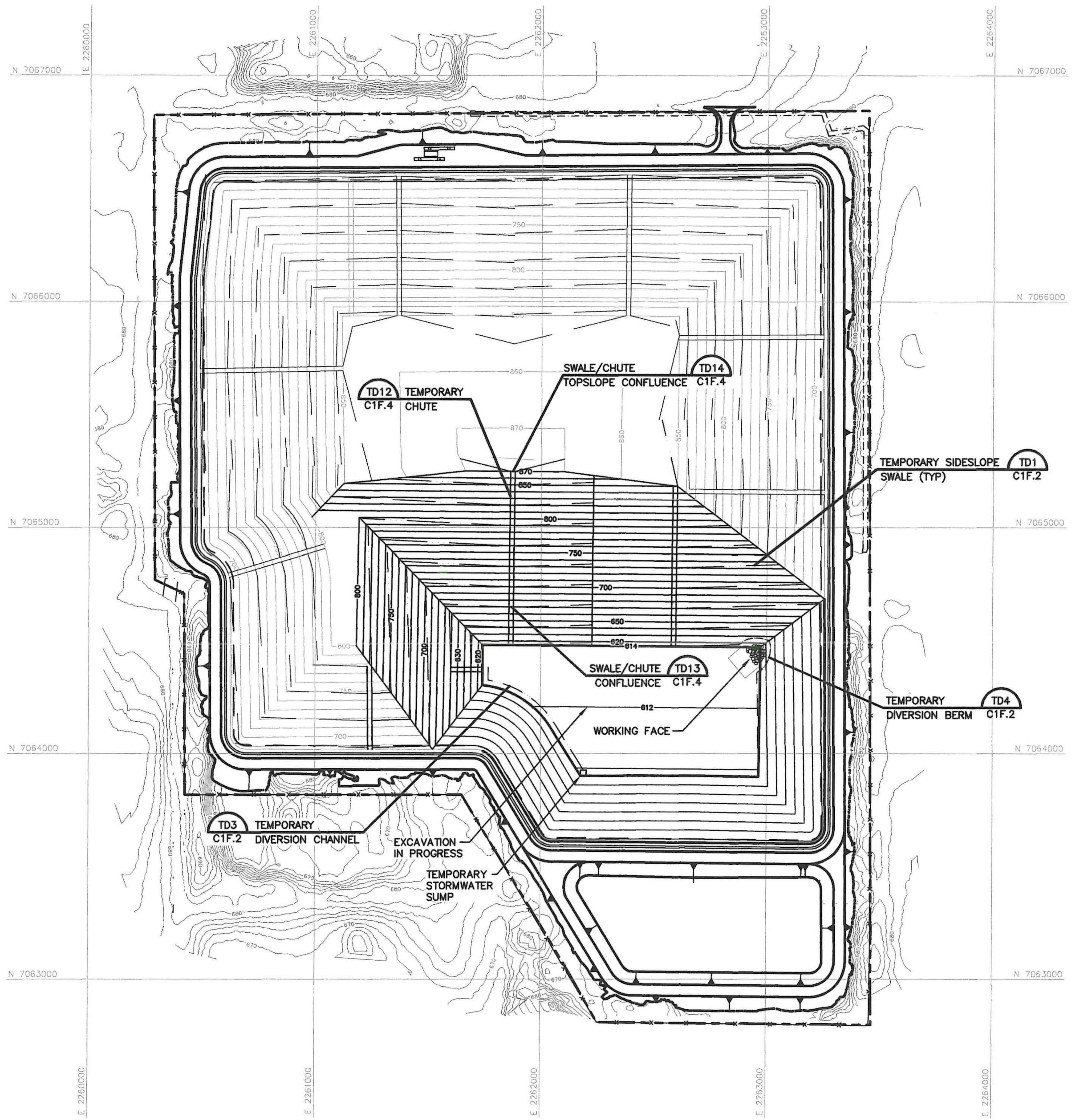
Maintenance activities will consist of the following, as needed:

- Placement of additional temporary or permanent vegetation
- Placement, grading, and stabilization of additional soils in eroded areas or in areas which have settled
- Replacement of riprap or other structural lining
- Removal of obstructions from drainage features
- Removal of silt and sediment build-up from the temporary erosion control structures
- Removal of ponded water on the intermediate cover or behind temporary erosion control structures
- Repairs to erosion and sedimentation controls
- Installation of additional erosion and sedimentation controls

Documentation and training requirements are discussed below:

- Site inspections by landfill personnel will be performed weekly or within 48 hours of a rainfall event of 0.5 inches or more.
- Documentation of the inspection will be included in the site operating record.
- Documentation of maintenance activities that were performed to correct damaged or deficient items noted during the site inspections will be included in the site operating record.
- Landfill personnel will be trained to perform inspections, install, and maintain temporary erosion control structures.

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C1-F-1 IntermediateCoverErosionControl.dwg Layout: C1-F-1 User: awhite



0 250 500
SCALE IN FEET

LEGEND

(dashed line)	PERMIT BOUNDARY
700	10' CONTOUR
N 7062000	STATE PLANE COORDINATES
x x	FENCE
800	FINAL COVER CONTOUR
612	EXCAVATION CONTOUR

NOTE(S):

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS

REV	DATE	DESCRIPTION

INTERMEDIATE COVER EROSION CONTROL FEATURES

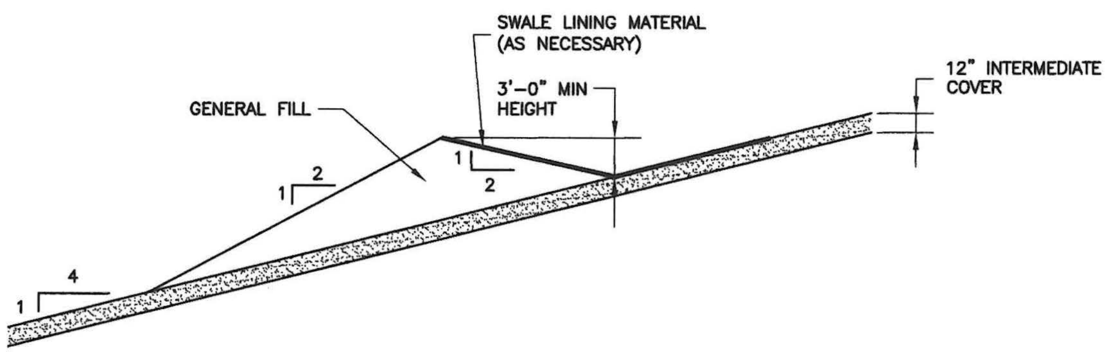
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

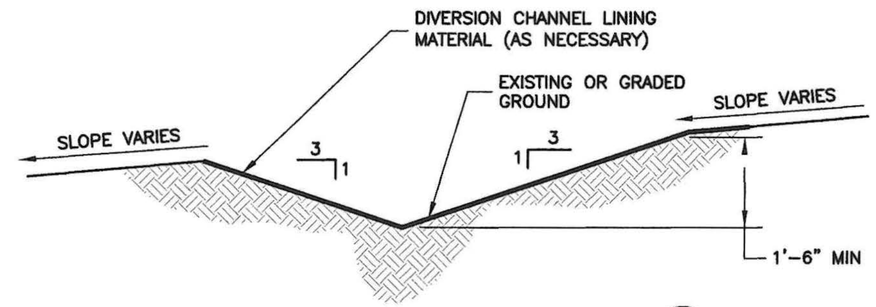
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1F.1



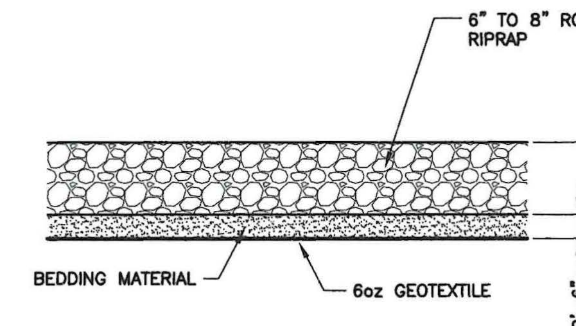
TEMPORARY SIDESLOPE SWALE (TD1 / C1F.2)

NTS



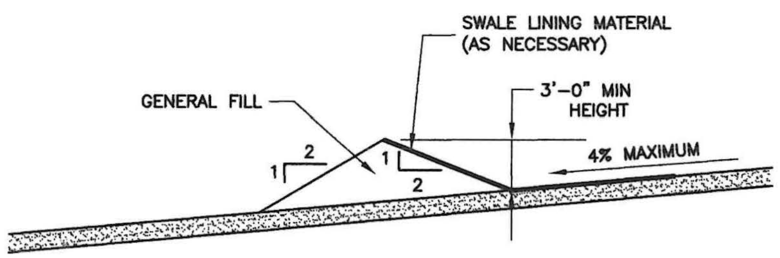
TEMPORARY DIVERSION CHANNEL (TD3 / C1F.2)

NTS



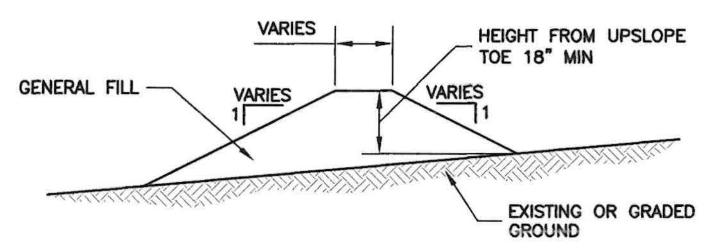
ROCK RIPRAP (TD5 / C1F.2)

NTS



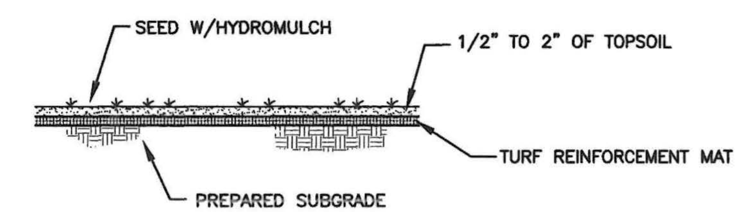
TEMPORARY TOPSLOPE SWALE (TD2 / C1F.2)

NTS



TEMPORARY DIVERSION BERM (TD4 / C1F.2)

NTS



TEMPORARY TURF REINFORCEMENT MATTING (TD6 / C1F.2)

NTS

NOTE:

1. LINING MATERIAL, IF NECESSARY, FOR THE TEMPORARY DRAINAGE SWALES WILL BE TURF REINFORCEMENT MATTING OR OTHER SUITABLE MATERIALS.

TEMPORARY EROSION CONTROL STRUCTURES
1. TEMPORARY EROSION CONTROL STRUCTURE DETAILS DEPICT VARIOUS TYPES OF EROSION CONTROL FEATURES FOR CURRENT AND FUTURE DEVELOPMENT.
2. ALL TEMPORARY EROSION CONTROL STRUCTURES SHOWN MAY NOT BE CONSTRUCTED DEPENDING ON SITE CONDITIONS.
3. LANDFILL WILL SELECT EROSION CONTROL DETAILS TO BE USED FOR SITE SPECIFIC CONDITIONS.
4. ACTUAL DIMENSIONS OF TEMPORARY EROSION CONTROL STRUCTURES MAY VARY BASED ON SITE CONDITIONS.

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED PROFESSIONAL ENGINEER
9/23/2025

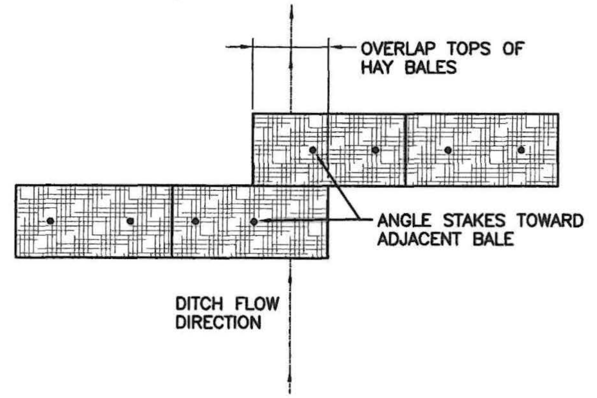
FOR PERMITTING PURPOSES

TEMPORARY EROSION CONTROL STRUCTURES

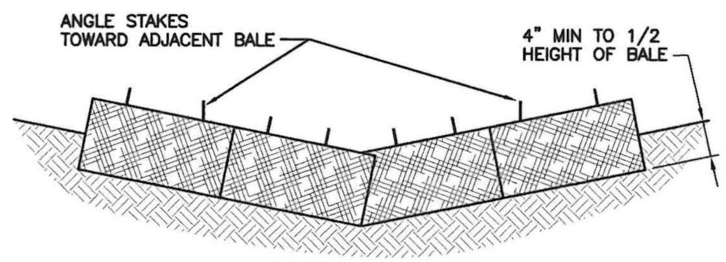
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1F.2



PLAN VIEW

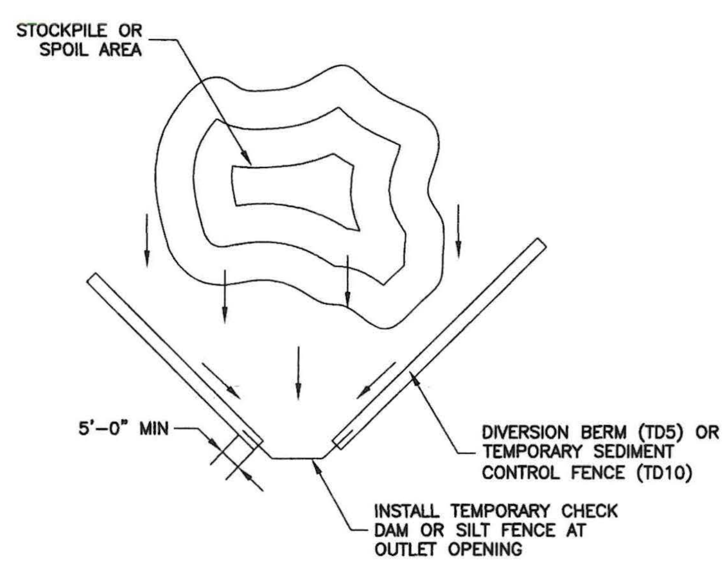


PROFILE VIEW

BALED HAY FOR EROSION CONTROL (TD7 / C1F.3)

NTS

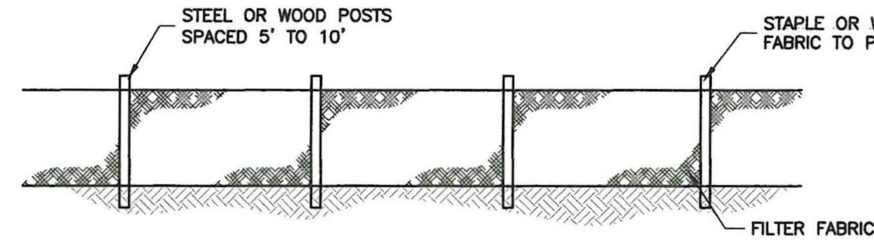
HAY BALE NOTE:
1. HAY BALES SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 4" AND WHERE POSSIBLE 1/2 THE HEIGHT OF THE BALE.



STOCKPILE EROSION CONTROL (TD8 / C1F.3)

NTS

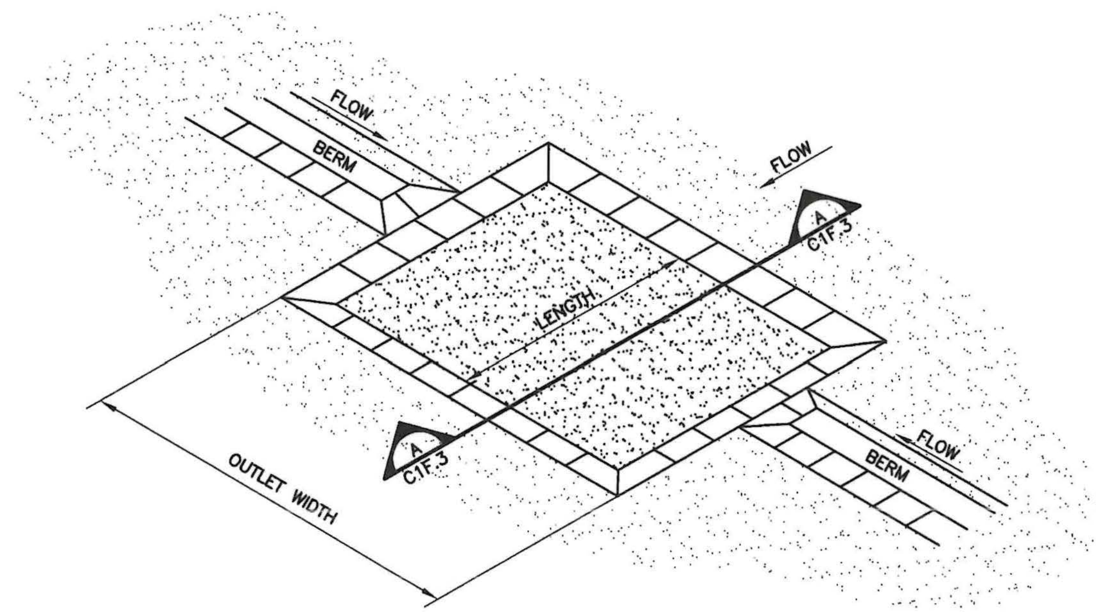
NOTE:
1. CONSTRUCT DIVERSION DIKE TO DIVERT STORMWATER RUN-OFF FROM STOCKPILE OR SPOIL AREA THROUGH CHECK DAM, HAY BALES, OR SILT FENCE.



TEMPORARY SEDIMENT CONTROL (SILT) FENCE (TD9 / C1F.3)

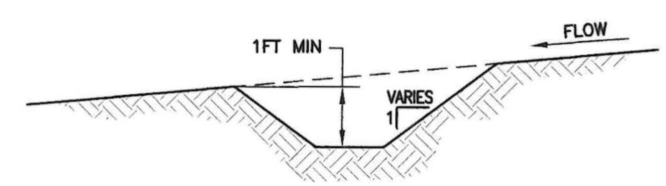
NTS

SILT FENCE NOTES:
1. MAXIMUM DRAINAGE AREA TO THE FENCE SHOULD NOT EXCEED THE MANUFACTURER'S SPECIFICATION BUT IN NO CASE BE GREATER THAN 0.5 ACRE PER 100 FEET OF FENCE.
2. TO ENSURE SHEET FLOW, A GRAVEL COLLAR OR LEVEL SPREADER MAY BE USED UPSLOPE OF THE SILT FENCE.



SEDIMENT TRAP PLAN

NTS



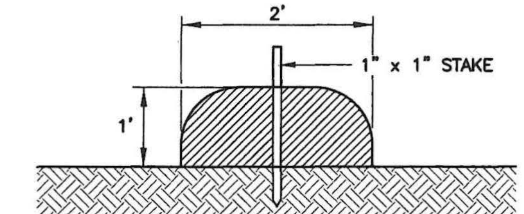
SEDIMENT TRAP SECTION (A-A / C1F.3)

NTS

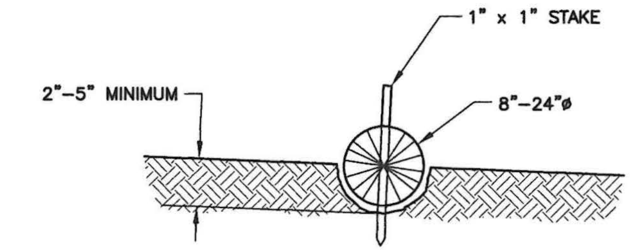
SEDIMENT TRAP (TD10 / C1F.3)

NTS

NOTE:
1. OUTLET INTO STABILIZED AREA (VEGETATION, ROCK, ETC.)
2. THE MAXIMUM AREA CONTRIBUTING TO A SEDIMENT TRAP SHOULD BE LESS THAN 10 ACRES.



OPTION 1



OPTION 2

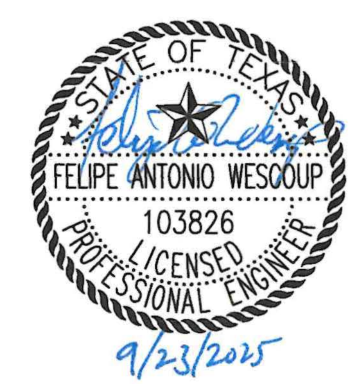
FILTER BERM (TD11 / C1F.3)

NTS

FILTER BERM NOTES:
1. FILTER BERMS MAY BE CONSTRUCTED OF MULCH, WOODCHIPS, BRUSH, COMPOST, SHREDDED WOODWASTE, OR SIMILAR MATERIALS.
2. FILTER BERMS MAY ALSO CONSIST OF MESH SOCKS FILLED WITH MULCH, WOOHCHIPS, BRUSH, COMPOST, SHREDDED WOODWASTE, OR SIMILAR MATERIALS.
3. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND THE COMPOST FILTER BERM.
4. STAKES WILL BE PLACED 2-5" DEEP.
5. MAXIMUM DRAINAGE AREA TO THE FILTER BERM SHOULD NOT EXCEED 2 ACRES.

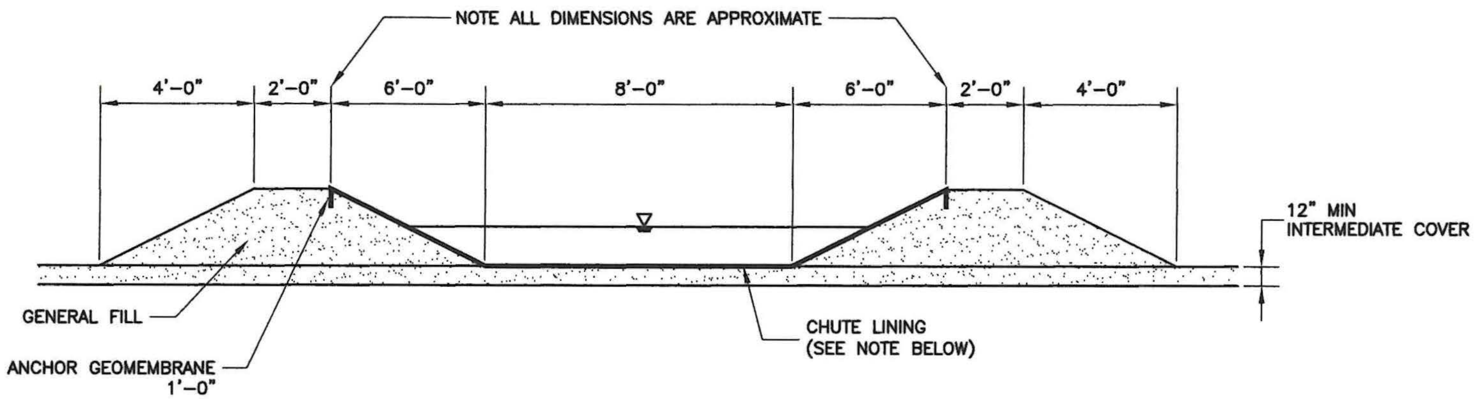
TEMPORARY EROSION CONTROL STRUCTURES

1. TEMPORARY EROSION CONTROL STRUCTURE DETAILS DEPICT VARIOUS TYPES OF EROSION CONTROL FEATURES FOR CURRENT AND FUTURE DEVELOPMENT.
2. ALL TEMPORARY EROSION CONTROL STRUCTURES SHOWN MAY NOT BE CONSTRUCTED DEPENDING ON SITE CONDITIONS.
3. LANDFILL WILL SELECT EROSION CONTROL DETAILS TO BE USED FOR SITE SPECIFIC CONDITIONS.
4. ACTUAL DIMENSIONS OF TEMPORARY EROSION CONTROL STRUCTURES MAY VARY BASED ON SITE CONDITIONS.



FOR PERMITTING PURPOSES

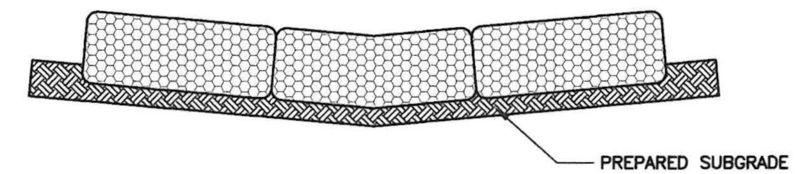
TEMPORARY EROSION CONTROL STRUCTURES	
CHISHOLM TRAIL DISPOSAL, LLC CHISHOLM TRAIL DISPOSAL LANDFILL	
BME	BIGGS & MATHEWS ENVIRONMENTAL 1700 ROBERT ROAD, STE. 100 MANSFIELD, TEXAS 76063 817-563-1144
TBPE FIRM NO. F-256 TBPG FIRM NO. 50222	DRAWING C1F.3



TEMPORARY CHUTE LETDOWN (TD12 / C1F.4)

NTS

NOTE: CHUTE LINING WILL CONSIST OF ONE OF THE FOLLOWING: TURF REINFORCEMENT, SACRIFICIAL GEOMEMBRANE, GABIONS, ROCK RIPRAP, CONCRETE, CRUSHED CONCRETE, OR STONE.



CHECK DAM (TD15 / C1F.4)

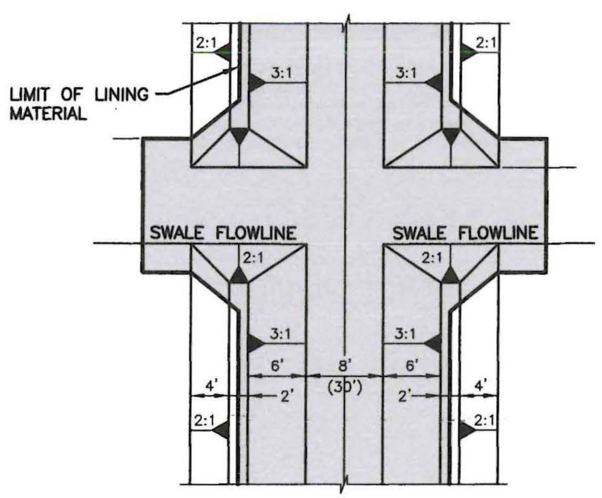
NTS

CHECK DAM NOTES:

1. MAY BE CONSTRUCTED USING GRAVEL, ROCK, GABIONS, COMPOST SOCKS, OR SAND BAGS.
2. PLACED ON PREPARED SUBGRADE OR BEDDING MATERIAL ALONG THE CONTOUR AT 0% GRADE OR AS NEAR AS POSSIBLE.
3. TOP WIDTH OF TWO FEET MINIMUM.
4. SIDESLOPES 2H:1V OR FLATTER.
5. MAY BE USED WHEN CONTRIBUTING DRAINAGE AREAS ARE LESS THAN 10 ACRES. MULTIPLE CHECK DAMS MAY BE INSTALLED IF DRAINAGE AREAS ARE GREATER THAN 10 ACRES.
6. CHECK DAMS SHOULD BE USED WHEN THE VOLUME OF RUNOFF IS TOO GREAT FOR OTHER EROSION CONTROL FEATURES (i.e. SILT FENCES, HAY BALES).

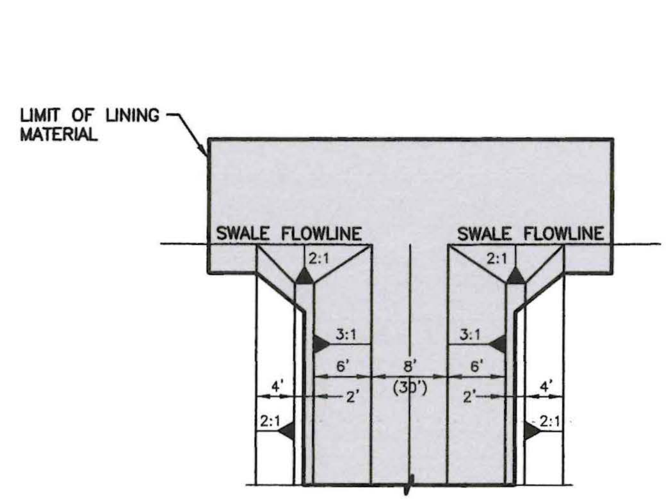
TEMPORARY EROSION CONTROL STRUCTURES

1. TEMPORARY EROSION CONTROL STRUCTURE DETAILS DEPICT VARIOUS TYPES OF EROSION CONTROL FEATURES FOR CURRENT AND FUTURE DEVELOPMENT.
2. ALL TEMPORARY EROSION CONTROL STRUCTURES SHOWN MAY NOT BE CONSTRUCTED DEPENDING ON SITE CONDITIONS.
3. LANDFILL WILL SELECT EROSION CONTROL DETAILS TO BE USED FOR SITE SPECIFIC CONDITIONS.
4. ACTUAL DIMENSIONS OF TEMPORARY EROSION CONTROL STRUCTURES MAY VARY BASED ON SITE CONDITIONS.



SWALE/CHUTE CONFLUENCE (TD13 / C1F.4)

NTS



SWALE/CHUTE TOPSLOPE CONFLUENCE (TD14 / C1F.4)

NTS

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

TEMPORARY EROSION CONTROL STRUCTURES

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C1F.4

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX C1G

INTERMEDIATE COVER
EROSION CONTROL STRUCTURE DESIGN

NARRATIVE

This appendix presents the supporting documentation to evaluate and design temporary erosion and sediment control structures for the intermediate cover phase of landfill development. Appendix C1G addresses the requirements of 30 TAC §330.305(d) and (e) and provides the evaluation and design of temporary erosion and sediment control structures for intermediate cover slopes.

INTERMEDIATE COVER PLAN

As intermediate cover is constructed, temporary chutes and swales will be constructed to prevent erosion and sedimentation. Erosion control features (i.e., filter berms, rock check dams, hay bales, or equivalent) may be constructed at the toe of filled areas to minimize erosion and prevent disturbance of the existing grassed slopes. Otherwise, temporary erosion and sediment control features will be installed within 180 days from when the intermediate cover is constructed. An existing conditions summary and Best Management Practices are included in Appendix C1F. Example intermediate cover drainage calculations are included in this appendix for use in site operations.

INTERMEDIATE COVER EVALUATION

The intermediate cover evaluation is based on the Universal Soil Loss Equation (USLE) following Soil Conservation Service (SCS) procedures. The evaluation is based on a 12-inch thick intermediate cover layer with 60 percent vegetated cover. Calculations for the soil loss for intermediate cover on external 4 percent and 25 percent slopes have been provided on pages C1G.4 through C1G.11.

SHEET FLOW DESIGN

The sheet flow calculations are presented for external 4 percent and 25 percent slope configurations. The permissible non-erodible velocities should be less than 5 ft/sec (clayey soil) or 4 ft/sec (sandy soil) on vegetated intermediate cover. The Manning's Equation and Rational Method were used to calculate sheet flow velocity.

TEMPORARY DRAINAGE SWALE DESIGN

The temporary drainage swales are designed for typical drainage areas and flowline slopes. The procedures in the TxDOT Hydraulic Design Manual, September 2019, were used to determine peak flow, flow depth, flow velocity, and swale capacity. The Rational Method and the Manning's Equation were used to calculate the design parameters.

TEMPORARY DIVERSION CHANNEL DESIGN

The temporary diversion channels are designed for typical drainage areas and flowline slopes. The procedures in the TxDOT Hydraulic Design Manual, September 2019, were used to determine peak flow, flow depth, flow velocity, and diversion channel capacity. The Rational Method and the Manning's Equation were used to calculate the design parameters.

TEMPORARY CHUTE DESIGN

The temporary chutes are designed for typical drainage areas on a 25 percent external side slope. The procedures in the TxDOT Hydraulic Design Manual, September 2019, were used to determine peak flow, flow depth, flow velocity, and chute capacity. The Rational Method and the Manning's Equation were used to calculate the design parameters.

INTERMEDIATE COVER EVALUATION

INTERMEDIATE COVER EVALUATION

SOIL LOSS

This section presents the supporting documentation for evaluation of the potential for intermediate cover soil erosion loss at the Chisholm Trail Disposal facility. The evaluation is based on the premise of adding excess soil to increase the time required before maintenance is needed as recommended in the EPA Solid Waste Disposal Facility Criteria Technical Manual (EPA 530-R-93-017, November 1993).

The design procedure is as follows:

1. Minimum thickness of the intermediate cover is evaluated based on the maximum soil loss of 50 tons per acre per year.

	4% slope	25% slope
Maximum Sheet Flow Length	820 ft	120 ft
Soil Loss	1.22 tons/acre/year	15.24 tons/acre/year

2. Soil loss is calculated using the Universal Soil Loss Equation (USLE) by following SCS procedures. The soil loss is based on 60 percent vegetative cover as recommended in the TNRCC, "Use of the Universal Soil Loss Equation in Final Cover/Configuration Design Procedural Handbook" (October 1993). These calculations are provided on pages C1G.6 and C1G.7.

3. Sheet flow velocities for a 25-year storm event are calculated to be less than permissible non-erodible velocities. The supporting calculations are presented on page C1G.13.

4. Temporary vegetation for the intermediate cover areas will be native and introduced grasses with root depths of 6 inches to 8 inches.

5. Native and introduced grasses will be hydroseeded, drill seeded, or broadcast seeded with fertilizer on the disked (parallel to contours) intermediate cover layer as soon as practical following placement of intermediate cover and will be documented in the site operating record. All intermediate cover areas will be managed to control erosion and achieve a predicted soil loss of less than 50 tons per acre per year. Temporary erosion and sediment control features (including at least 60 percent vegetative cover) will be installed within 180 days from when the intermediate cover is constructed. Areas that experience erosion or do not readily vegetate will be reseeded until vegetation is established or the soil will be replaced with soil that will support the grasses.

SHEET FLOW VELOCITY

The sheet flow velocity calculations are presented for external 4 percent and 25 percent slope configurations. The procedures outlined in the TxDOT Hydraulic Manual were used to determine velocities. Maximum sheet flow lengths for all three conditions were evaluated. Calculations are provided on page C1G.13.

Intermediate Cover Erosion Loss Evaluation

Required: 1. Determine the erosion loss for the intermediate cover design based on a maximum soil loss of 50 tons/acre/year.

Method: Expected soil loss is calculated using the Universal Soil Loss Equation.

References: 1. TNRCC, *Use of the Universal Soil Loss Equation in Final Cover/Configuration Design Procedural Handbook,* October 1993.

Solution: Annual Soil Loss in tons/acre/year (A) = RKLSCP

Design Parameters	External Top Slope (4%)	External Side Slope (25%)	
Rainfall Factor (R) =	250	250	Wise County
Soil Erodibility Factor (K) =	0.25	0.25	(Loam)
Longest Run =	820	120	ft
Slope =	4.0	25	%
Topographic Factor (LS) =	0.93	6.45	
Crop Management Factor (C) =	0.042	0.042	(60% vegetative cover)
Erosion Control Practice Factor (P) =	0.50	0.90	
Soil Loss (A) =	1.22	15.24	tons/acre/year

Summary: As noted in the permit drawings, the intermediate cover will be a minimum of 12 inches thick. As shown above, the maximum soil loss is 15.24 tons/acre/year, which is less than the maximum allowable soil loss of 50 tons/acre/year.

Intermediate Cover LS Factor Calculations

Required: 1. Determine the Length/Slope Factor based on slope length and slope gradient.

References: 1. TNRCC, *Use of the Universal Soil Loss Equation in Final Cover/Configuration Design Procedural Handbook,* October 1993.

Solution: Length/Slope Factor (LS) = ((L/72.6)m)*((65.41*sin2(S))+(4.56*sin(S))+0.065)

LS = Length/Slope Factor
L = Slope Length (ft)
S = radians
m = exponent dependent on the slope gradient

m = 0.2 for S <= 1.0%
0.3 for 1.0% < S <= 3.5%
0.4 for 3.5% < S < 5.0%
0.5 for S => 5.0%

Length, L (ft)	Slope, S %	Slope, S (ft/ft)	θ (radians)	θ (degrees)	m	LS
820	4.0	25.00	0.040	2.291	0.4	0.93
120	25	4	0.245	14.036	0.5	6.45

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

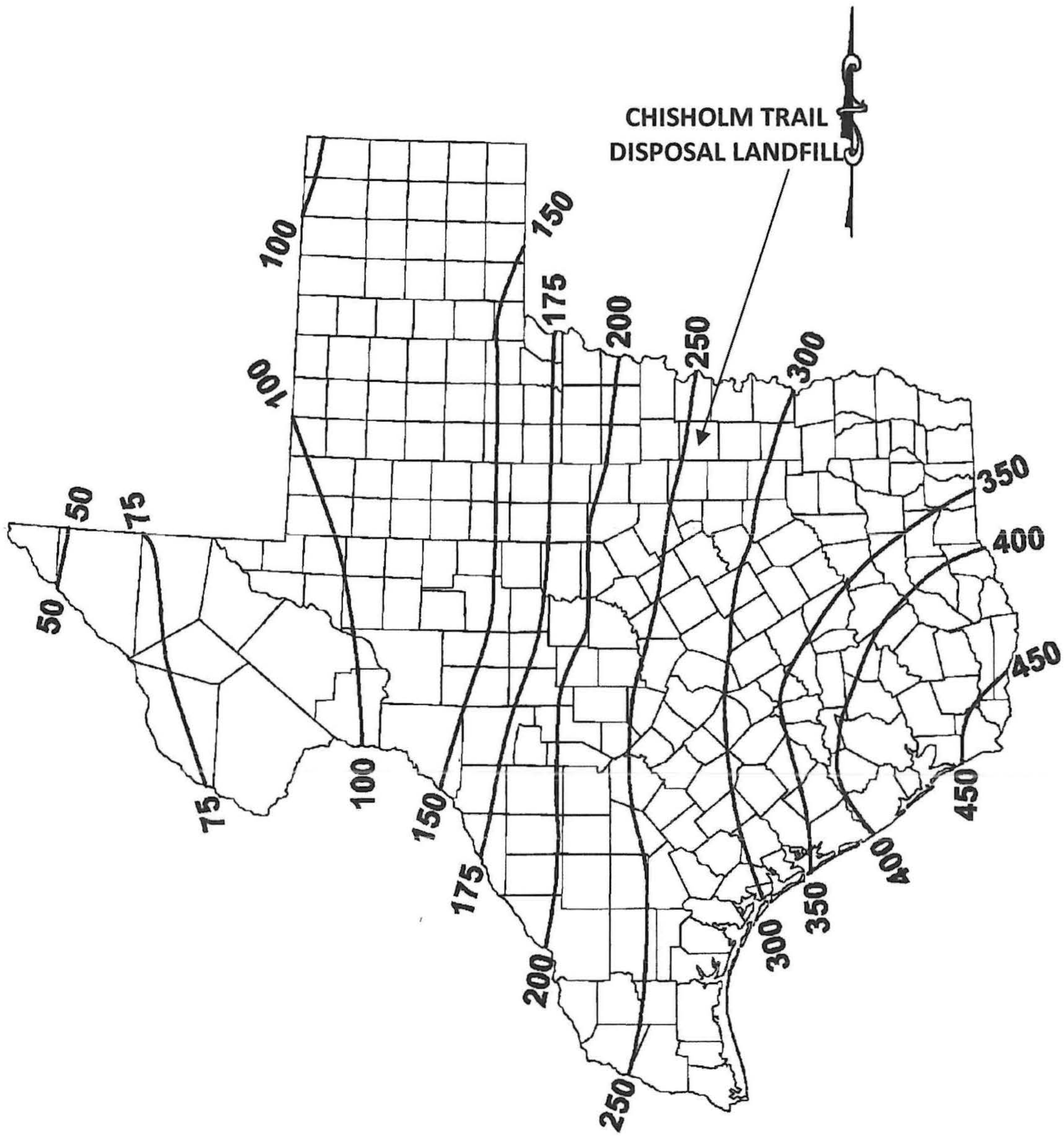


FIGURE 1 - AVERAGE ANNUAL VALUES OF THE RAINFALL EROSION INDEX

Table 1: Approximate Values of Factor K for USDA Textural Classes

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

Texture Class	Organic Matter Content		
	<0.5%	2%	4%
	K	K	K
Sand	0.05	0.03	0.02
Fine Sand	0.16	0.14	0.10
Very Fine Sand	0.42	0.36	0.28
Loamy Sand	0.12	0.10	0.08
Loamy Fine Sand	0.24	0.20	0.16
Loamy Very Fine Sand	0.44	0.38	0.30
Sandy Loam	0.27	0.24	0.19
Fine Sandy Loam	0.35	0.30	0.24
Very Fine Sandy Loam	0.47	0.41	0.33
Loam	0.38	0.32	0.29
Silt Loam	0.48	0.42	0.33
Silt	0.60	0.52	0.42
Sandy Clay Loam	0.27	0.25	0.21
Clay Loam	0.28	0.25	0.21
Silty Clay Loam	0.37	0.32	0.26
Sandy Clay	0.14	0.13	0.12
Silty Clay	0.25	0.23	0.19
Clay	0.13 - 0.29		

The values shown are estimated averages of broad ranges of specific soil values. When a texture is near the borderline of two texture classes, use the average of the two K values.

Table 2: Factor C for Permanent Pasture, Range, and Idle Land[1]

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

Vegetative Canopy		Cover that Contacts the Soil Surface					
Type and Height[2]	Percent Cover[3]	Percent Ground Cover					
		0	20	40	60	80	95+
No Appreciable Canopy		0.45	0.20	0.10	0.042	0.013	0.003
Tall weeds or short brush with average drop fall height of 20 in.	25	0.36	0.17	0.09	0.038	0.013	0.011
	50	0.26	0.13	0.07	0.035	0.012	0.003
	75	0.17	0.10	0.06	0.032	0.011	0.003

Extracted from: United States Department of Agriculture, AGRICULTURE HANDBOOK NUMBER 537

[1] The listed C values assume that the vegetation and mulch are randomly distributed over the entire area.

[2] Canopy height is measured as the average fall height of water drops falling from the canopy to the ground. Canopy effect is inversely proportional to drop fall height and is negligible if fall height exceeds 33 feet.

[3] Portions of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's eye view).

Table 3: P Factors for Contouring, Contour Stripcropping and Terracing

Reproduced from: Texas Natural Resource Conservation Commission, Municipal Solid Waste Division, Use of the Universal Soil Loss Equation in Final Cover/Configuration Design: Procedural Handbook, 1993.

Land Slope	P Values		
%	Contouring†	Contour Stripcropping	Terracing†
2.0 to 7	0.50	0.25	0.50
8.0 to 12	0.60	0.30	0.60
13.0 to 18	0.80	0.40	0.80
19.0 to 24	0.90	0.45	0.90

(This table appeared in SCS (5), p.9)

† Contouring and terracing columns are suitable for MSWLF cover. Contour stripcropping is not suitable for the type of vegetative cover normally practiced at municpal landfills.

Table 4: Guide for Assigning Soil Loss Tolerance Values (T) to Solid Having Different Rooting Depths

Rooting Depth	Soil Loss Tolerance Values Annual Soil Loss (Tons/Acre)	
Inches	Renewable Soil a/	Renewable Soil b/
0 - 10	1	1
10 - 20	2	1
20 - 40	3	2
40 - 60	4	3
60	5	4

(This table appeared in SCS (6), p.4)

a/ Soil with favorable substrata that can be renewed by tillage, fertilizer, organic matter, and other management practices. This column does not represent MSWLF final covers under normal conditions.

b/ Soil with unfavorable substrata such as rock or soft rock that cannot be renewed by economical means. Most of the MSWLF covers with constructed clay cap and/or flexible membrane should use this performance criteria.

SHEET FLOW

Intermediate Cover Sheet Flow Velocity

Required: Determine the sheet flow velocity for the intermediate cover design and compare to the permissable non-erodible flow velocity.

Method:
1. Determine the 25-year peak flow rate using the Rational Method.
2. Calculate flow depth using Manning's Equation.
3. Calculate sheet flow velocity and compare to permissible non-erodible velocity.

References:
1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised October 2011.
2. United States Geologic Survey, *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas*, 2004.

Solution:

1. Determine the 25-year peak flow rate (Q) using the Rational Method

25-Year Rainfall Depth (Pd) =	1.28	in	(ref 2)
Time of Concentration (tc) =	10.0	min	(conservative minimum value)
Rainfall Intensity (I) =	7.7	in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70		(typical value for intermediate cover)
25-Year Peak Flow Rate (Q) =	CIA	cfs	

	External Top Slope (4%)	External Side Slope (25%)		
Longest Run =	820	120	ft	(longest sheet flow distance to swale)
Width =	1.00	1.00	ft/ft	(unit width of flow)
Area =	0.0188	0.0028	acre	
Q	0.101	0.015	cfs	

2. Calculate the flow depth using Manning's Equation.
   - Rearrange Manning's Equation for wide and shallow flow to calculate flow depth:

$$y = (Qn/1.49S^{0.5})^{0.6}$$

Manning's Roughness (n) = 0.03 (typical value for vegetated intermediate cover)

Slope =	0.040	0.250	ft/ft
Depth (y) =	0.064	0.012	ft

3. Calculate sheet flow velocity and compare to permissible non-erodible velocity.
   - A permissible non-erodible velocity of 5 ft/sec (clayey soil) or 4 ft/sec (sandy soil) is typical for vegetated intermediate covers. Refer to page C1-G-6 for soil loss calculations.

$$V = Q / (y * width)$$

Sheet flow velocity	**1.58**	**1.27**	**ft/sec**

Summary: The permissable non-erodible velocity should be less than 5.0 ft/sec (clayey soil) or 4.0 ft/sec (sandy soil) on vegetted intermediate cover. Therefore, the expected sheet flow velocity is acceptable on the external intermediate cover slopes with 60% vegetative cover.

TEMPORARY DRAINAGE SWALE DESIGN

TEMPORARY DRAINAGE SWALE DESIGN

The temporary drainage swale design for intermediate cover areas is presented for the typical swale flowline of 0.5 percent. The procedures in the TxDOT Hydraulic Design Manual were used to determine peak flow, flow depth, flow velocity, and swale capacity. The temporary swales will be located on the intermediate cover to prevent erosion as follows:

Slope (%)	Maximum Sheet Flow Length (ft)	Maximum Drainage Area (acres)	Maximum Swale Length (ft)
4	820	5.5	292
25	120	3.5	1267

All temporary swales shall be designed to minimize erosion and provide a maximum flow depth of 1.5 feet. The total height of the swales at the flowline is a minimum of 3 feet, as depicted in Appendix C1F on page C1F.8. As noted in the calculations, the velocities in the swales are less than permissible non-erodible velocities. If sustained erosion is observed, facility management will evaluate and construct additional temporary drainage swales. Example drainage swale calculations for a grassed intermediate cover are provided on pages C1G.16 and C1G.17.

Drainage Swale Analysis - External Intermediate Cover Topslopes

Required: Determine the inermediate cover topslope drainage swale capacity.

Method:

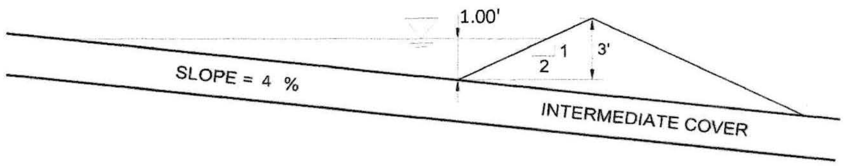
1. Calculate the intermediate cover topslope swale's flow capacity using Manning's Equation.
2. Determine the maximum allowable topslope drainage area using the Rational Method.
3. Determine the maximum swale length based on the maximum sheet flow length.

References:

1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised October 2011.
2. United States Geologic Survey, *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas*, 2004.

Solution:

1. Calculate flow capacity using Manning's Equation.
 - Swale Characteristics:



Max swale flow depth (D) =	1.00 ft	
Running swale slope (S) =	0.5 %	
Manning's Roughness (n) =	0.03	(typical value for vegetated intermediate cover)
Left slope (LS) =	25.00 :1	
Right slope (RS) =	2 :1	
Flow Area (A) =	((LS+RS)*D^2)/2	
Wetted Perimeter (WP) =	((LS*D)^2+D^2)^(0.5) + ((RS*D)^2+D^2)^(0.5)	
Hydraulic Radius (R) =	A / WP	

Flow Area (A) =	13.500 sf
Wetted Perimeter (WP) =	27.256 ft
Hydraulic Radius (R) =	0.495 ft

 - Use Manning's Equation to determine the flow velocity in the swale.

Velocity (V) = 1.49*R^(2/3)*S^(1/2)/n

Velocity (V) = 2.193 ft/sec

 - Calculate the swale's flow capacity.

Swale capacity (Q) = V * A

Q = 29.6 cfs

2. Determine the maximum allowable drainage area using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.28 in	(ref 2)
Time of Concentration (tc) =	10 min	(conservative minimum value)
Rainfall Intensity (I) =	7.7 in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70	(typical value for intermediate cover)
25-Year Peak Flow Rate (Q) =	CIA cfs	

 - Rearrange the Rational Formula to calculate allowable drainage area:

Drainage Area = Q / (CI)

Maximum Allowable Swale Drainage Area = 5.5 acres

3. Determine the maximum swale length based on the maximum sheet flow length.

Maximum Sheet Flow Length = 820 ft

$$\text{Maximum Swale Length} = \frac{\text{Maximum Swale Drainage Area * 43560}}{\text{Maximum Sheet Flow Length}}$$

Maximum Swale Length = 292

Summary: The maximum sheet flow length will be 820 feet and maximum drainage area is 5.5 acres. The calculated velocity is less than the permissible non-erodible velocity.

Drainage Swale Analysis - External Intermediate Cover Sideslopes

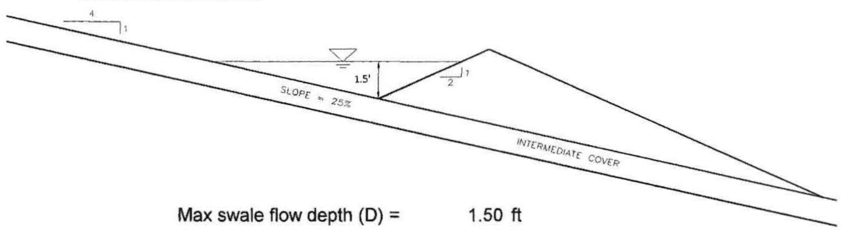
Required: Determine the inermediate cover sideslope drainage swale capacity.

Method:
1. Calculate the intermediate cover sideslope swale's flow capacity using Manning's Equation.
2. Determine the maximum allowable sideslope drainage area using the Rational Method.
3. Determine the maximum swale length based on the maximum sheet flow length.

References:
1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised October 2011.
2. United States Geologic Survey, *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas*, 2004.

Solution:
1. Calculate flow capacity using Manning's Equation.

- Swale Characteristics:



Max swale flow depth (D) =	1.50	ft	
Running swale slope (S) =	0.5	%	
Manning's Roughness (n) =	0.03		(typical value for vegetated intermediate cover)
Left slope (LS) =	4.00	:1	
Right slope (RS) =	2	:1	
Flow Area (A) =	((LS+RS)*D^2)/2		
Wetted Perimeter (WP) =	((LS*D)^2+D^2)^(0.5) + ((RS*D)^2+D^2)^(0.5)		
Hydraulic Radius (R) =	A / WP		

Flow Area (A) =	6.750	sf
Wetted Perimeter (WP) =	9.539	ft
Hydraulic Radius (R) =	0.708	ft

- Use Manning's Equation to determine the flow velocity in the swale.

Velocity (V) = 1.49*R^(2/3)*S^(1/2)/n

Velocity (V) = 2.789 ft/sec

- Calculate the swale's flow capacity.

Swale capacity (Q) = V * A

Q = 18.8 cfs

2. Determine the maximum allowable drainage area using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.28	in	(ref 2)
Time of Concentration (tc) =	10	min	(conservative minimum value)
Rainfall Intensity (I) =	7.7	in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70		(typical value for intermediate cover)
25-Year Peak Flow Rate (Q) =	CIA	cfs	

- Rearrange the Rational Formula to calculate allowable drainage area:

Drainage Area = Q / (CI)

Maximum Allowable Swale Drainage Area = 3.5 acres

3. Determine the maximum swale length based on the maximum sheet flow length.

Maximum Sheet Flow Length = 120 ft

$$\text{Maximum Swale Length} = \frac{\text{Maximum Swale Drainage Area} * 43560}{\text{Maximum Sheet Flow Length}}$$

Maximum Swale Length = 1267 ft

Summary: The maximum sheet flow length will be 120 feet and maximum drainage area is 3.5 acres. The calculated velocity is less than the permissible non-erodible velocity.

TEMPORARY DIVERSION CHANNEL DESIGN

TEMPORARY DIVERSION CHANNEL DESIGN

The temporary diversion channel design for preventing surface water from entering excavated areas is presented on the next page for three typical slopes of 0.5 percent, 1 percent and 2 percent and three typical drainage areas of 1, 5, and 10 acres. The procedures in the TxDOT Hydraulic Design Manual were used to determine peak flow, flow depth, flow velocity, and diversion channel capacity. Temporary diversion channels will be designed to minimize erosion and sedimentation. Temporary diversion channels will be excavated only in areas of in-situ soil or soil stockpile areas. They will not be used over lined areas or areas that have received waste.

Temporary Diversion Channel

Diversion channel drainage areas were based on the typical size that may occur during the development of the site. The diversion channels are intended to prevent surface water from entering the excavated areas. 1-, 5-, and 10-acre drainage areas were considered:

Diversion Channel Slope	Diversion Channel Area (Acres)	Flow (cfs)	Bottom Width (ft)	Side Slopes (H:V)	Manning's number (n)	Normal Depth (ft)	Flow Area (ft^2)	Velocity (ft/s)	Energy Head (ft)
0.5	1	5.4	0	3	0.03	0.94	2.65	2.04	1.00
0.5	5	26.9	0	3	0.03	1.71	8.81	3.05	1.86
0.5	10	53.8	0	3	0.03	2.22	14.83	3.63	2.43
1	1	5.4	0	3	0.03	0.83	2.04	2.65	0.93
1	5	26.9	0	3	0.03	1.51	6.80	3.96	1.75
1	10	53.8	0	3	0.03	1.95	11.43	4.71	2.30
2	1	5.4	0	3	0.03	0.73	1.58	3.44	0.91
2	5	26.9	0	3	0.03	1.32	5.24	5.13	1.73
2	10	53.8	0	3	0.03	1.71	8.81	6.10	2.29

Notes:

1. The calculations shown in the table above are normal depths from the 25-year rainfall event.
2. The required diversion channel depth will have 0.5 foot of freeboard.
3. Diversion channels shall be grassed. Erosion control features will be provided for velocities exceeding 5 fps.
4. During operation of the site different configurations of diversion channels may be used to prevent surface water from entering excavated areas. The landfill operator will determine the sizing of diversion channels if different lining materials is used.
5. The shading represents sample calculation presented on pages C1-G-21 and C1-G-22.

Temporary Diversion Channel
Example Calculations

Required: Determine the necessary dimensions of the temporary diversion channel for routing surface water around excvations.

Methods:

1. Calculate the 25-year peak flow rate (Q) for a 1-acre drainage area using the Rational Method.
2. Calculate the normal depth for the temporary diversion channel for a drainage area of 1 acre with a slope of 2%.

References:

1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised October 2011.
2. United States Geologic Survey, *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas*, 2004.

Solution:

1. Calculate the 25-year peak flow rate (Q) for a 1-acre drainage area using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.28	in	(ref 2)
Time of Concentration (tc) =	10.0	min	(conservative minimum value)
Rainfall Intensity (I) =	7.7	in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70		(ref 1, Table 4-11)
Area (A) =	1	acre	
25-Year Peak Flow Rate (Q) =	CIA	cfs	
Q =	5.376		
Q =	5.4	cfs	

2. Calculate the normal depth for the temporary diversion channel for a drainage area of 1 acre with a slope of 2%.

List of Symbols:

Q_d = design flow rate for channel, cfs
R = hydraulic radius, ft
n = Manning's roughness coefficient
S = channel slope, ft/ft
b = bottom width of channel, ft
z_r = z-ratio (ratio of run to rise for channel sideslope) for right sideslope of diversion channel
z_l = z-ratio (ratio of run to rise for channel sideslope) for left sideslope of diversion channel
A_f = flow area, sf
g = gravitational acceleration = 32.2 ft/s^2
T = top width of flow, ft
d = normal depth of diversion channel, ft

Design Inputs:

Q_d =	5.4	cfs (from page C1-G-20)
S =	0.02	ft/ft
b =	0	ft
z_r =	3	(H) : 1 (V)
z_l =	3	(H) : 1 (V)
n =	0.03	

Temporary Diversion Channel
Example Calculations

Step A - Based on the geometry of the swale cross section, solve for R and A_f.

$$R = \frac{bd + 1/2d^2(z_r + z_l)}{b + d((z_l^2 + 1)^{0.5} + (z_r^2 + 1)^{0.5})}$$

$$A_f = bd + 1/2d^2(z_r + z_l)$$

Assume: $d = 0.73$ ft

$R = 0.344$ ft

$A_f = 1.58$ sf

Solve for Q: $Q = 5.4$

If Q is not equal to Q_d, select a new d and repeat calculations.

The program uses an iterative process to calculate the normal depth of the diversion channel to satisfy Manning's Equation.

$$Q = \frac{1.486}{n} A\, R^{0.67} S^{0.5}$$

Step B - solve for velocity, T, Froude number, velocity head, and energy head.

$Q = VA \Rightarrow V = Q/A$

$V = 3.44$ ft/s

$T = b + d(z_l + z_r)$

$T = 4.35$ ft

$$F_r = \frac{V}{(gA/T)^{0.5}}$$

$F_r = 1.01$

$$\text{Velocity Head} = \frac{V^2}{2g}$$

Velocity Head = 0.18 ft

Energy Head = depth + velocity head

Energy Head = 0.91 ft

TEMPORARY CHUTE DESIGN

TEMPORARY CHUTE DESIGN

Temporary sideslope swales will collect and route surface water runoff from intermediate cover sideslope areas to temporary chutes on the intermediate cover sideslopes. Temporary topslope swales will collect and route surface water runoff from intermediate cover top dome areas to temporary chutes on the intermediate cover sideslopes. Temporary topslope chutes are not required as topslope areas will not exceed the limit of sheet flow of 800 feet.

The temporary chute design is applicable for external sideslopes of the landfill with intermediate cover. Temporary chutes will typically consist of channels lined with erosion control material. The temporary flow depth provided is 2-feet. The design flow depth for geomembrane and concrete lined chutes is 0.25 feet which provide a freeboard of 1.75 feet. The design flow depth for turf reinforcement mat, gabions, riprap, crushed stone or crushed concrete lined chutes is 2.5 feet which provide a freeboard of 1.75 feet.

The flow capacity of the chute structures was determined based on the Manning's Equation. The maximum flow calculated from the Manning's Equation is used to determine the maximum drainage area based on the Rational Method. The design calculations presented on pages C1G.25 through C1G.27 represent typical calculations for chutes lined with different materials on a 25 percent slope. If sustained erosion is observed, facility management will evaluate the use and construction of temporary chutes.

Temporary Chute Flow Evaluation

Required: 1. Determine the capacity of a variety of chutes with different lining materials.

Method: 1. Use Manning's Equation to calculate the temporary chute capacity for a variety of lining materia
2. Use the Rational Method to determine the maximum drainage area for a variety of temporary chute lining materials and temporary chute bottom widths.

References: 1. Texas Department of Transportation, *Hydraulic Design Manual*, Revised October 2011.
2. United States Geologic Survey, *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas*, 2004.

Solution: 1. Chutes will be designed to function during the 25-year storm event.

Where: Q = Chute capacity (cfs)
n = Manning's Coefficient (unitless)[1]
A = Cross sectional area (ft^2)
WP = Wetted Perimeter (ft)
R = Hydraulic Radius (ft)
S = Letdown slope (ft/ft)
d = Normal Depth (ft)
b = Bottom Width of Chute (ft)
z = Chute Side Slope (ft/ft)

$$A = bd + zd^2$$

$$WP = b + 2\,[(zd)^2 + d^2]^{0.5}$$

$$R = A / WP$$

$$Q = \frac{1.486(A)(R^{2/3})(S^{1/2})}{n}$$

[1] The Manning's Coefficient was selected from the references for the applicable lining material.

Temporary Chute Flow Evaluation

HDPE Geomembrane Lined Chute

Depth d (ft)	Bottom Width b (ft)	Letdown Slope S (ft/ft)	Chute Side Slope z (ft/ft)	Manning's Coefficient* n	Area A (sf)	Wetted Perimeter WP (ft)	Hydraulic Radius R (ft)	Velocity V (fps)	Flow Rate Q (cfs)
0.25	8	0.25	3	0.013	2.19	9.58	0.228	21.35	46.7
0.25	30	0.25	3	0.013	7.69	31.58	0.243	22.28	171.3

* Manning's coefficient selected for a temporary HDPE geomembrane lined chute.

Temporary Chute Flow Evaluation

2. Use the Rational Method to determine the maximum drainage area for a variety of temporary chute lining materials and temporary chute bottom widths.

25-Year Rainfall Depth (Pd) =	1.28 in	(ref 2)
Time of Concentration (tc) =	10.0 min	(conservative minimum value)
Rainfall Intensity (I) =	7.7 in/hr	(ref 1, I = Pd/tc)
Runoff Coefficient (C) =	0.70	(ref 1, Table 4-11)

- Rearranging the rational formula, the maximum drainage area is determined as follows:

Q = Flow Rate
A = Maximum Drainage Area
A = Q/(CI)
A = 46.7/(0.7*7.68)
A = 8.7 acres

HDPE Geomembrane Lined Chute

Bottom Width (ft)	Flow Rate (cfs)	Maximum Drainage Area (acres)
8	46.7	8.7
30	171.3	31.9

DESIGN SUMMARY

The Chisholm Trail Disposal Landfill will implement the erosion and sediment control features on the intermediate cover as the landfill develops. The following items will be implemented as filling operations are ongoing:

- Intermediate cover will be established on all areas that have received waste but will remain inactive for periods greater than 180 days.
- Sufficient permanent and temporary erosion and sediment control features shall be constructed to redirect surface water and prevent erosion.
- Temporary erosion and sediment control features shall be constructed within 180 days of placement of intermediate cover.
- Temporary erosion control structures (e.g., rock check dams, filter berms) may be established along the toe of existing vegetated intermediate cover areas with approximately 70-90 percent coverage.
- Final cover will be constructed as the site develops. Temporary erosion control features will be removed as permanent erosion controls are constructed.
- The erosion and sediment control plan and temporary erosion and sediment control details for the intermediate cover are included in Attachment C, Appendix C1F, Intermediate Cover Erosion and Sediment Control Plan.

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT C2
FLOOD CONTROL ANALYSIS

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED
PROFESSIONAL ENGINEER
9/23/2025
Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS
FIRM REGISTRATION NO. F-256 AND NO. 10194895

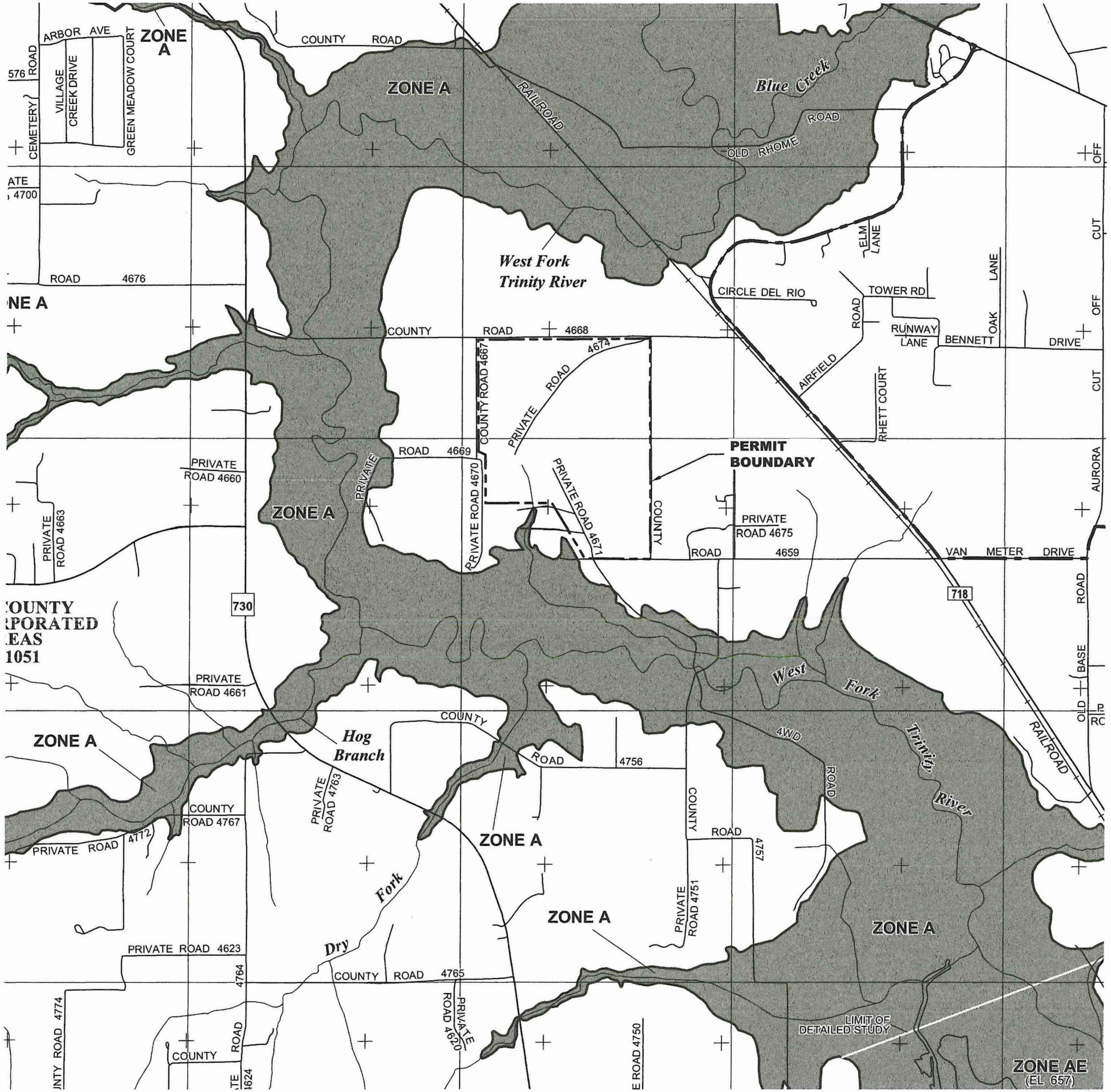
TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

FLOOD CONTROL AND ANALYSIS

30 TAC §330.63(c)(2), §330.307, and §330.547

The flood control and analysis includes the demonstrations consistent with the requirements of §§330.63(c)(2), 330.307, and 330.547. Drawing C2.1 shows that the facility is not located within the 100-Year Special Flood Hazard Area. The proposed Chisholm Trail Disposal (CTD) Landfill waste disposal operations will be conducted outside the 100-year floodplain.

In accordance with §330.63(c)(2), the CTD Landfill is not located within a 100-year floodplain. FEMA has defined the limits of the 100-year floodplain (1% annual chance) in the vicinity of the landfill and published the Flood Insurance Rate Map (FIRM) for the area as the FIRM Community Panel Number 48497C0475D revised September 16, 2011. Since the CTD Landfill is not located within a 100-year floodplain, flood protection levees are not required and §330.307 is not applicable. In accordance with §330.547(a), the CTD Landfill's waste disposal operations will not be located in the 100-year floodway. In accordance with §330.547(b), the CTD Landfill's municipal solid waste disposal units are not located in the 100-year floodplain, will not restrict the flow of the 100-year flood, will not reduce the temporary water storage capacity of the floodplain, and will not result in the washout of solid waste. Further, in accordance with §330.547(c), the CTD Landfill's processing and/or storage units are not located within the 100-year floodplain.



0 1000 2000
SCALE IN FEET

LEGEND

PERMIT BOUNDARY

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

3100000 FT — 5000-foot ticks: Texas State Plane North Central Zone (FIPS Zone 4202), Lambert Conformal Conic projection

4989000m N — 1000-meter Universal Transverse Mercator grid values, zone 14

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
March 19, 1990

NOTE:

1. THIS MAP HAS BEEN COMPILED FROM FEMA FLOOD INSURANCE RATE MAP (FIRM) OF WISE COUNTY, TEXAS AND INCORPORATED AREAS COMMUNITY PANEL NUMBER 48497C0475D REVISED DECEMBER 16, 2011, DOWNLOADED FROM FEMA WEBSITE ON SEPTEMBER 27, 2023.

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

FLOOD INSURANCE RATE MAP (FIRM)

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C2.1

O:\Green Group\Wise County\Solid Waste\Type I\P\Drawings\ATT C\C2.1-FEMA_FIRM.dwg Layout: C2-1 User: awhite

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT C3
DRAINAGE SYSTEM PLANS AND DETAILS

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED
PROFESSIONAL ENGINEER
9/23/2025
Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

Prepared by

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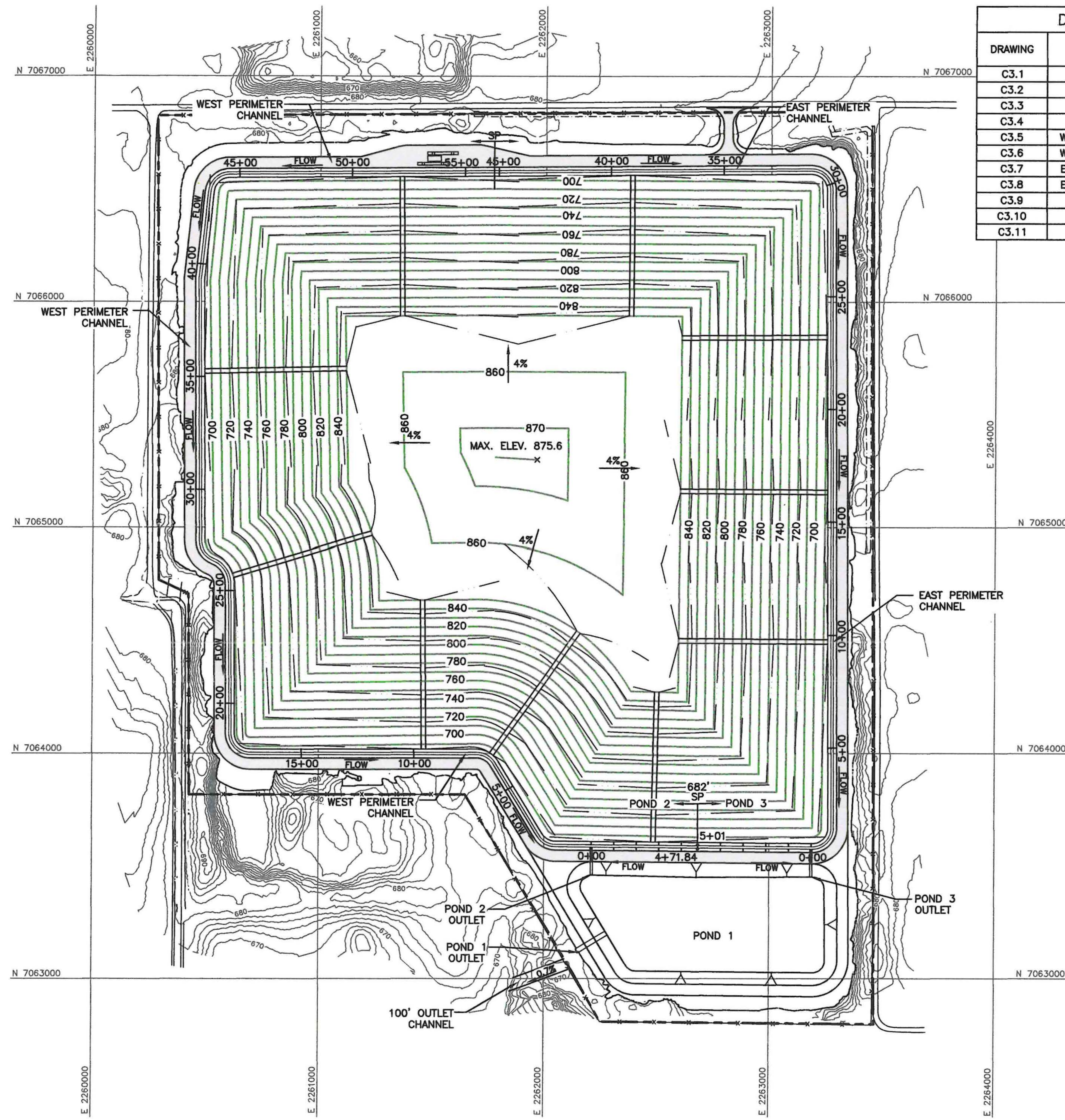
TEXAS BOARD OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS
FIRM REGISTRATION NO. F-256 AND NO. 10194895

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222



DRAWING INDEX

DRAWING	DESCRIPTION
C3.1	DRAINAGE PLAN
C3.2	POND 1
C3.3	POND 2
C3.4	POND 3
C3.5	WEST PERIMETER CHANNEL PROFILE
C3.6	WEST PERIMETER CHANNEL PROFILE
C3.7	EAST PERIMETER CHANNEL PROFILE
C3.8	EAST PERIMETER CHANNEL PROFILE
C3.9	CHUTE & PROFILES
C3.10	DRAINAGE DETAILS
C3.11	DRAINAGE DETAILS

0 250 500
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 700 — 10' CONTOUR
- N 7062000 — STATE PLANE COORDINATES
- x — x — FENCE
- 800 — FINAL COVER CONTOUR
- FLOW — CHANNEL FLOW DIRECTION
- SP — SEPARATION POINT

NOTES:

1. EXISTING CONTOURS TAKEN FROM DRONE SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS

REV	DATE	DESCRIPTION	DWN BY

DRAINAGE PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
C3.1

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C3.1_DrainPlan.dwg Layout: C3-1 User: MatthewWelch

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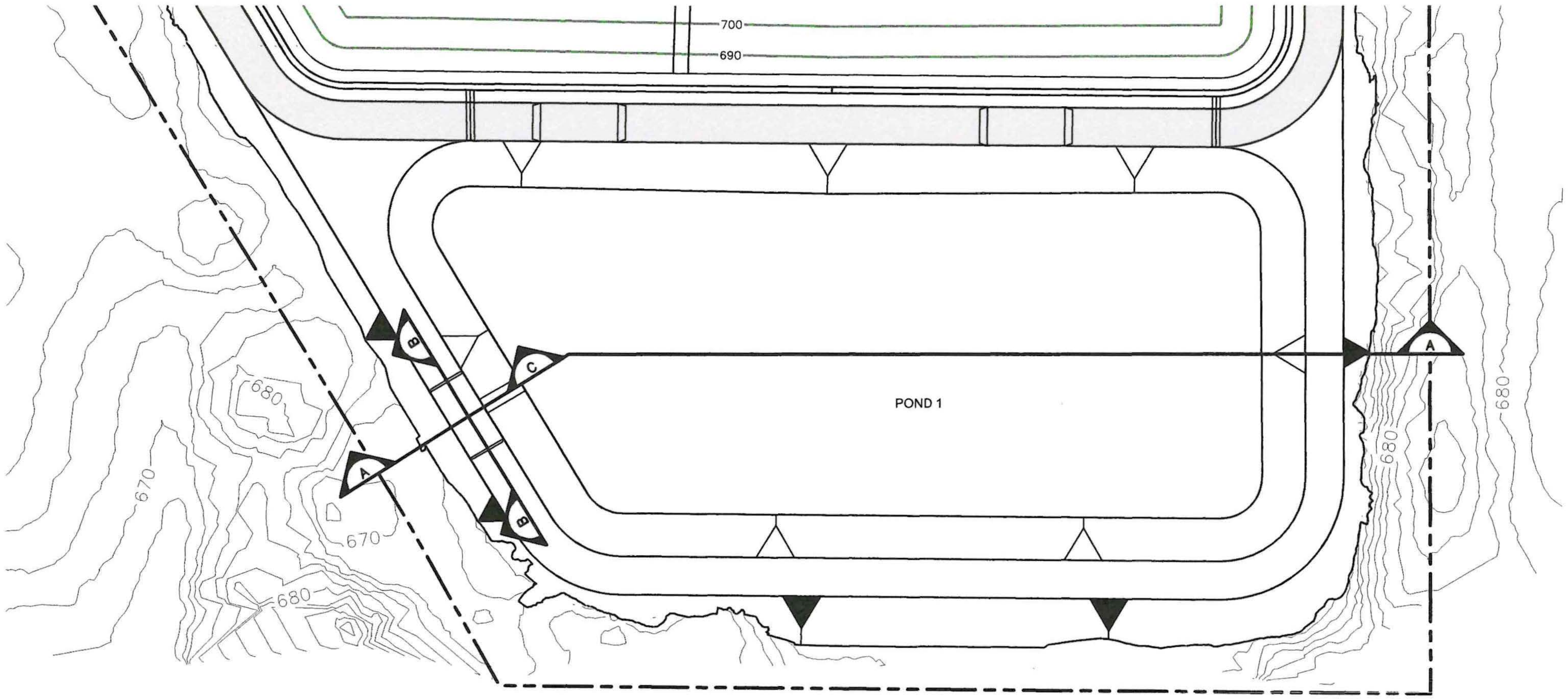


POND 1 ELEVATION–STORAGE RELATIONSHIP	
ELEVATION (FT)	VOLUME AT ELEVATION (AC–FT)
668	0.0
669	9.7
670	19.6
671	29.8
672	40.2
673	50.9
674	61.9
675	73.2
676	84.7
677	96.5
678	108.6
679	120.9
680	133.5
681	146.5
682	159.7
683	173.1

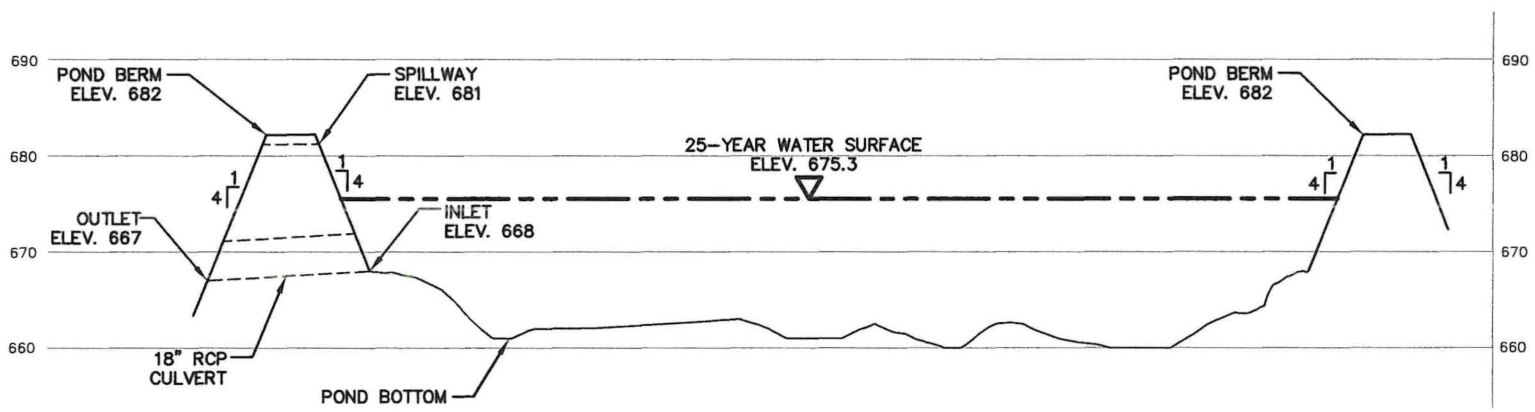
0 100 200
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 700 EXISTING 10' GROUND CONTOUR
- 500 10' FINAL COVER CONTOUR
- DRAINAGE FLOW DIRECTION

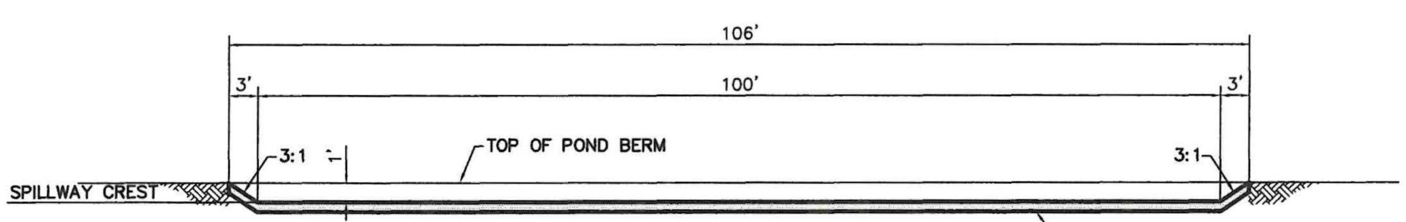
NOTES:

1. EXISTING GROUND CONTOURS PROVIDED BY BIGGS & MATHEWS ENVIRONMENTAL, FROM DRONE SURVEY FLOWN APRIL 5, 2024.
2. REFER TO DRAINAGE SYSTEM CALLOUTS FOR PONDS, CHANNELS, CHUTES, AND CULVERT DETAILS.

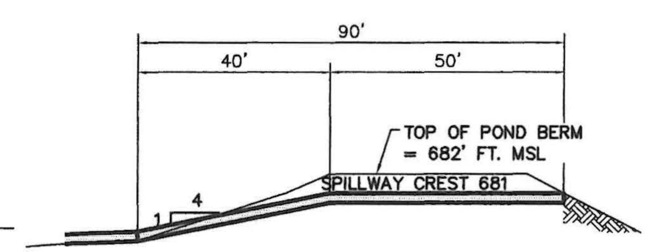


POND 1 – SECTION A (A)

0 100 200 HORIZONTAL SCALE — 0 10 20 VERTICAL SCALE



SPILLWAY SECTION (B)



SPILLWAY SECTION (C)

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
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9/23/2025

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REVISIONS			
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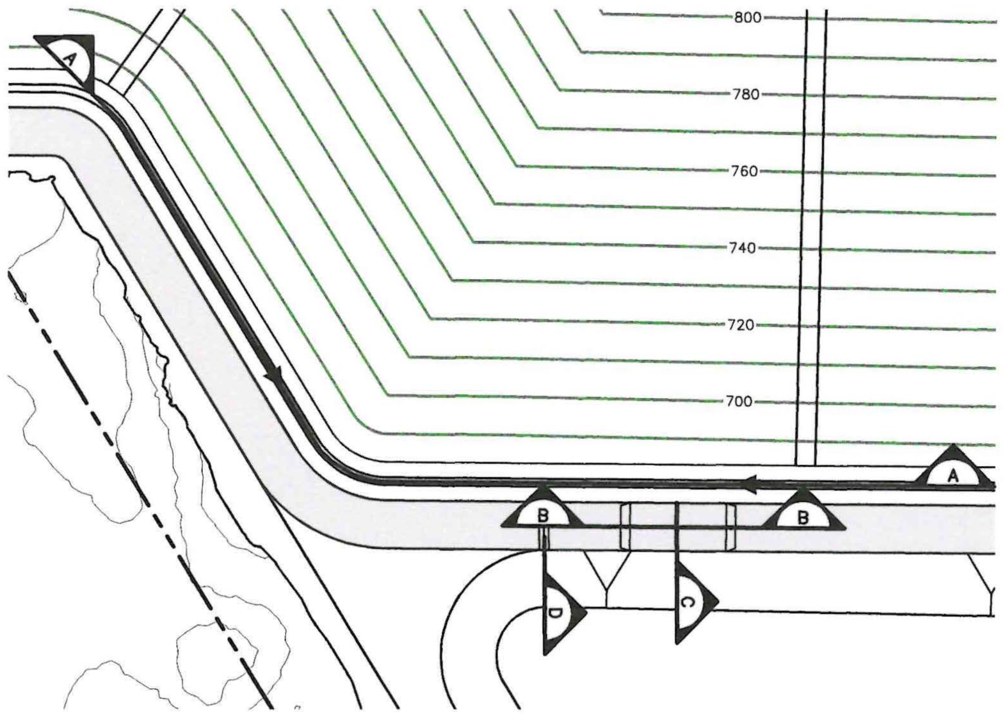
POND 1 SECTION

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817–563–1144

TBPE FIRM NO. F–256
TBPG FIRM NO. 50222

C3.2



POND 2 ELEVATION–STORAGE RELATIONSHIP	
ELEVATION (FT)	VOLUME AT ELEVATION (AC–FT)
678	0.0
679	0.0
680	0.2
681	0.7
682	1.3
683	2.2

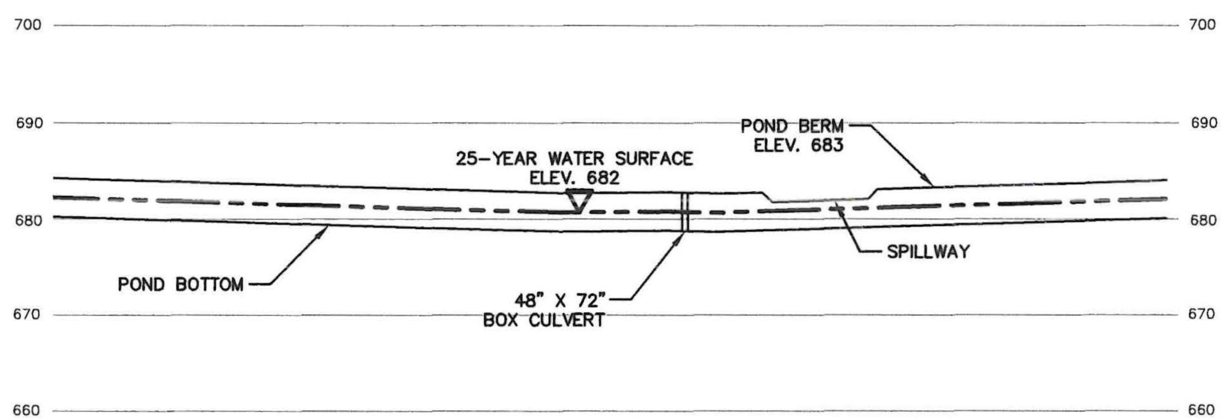
0 100 200
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 700 EXISTING 10' GROUND CONTOUR
- 500 10' FINAL COVER CONTOUR
- DRAINAGE FLOW DIRECTION

NOTES:

1. EXISTING GROUND CONTOURS PROVIDED BY BIGGS & MATHEWS ENVIRONMENTAL, FROM DRONE SURVEY FLOWN APRIL 5, 2024.
2. REFER TO DRAINAGE SYSTEM CALLOUTS FOR PONDS, CHANNELS, CHUTES, AND CULVERT DETAILS.



POND 2 – SECTION C (A)

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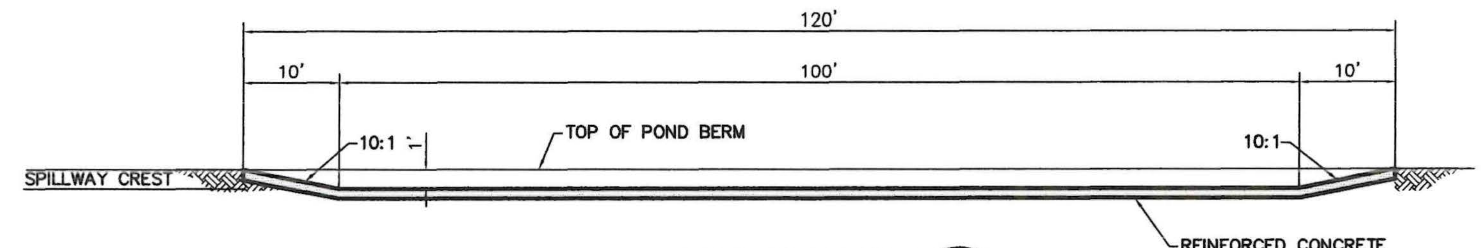
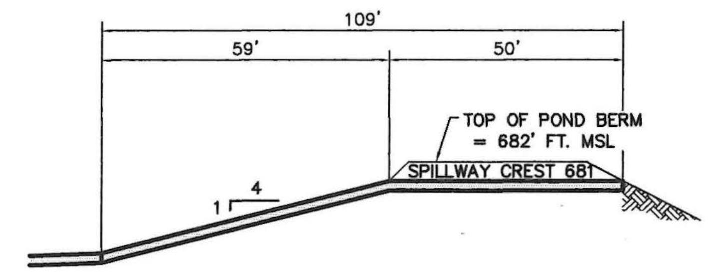
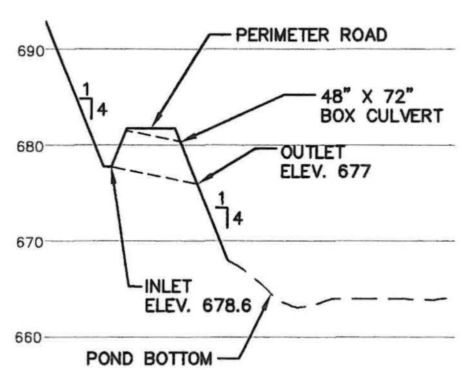


SPILLWAY SECTION (B)



SPILLWAY SECTION (C)



POND 2 – SECTION (D)

0 100 200 HORIZONTAL SCALE; 0 10 20 VERTICAL SCALE

STATE OF TEXAS
FELIPE ANTONIO WESCOUP
103826
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

POND 2 SECTION

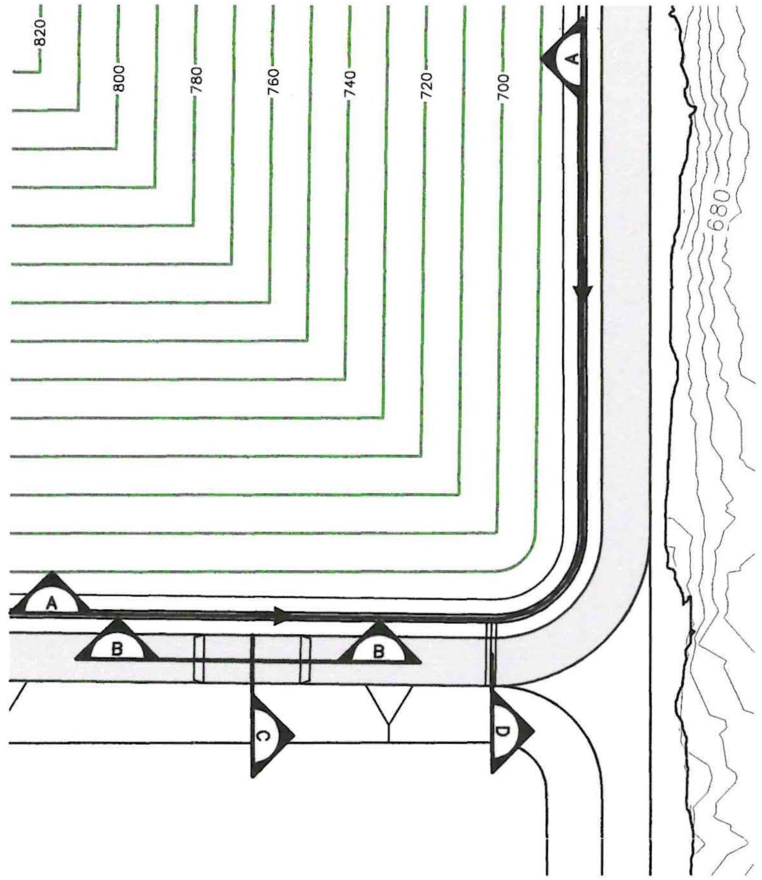
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817–563–1144

TBPE FIRM NO. F–256
TBPG FIRM NO. 50222

C3.3

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C3-Dwg3 Pond Sections.dwg Layout: pond-2 User: awhite



POND 2 ELEVATION–STORAGE RELATIONSHIP	
ELEVATION (FT)	VOLUME AT ELEVATION (AC–FT)
678	0.0
679	0.0
680	0.2
681	0.6
682	1.2
683	1.9

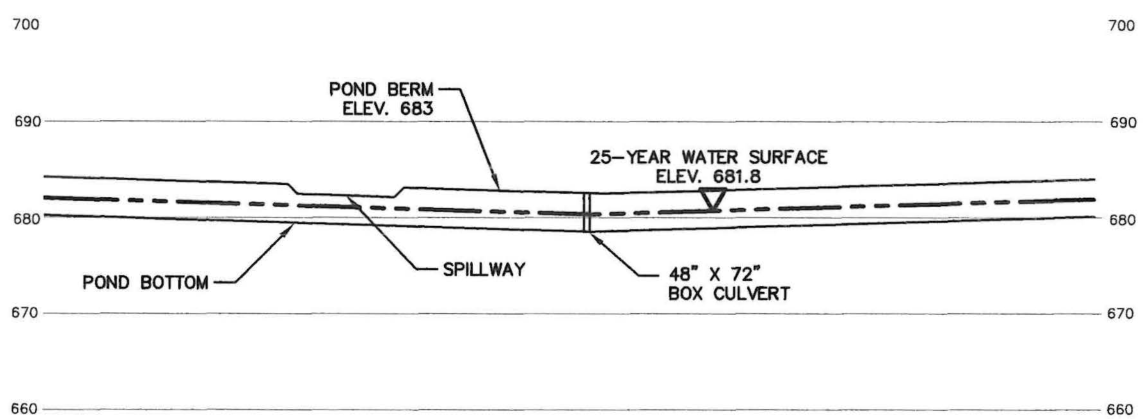
0 100 200
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 700 EXISTING 10' GROUND CONTOUR
- 500 10' FINAL COVER CONTOUR
- DRAINAGE FLOW DIRECTION

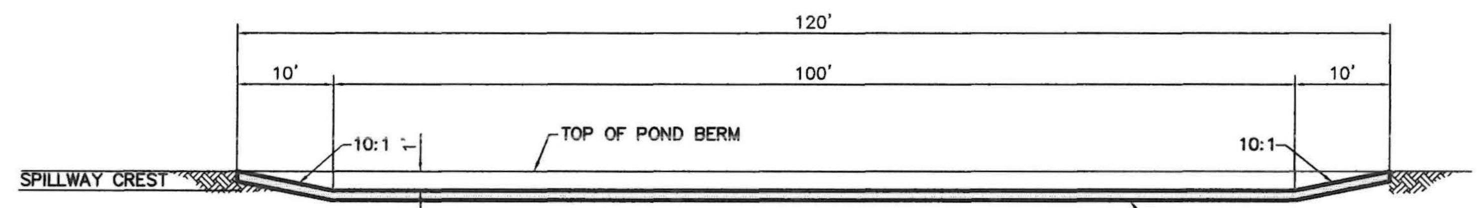
NOTES:

1. EXISTING GROUND CONTOURS PROVIDED BY BIGGS & MATHEWS ENVIRONMENTAL, FROM DRONE SURVEY FLOWN APRIL 5, 2024.
2. REFER TO DRAINAGE SYSTEM CALLOUTS FOR PONDS, CHANNELS, CHUTES, AND CULVERT DETAILS.

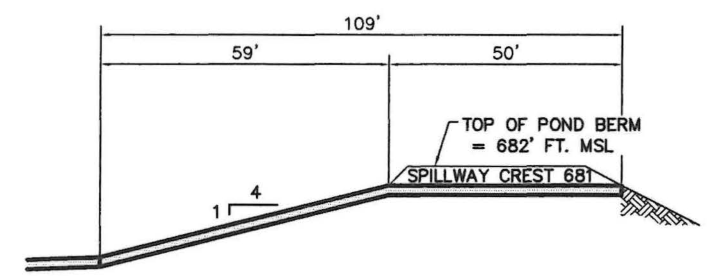


POND 3 – SECTION D

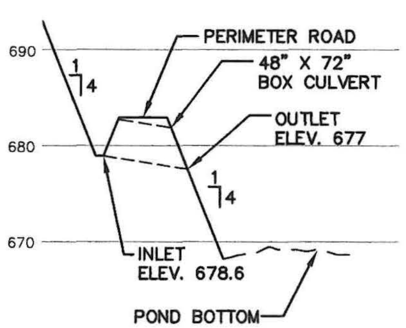
0 100 200 HORIZONTAL SCALE 0 10 20 VERTICAL SCALE



SPILLWAY SECTION B



SPILLWAY SECTION C



POND 3 – SECTION D

0 100 200 HORIZONTAL SCALE 0 10 20 VERTICAL SCALE

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POND 3 SECTION

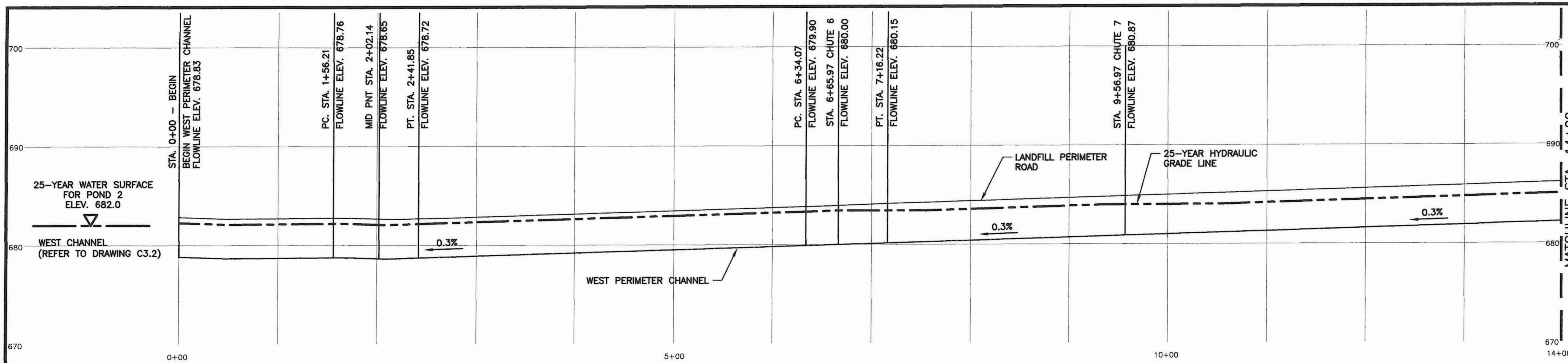
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817–563–1144

TBPE FIRM NO. F–256
TBPG FIRM NO. 50222

C3.4

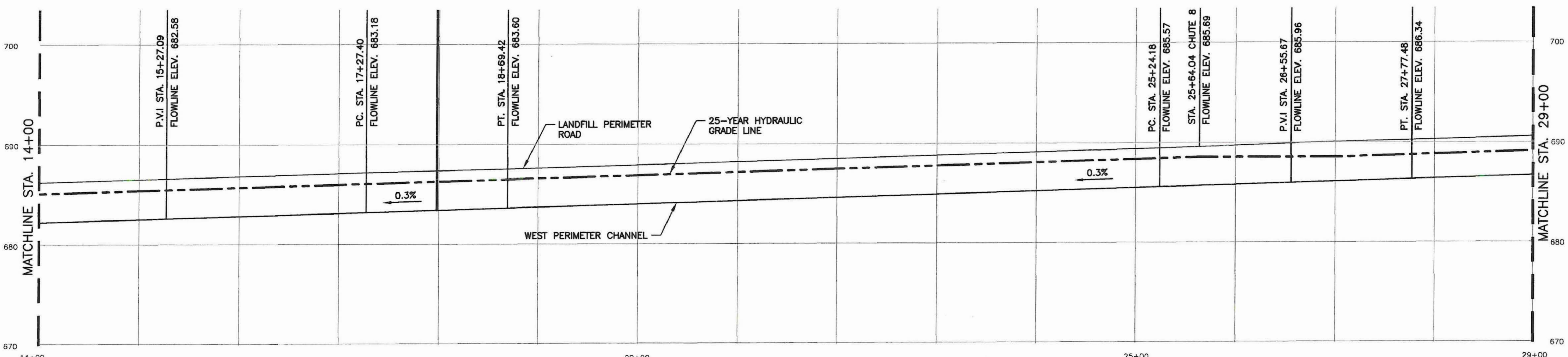
O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT C\C3-Dwg3 Pond Sections.dwg Layout: pond-3 User: awhite



WEST CHANNEL PROFILE

STA. 000 TO 14+00

0 50 100 HORIZONTAL SCALE — 0 5 10 VERTICAL SCALE



WEST CHANNEL PROFILE

STA 14+00 TO 29+00

0 50 100 HORIZONTAL SCALE — 0 5 10 VERTICAL SCALE

25–YEAR HYDRAULIC ANALYSIS

STATION		BOTTOM SLOPE (%)	BOTTOM WIDTH (ft)	CHANNEL DEPTH (ft)	FLOW DEPTH (ft)	FREE–BOARD (ft)	FLOW RATE (cfs)	FLOW VELOCITY (fps)	EROSION PROTECTION
0	6+65	0.0030	8	4.00	3.43	0.57	327.10	4.38	VEGETATION
6+65	9+56	0.0030	8	4.00	3.17	0.83	274.00	4.19	VEGETATION
9+56	25+64	0.0030	8	4.00	2.87	1.13	221.00	3.96	VEGETATION
25+64	35+64	0.0030	8	4.00	2.43	1.57	156.10	3.62	VEGETATION
35+64	52.+23	0.0040	8	4.00	1.71	2.29	87.30	3.44	VEGETATION

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WEST CHANNEL PROFILE 0+00 THROUGH 29+00

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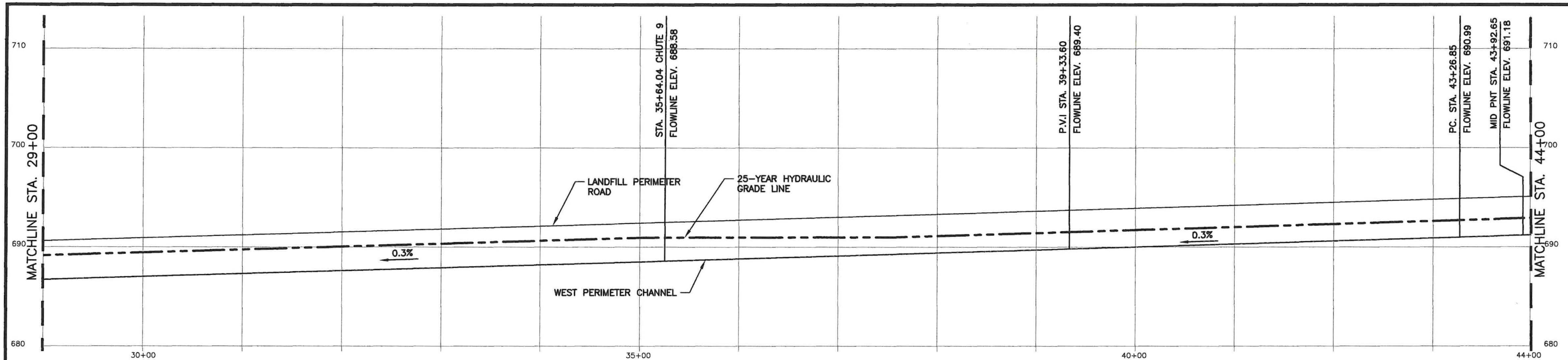
C3.5



WEST CHANNEL PROFILE

STA. 29+00 TO 44+00

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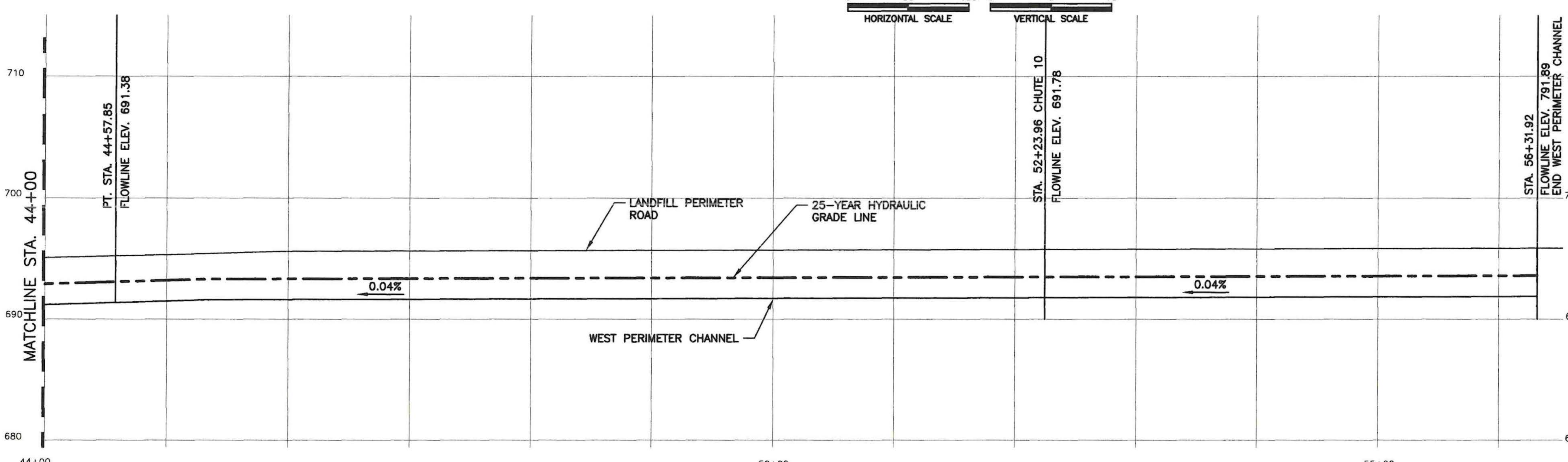

WEST CHANNEL PROFILE

STA 44+00 TO 56+31.92

0 50 100 HORIZONTAL SCALE — 0 5 10 VERTICAL SCALE

25-YEAR HYDRAULIC ANALYSIS

STATION		BOTTOM SLOPE (%)	BOTTOM WIDTH (ft)	CHANNEL DEPTH (ft)	FLOW DEPTH (ft)	FREE-BOARD (ft)	FLOW RATE (cfs)	FLOW VELOCITY (fps)	EROSION PROTECTION
0	6+65	0.0030	8	4.00	3.43	0.57	327.10	4.38	VEGETATION
6+65	9+56	0.0030	8	4.00	3.17	0.83	274.00	4.19	VEGETATION
9+56	25+64	0.0030	8	4.00	2.87	1.13	221.00	3.96	VEGETATION
25+64	35+64	0.0030	8	4.00	2.43	1.57	156.10	3.62	VEGETATION
35+64	52.+23	0.0040	8	4.00	1.71	2.29	87.30	3.44	VEGETATION

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REV	DATE	DESCRIPTION	DWN BY

WEST CHANNEL PROFILE 29+00 THROUGH 56+31.92

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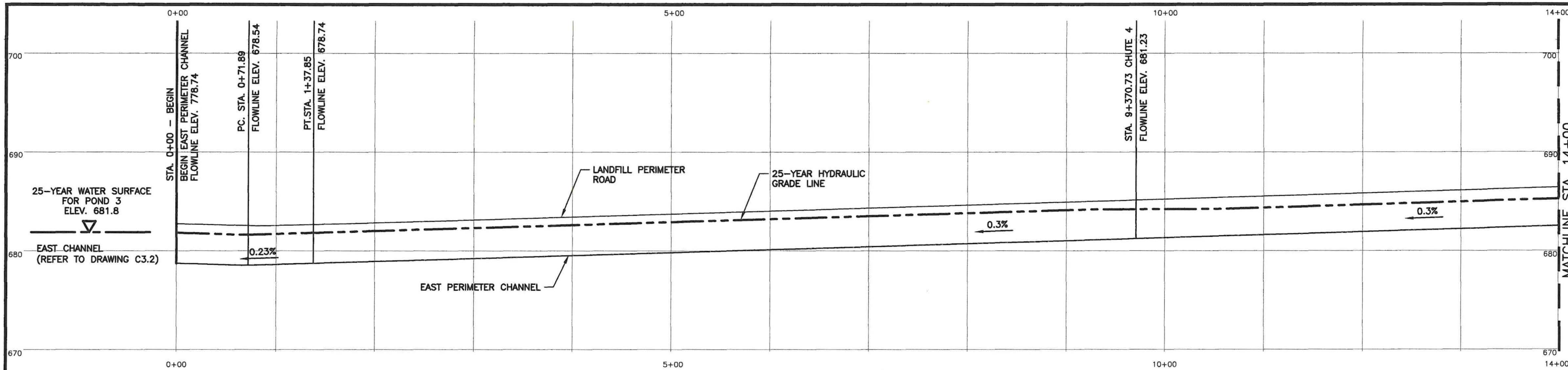
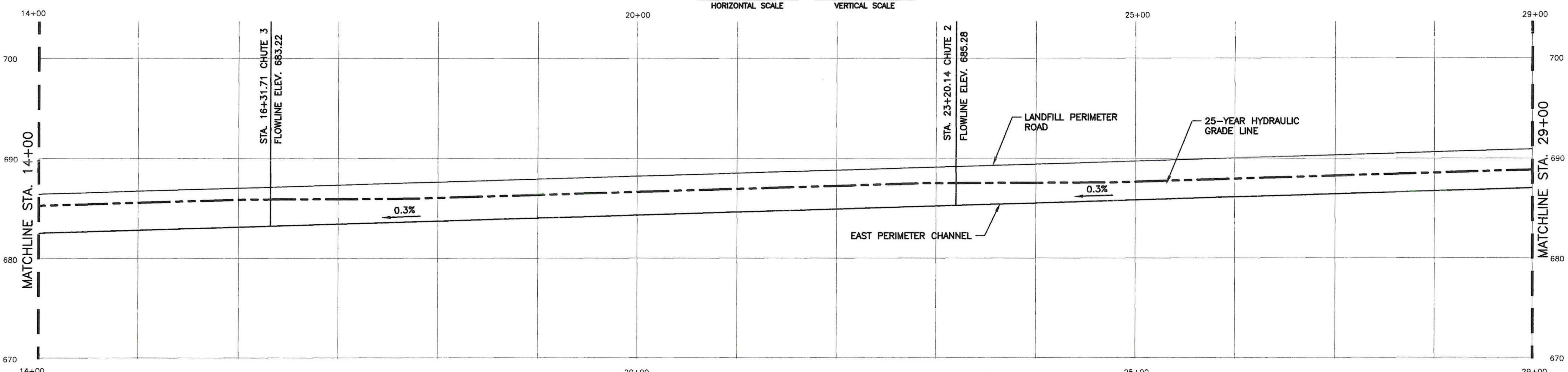
C3.6



EAST CHANNEL PROFILE

STA. 0+00 TO 14+00

0 50 100 HORIZONTAL SCALE — 0 5 10 VERTICAL SCALE



EAST CHANNEL PROFILE

STA 14+00 TO 29+00

0 50 100 HORIZONTAL SCALE — 0 5 10 VERTICAL SCALE

25-YEAR HYDRAULIC ANALYSIS

STATION		BOTTOM SLOPE (%)	BOTTOM WIDTH (ft)	CHANNEL DEPTH (ft)	FLOW DEPTH (ft)	FREE-BOARD (ft)	FLOW RATE (cfs)	FLOW VELOCITY (fps)	EROSION PROTECTION
0	9+370	0.0030	8	4	3.09	0.91	259.7	4.13	VEGETATION
9+370	16+31	0.0030	8	4	2.74	1.26	200.5	3.86	VEGETATION
16+31	23+20	0.0030	8	4	2.32	1.68	140.5	3.52	VEGETATION
23+20	39+05	0.0030	8	4	1.83	2.17	86.8	3.09	VEGETATION

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REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

EAST CHANNEL PROFILE
0+00 THROUGH 29+00

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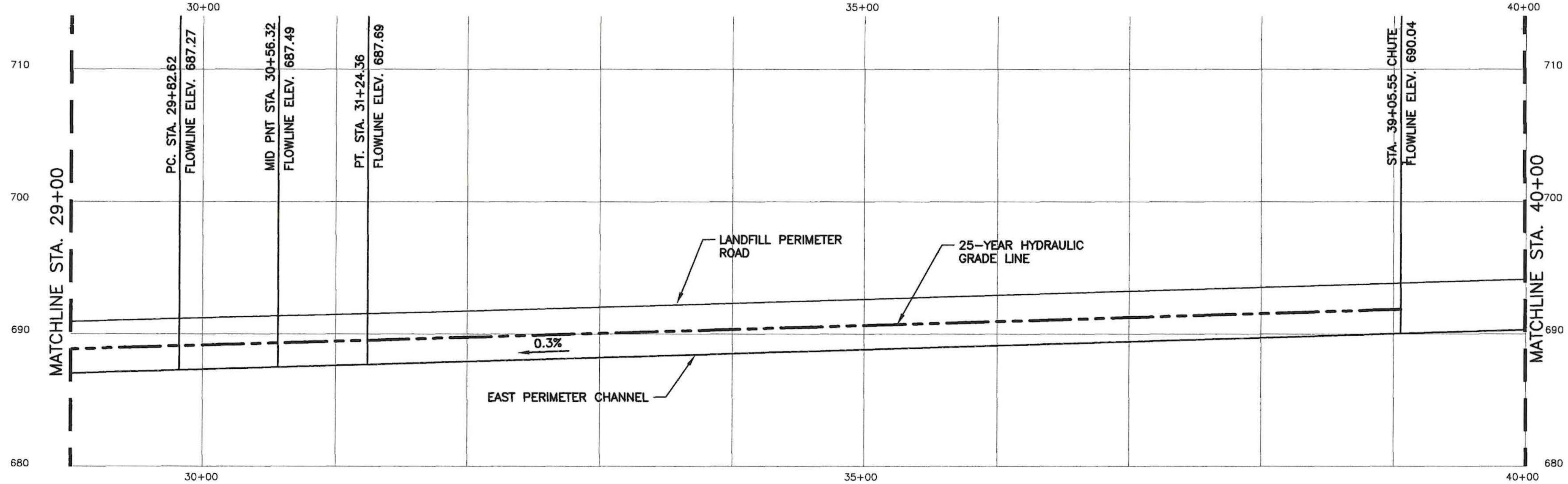
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

C3.7



EAST CHANNEL PROFILE

STA. 29+00 TO 40+00

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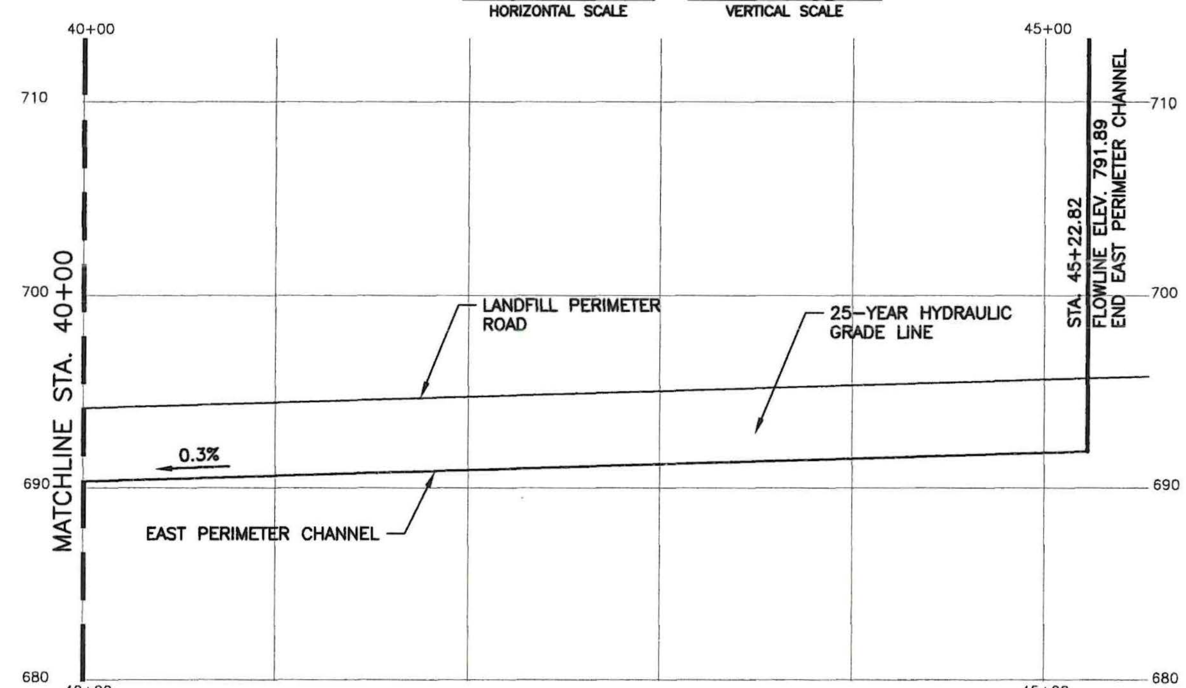

EAST CHANNEL PROFILE

STA 40+00 TO 45+22.82

0 50 100 HORIZONTAL SCALE — 0 5 10 VERTICAL SCALE

25-YEAR HYDRAULIC ANALYSIS

STATION		BOTTOM SLOPE (%)	BOTTOM WIDTH (ft)	CHANNEL DEPTH (ft)	FLOW DEPTH (ft)	FREE-BOARD (ft)	FLOW RATE (cfs)	FLOW VELOCITY (fps)	EROSION PROTECTION
0	9+370	0.0030	8	4	3.09	0.91	259.7	4.13	VEGETATION
9+370	16+31	0.0030	8	4	2.74	1.26	200.5	3.86	VEGETATION
16+31	23+20	0.0030	8	4	2.32	1.68	140.5	3.52	VEGETATION
23+20	39+05	0.0030	8	4	1.83	2.17	86.8	3.09	VEGETATION

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REVISIONS

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EAST CHANNEL PROFILE
29+00 THROUGH 45+22.82

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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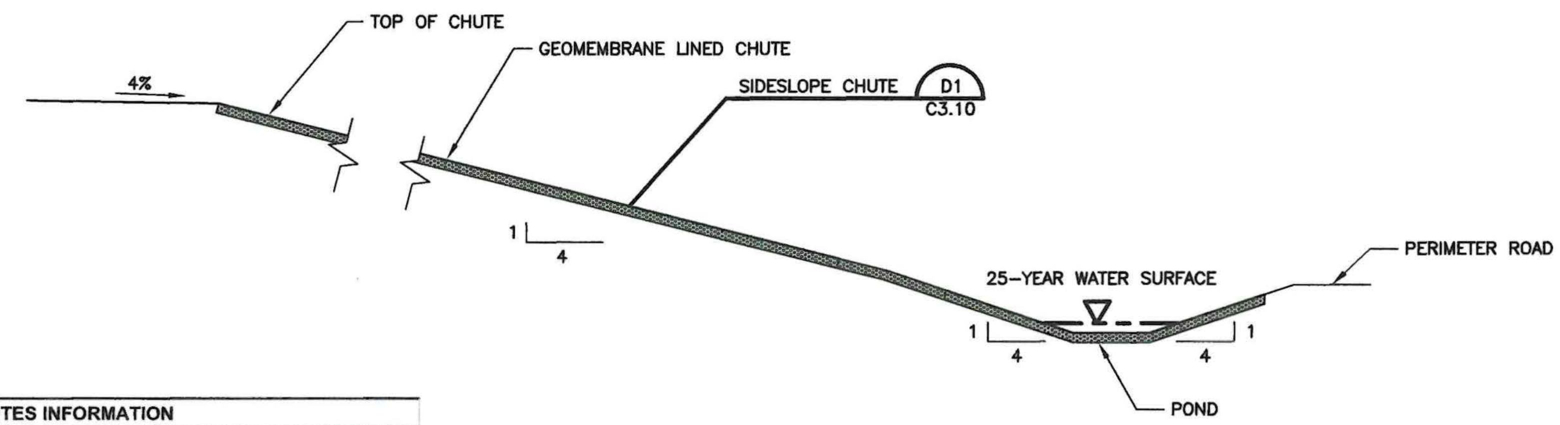
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

C3.8



CHUTES INFORMATION				
CHUTE #	FLOW DEPTH (FT)	FLOW VELOCITY (FPS)	BERM HEIGHT (FT)	25-YEAR WATER SURFACE ELEV (FT)
1	0.26	22.60	2.00	691.87
2	0.21	19.39	2.00	687.60
3	0.22	20.69	2.00	685.96
4	0.22	20.41	2.00	684.32
5	0.19	18.39	2.00	682.00
6	0.22	20.49	2.00	683.58
7	0.22	20.38	2.00	684.04
8	0.24	21.59	2.00	688.56
9	0.25	21.73	2.00	691.01
10	0.26	22.65	2.00	693.49

CHUTE PROFILE CP1 C3.9

(TYP)

0 10 20
SCALE IN FEET

NOTE: SEE ATTACHMENT C1, APPENDIX C1.E, PAGE C1E.21 FOR DOWNCHUTE CALCULATIONS.

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CHUTE AND PROFILE

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TBPG FIRM NO. 50222

C3.9

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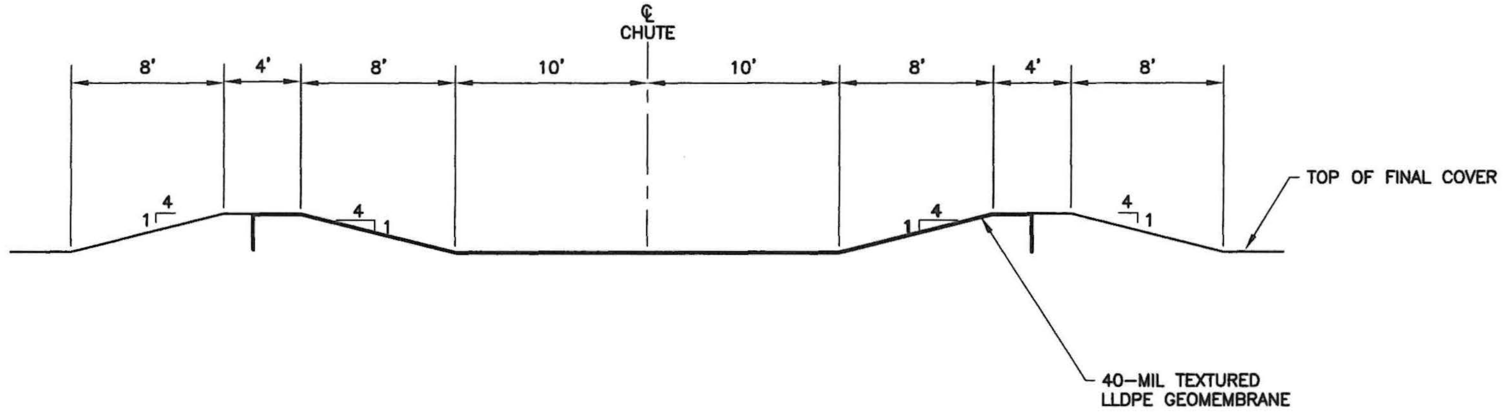
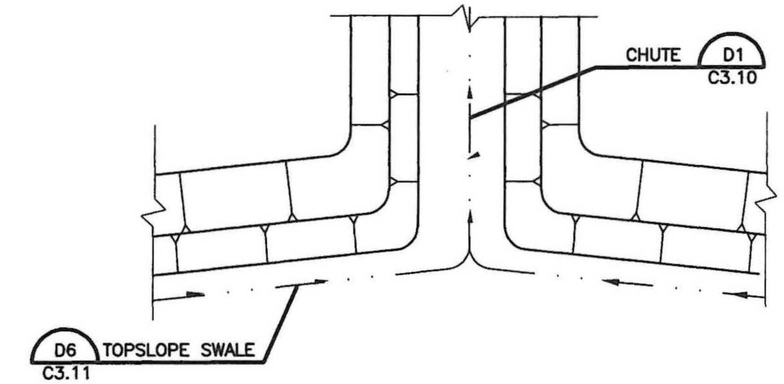


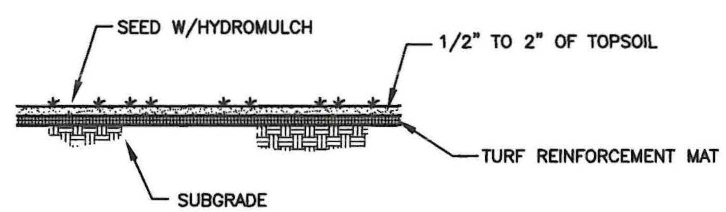
SIDESLOPE CHUTE D1 C3.10

0 5 10 SCALE IN FEET



SWALE/CHUTE TOPSLOPE CONFLUENCE D3 C3.10

0 5 10 SCALE IN FEET

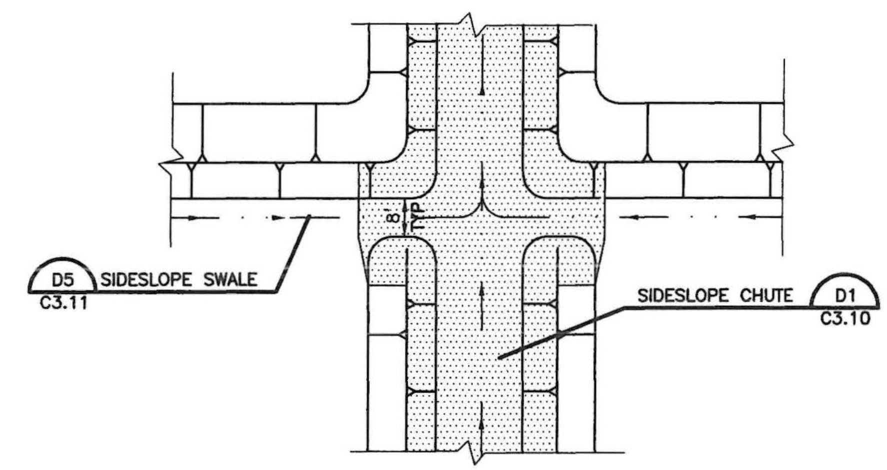


TURF REINFORCEMENT MATTING (TYP) D2 C3.10

NTS

NOTES:

TURF REINFORCEMENT MATTING SHALL BE INSTALLED IN AREAS SUSCEPTIBLE TO EXPERIENCING EROSION AS FIELD CONDITIONS WARRANT.



SWALE/CHUTE SIDESLOPE CONFLUENCE D4 C3.10

0 5 10 SCALE IN FEET

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DRAINAGE DETAILS

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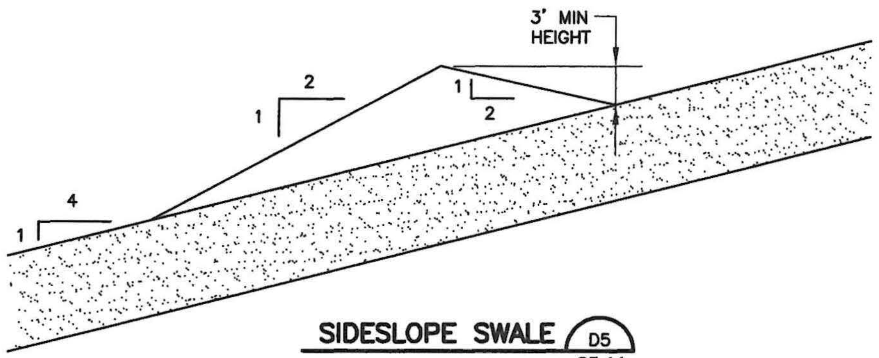
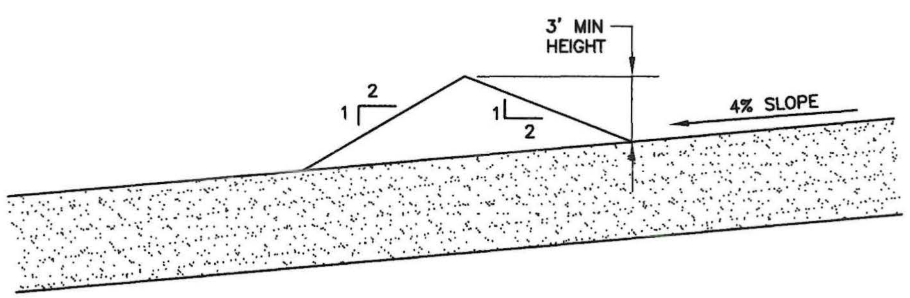
C3.10



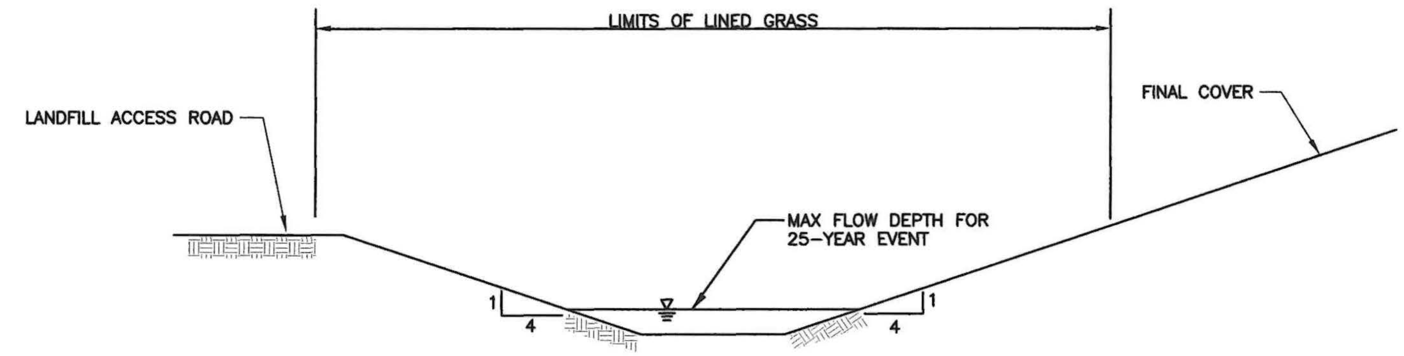
SIDESLOPE SWALE D5 C3.11

NTS



TOPSLOPE SWALE D6 C3.11

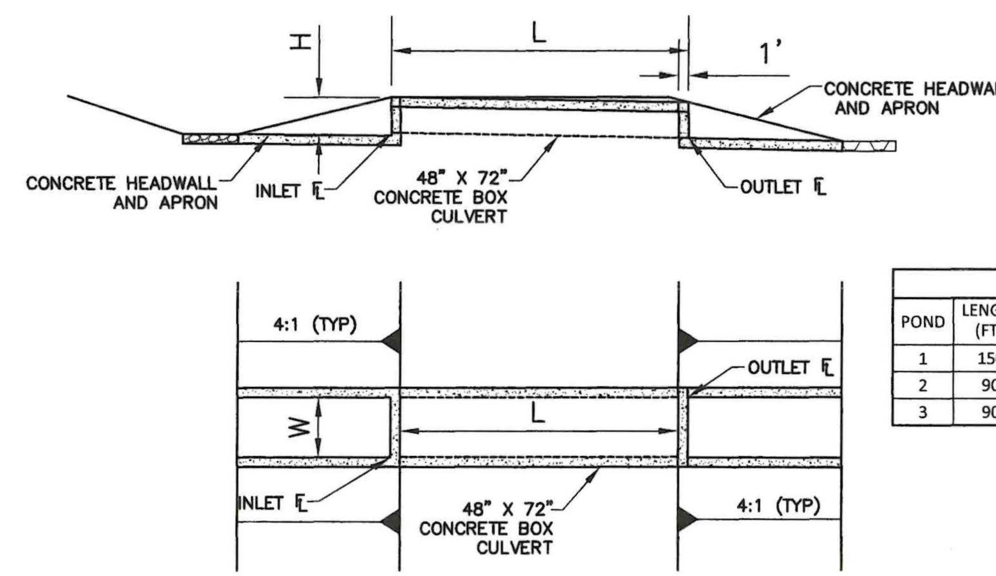
NTS



GRASS LINED

TRAPEZOIDAL DITCH D7 C3.11

NTS

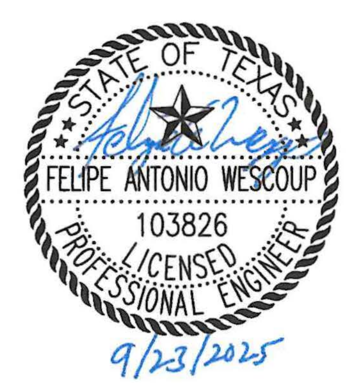


CULVERT DETAIL D8 C3.11

NTS

CULVERT DIMENSIONS

POND	LENGTH (FT.)	HEIGHT (FT.)	WIDTH (FT.)	INLET ELEV. (FT.)	OUTLET ELEV. (FT.)
1	150	1.5	1.5	668.0	667.0
2	90	4	6	678.6	677.0
3	90	4	6	678.6	677.0



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REVISIONS			
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DRAINAGE DETAILS

CHISHOLM TRAIL DISPOSAL, LLC
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TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

C3.11

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D
WASTE MANAGEMENT UNIT DESIGN

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS
FIRM REGISTRATION NO. F-256 AND NO. 10194895

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

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PROFESSIONAL ENGINEER
STATE OF TEXAS
9/23/2025

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

CONTENTS

1 WASTE MANAGEMENT UNIT DESIGN

30 TAC §330.63(d)

The proposed Chisholm Trail Disposal (CTD) Landfill will be a Type IV solid waste disposal facility (TCEQ MSW Permit No. 2421) located in Wise County, Texas. The permit boundary encompasses 251 acres of which 167 acres will be used for waste disposal. The proposed permit boundary and the waste management unit is shown in Attachment D1 on Drawing D1.1.

2 MATERIAL STAGING AREAS

30 TAC §330.63(d)(3)(B)

The material staging areas have been designed for the rapid processing and minimum detention of solid waste at the facility and to control and contain a worst-case spill or release and to account for precipitation from the 25-year, 24-hour rainfall event. The material staging areas may include the large item staging area, reusable materials staging area, citizen's convenience area, and wood waste mulching area as shown in Attachment D1 on Drawing D1.2.

2.1 Large Item Staging Area

A staging area for large, heavy, or bulky items may be provided over existing lined areas. Items classified as large, heavy, or bulky include white goods (household appliances), air conditioner units, metal tanks, and large metal pieces. Any rainfall runon or runoff from the area will be contained within the active area and handled as contaminated water. These items will be recycled within 180 days of acceptance at the facility or disposed of at the working face within 10 days of acceptance. The procedures for the acceptance, staging, and disposal of large items, including items containing chlorinated fluorocarbons, are addressed in Part IV. A detail of the large item staging area is shown in Attachment B on Drawing B.3.

2.2 Reusable Materials Staging Area

Source-separated inert materials such as brick, concrete, rubble, and aggregate, and reclaimed asphalt pavement may be staged at the facility for use on facility access roads, staging areas, and drainage structures. The reusable materials staging area will be located within the landfill footprint and will be relocated periodically. These materials are typically staged near the location within the facility where they will be used. The size of the stockpiles will vary depending on the amount of materials received. Since brick, concrete, rubble, aggregate materials, and reclaimed asphalt pavement are inert, their storage will not create a public health hazard or nuisance, and runon and runoff control from rainfall will not be required. Since these inert materials will continuously be reused for site operations there is no time limit on the storage of these materials. Reclaimed asphalt pavement that contains asbestos will not be used and will not be accepted for disposal.

2.3 Citizen's Convenience Area (optional)

A citizen's convenience area for waste drop-off may be located in Sector 2, as shown in Attachment B on Drawing B.2 and B.4. Operational characteristics and procedures for the citizen's convenience area are addressed in Part IV.

2.4 Wood Waste Mulching Area

A wood waste mulching area for source separated clean wood materials may be provided over lined areas. The wood waste will be recycled and removed from the mulching area within 180 days. Since these are clean wood materials, runon and runoff control from stormwater will not be required. Operational characteristics and procedures for the wood waste mulching area are addressed in Part IV.

3 LANDFILL UNITS

30 TAC §§330.63(d)(4) and 330.453

3.1 All Weather Operation

A permanent all-weather entrance road will be constructed from County Road 4668 to the scale facility and a permanent all-weather perimeter road will be constructed around the landfill units as shown in Attachment D1 on Drawing D1.2. The entrance road will be constructed prior to opening the facility and the perimeter road will be constructed as the facility is developed. The entrance road will be constructed of asphalt or reinforced concrete and the perimeter road will be constructed of aggregate as shown in Attachment D1 on Drawing D1.4. The entrance road surface will limit the tracking of mud onto the public access road.

Temporary all-weather access roads will be constructed as needed to provide access from the scale facility to the various staging areas and active waste disposal areas. The access roads will be moved as the facility is developed. The access roads will be constructed of aggregate, concrete rubble, masonry rubble, recycled asphalt, or other similar material to provide access to the active areas during all weather conditions as shown in Attachment D1 and Drawing D1.4.

Stockpiles of aggregate, concrete rubble, masonry rubble, recycled asphalt or other similar material will be available for use in maintaining access roads. Grading equipment will be used to control or remove mud accumulations on the landfill access roads around the landfill and entrance road. In addition, a disposal area near the access road will be available for use during wet weather operations.

3.2 Landfilling Methods

The development method for the landfill is a combination of area-excavation fill followed by aerial fill to the proposed landfill completion heights. Final cover placement will generally follow the sequence of development as shown in Part II, Appendix IIA, and may be ongoing as the site is developed. The landfill will be closed according to the closure plan provided in Attachment H.

3.3 Landfill Design Parameters

The 251 permitted acres will include a total of 167 acres for waste disposal and 84 acres of buffer and other non-waste fill areas. The deepest excavation elevation will be 619.6 feet msl at the south toe of slope, the maximum waste elevation will be 872.1 feet msl, and the maximum final cover elevation will be 875.6 feet msl. Excavation side slopes and waste side slopes will be 4H:1V or flatter. Waste topslopes will have a 4 percent slope. Excavation and final completion plans are presented in Attachment D1 on Drawings D1.5 and D1.6.

3.4 Site Life Projection

The total disposal capacity will be 39,481,000 cubic yards (waste and weekly cover), which will provide an estimated 78 years of site life. Calculations for the disposal capacity and site life estimate are provided in Attachment D4.

3.5 Landfill Cross Sections

Cross sections of the landfill unit are provided in Attachment D2. These sections show the top of the proposed perimeter berm, top of the final cover, maximum elevation of the proposed fill, top of the wastes, existing ground, bottom of the excavations, side slopes of excavations, groundwater monitoring wells, and the initial and static levels of any water encountered. Soil borings, monitoring wells, and gas monitoring probes near the sections have been projected onto the sections. The section locations were selected to represent typical conditions across the site.

3.6 Liner Quality Control Plan

The quality control plan for the liner system is provided in Attachment D7 and details of the liner system are provided in Attachment D3.

3.7 Final Cover Quality Control Plan

The quality control plan for the final cover system is provided in Attachment D8 and details of the final cover system are provided in Attachment D3.

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D1
SITE LAYOUT PLANS

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

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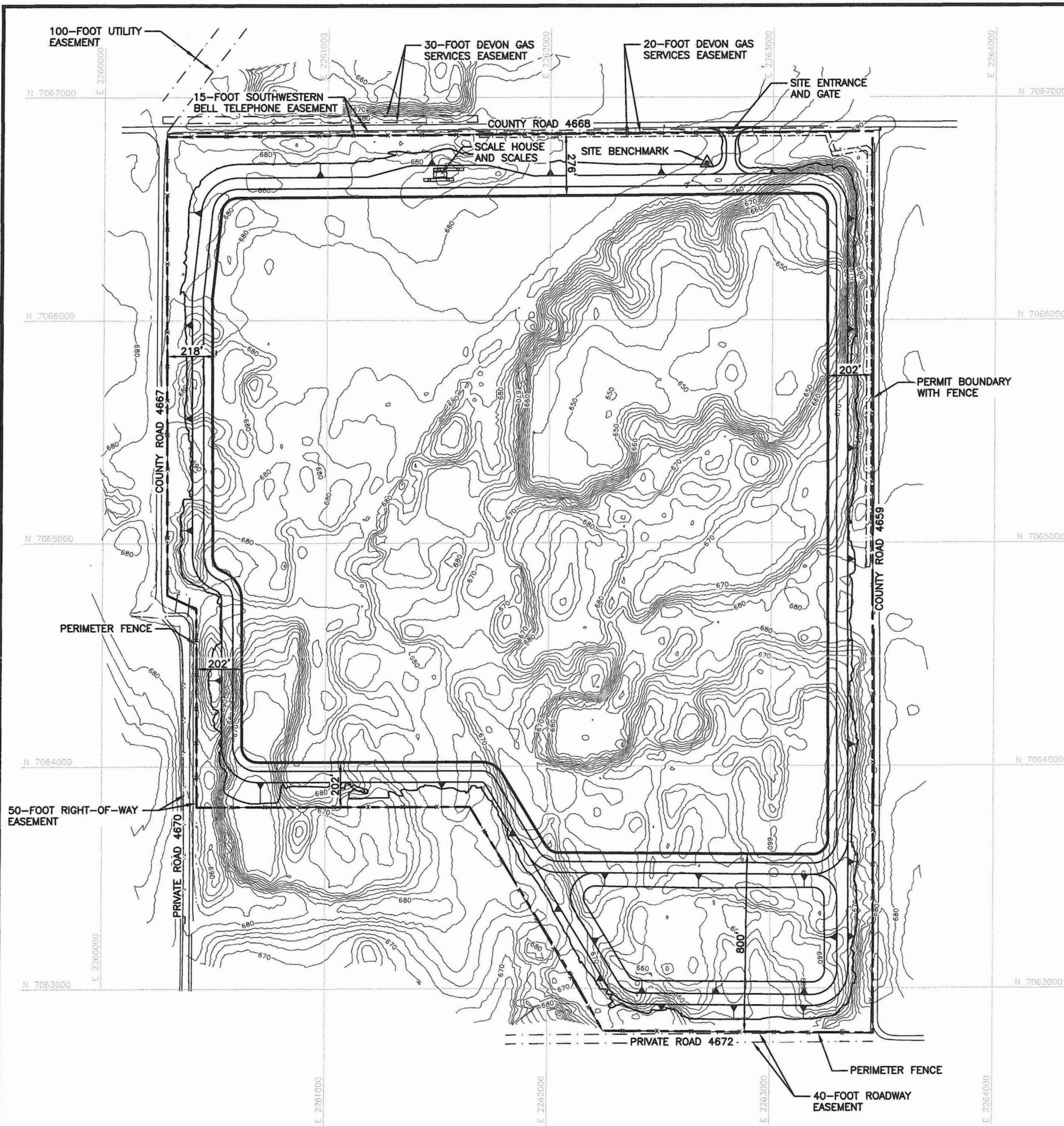
TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222



LEGEND

— — —	PERMIT BOUNDARY
—700—	10' CONTOUR
N 7062000	STATE PLANE COORDINATES
— - — - —	EASEMENT
— x — x —	FENCE
———	WASTE MANAGEMENT UNIT

NOTE(S):

1. EXISTING CONTOURS COMPILED FROM SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL, DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC. PERMIT BOUNDARY AREA = 251.62 ACRES.
3. THE EXISTING DEVON GAS SERVICES EASEMENT WITHIN THE LANDFILL FOOTPRINT WILL BE ABANDONED PRIOR TO SITE DEVELOPMENT.
4. SITE BENCHMARK INFORMATION: N 7066704.59 E 2262689.96 ELEV. 682.12
5. REFER TO PART I APPENDIX IB FOR EASEMENT AND PROPERTY DESCRIPTIONS.

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REV	DATE	DESCRIPTION
		REVISIONS

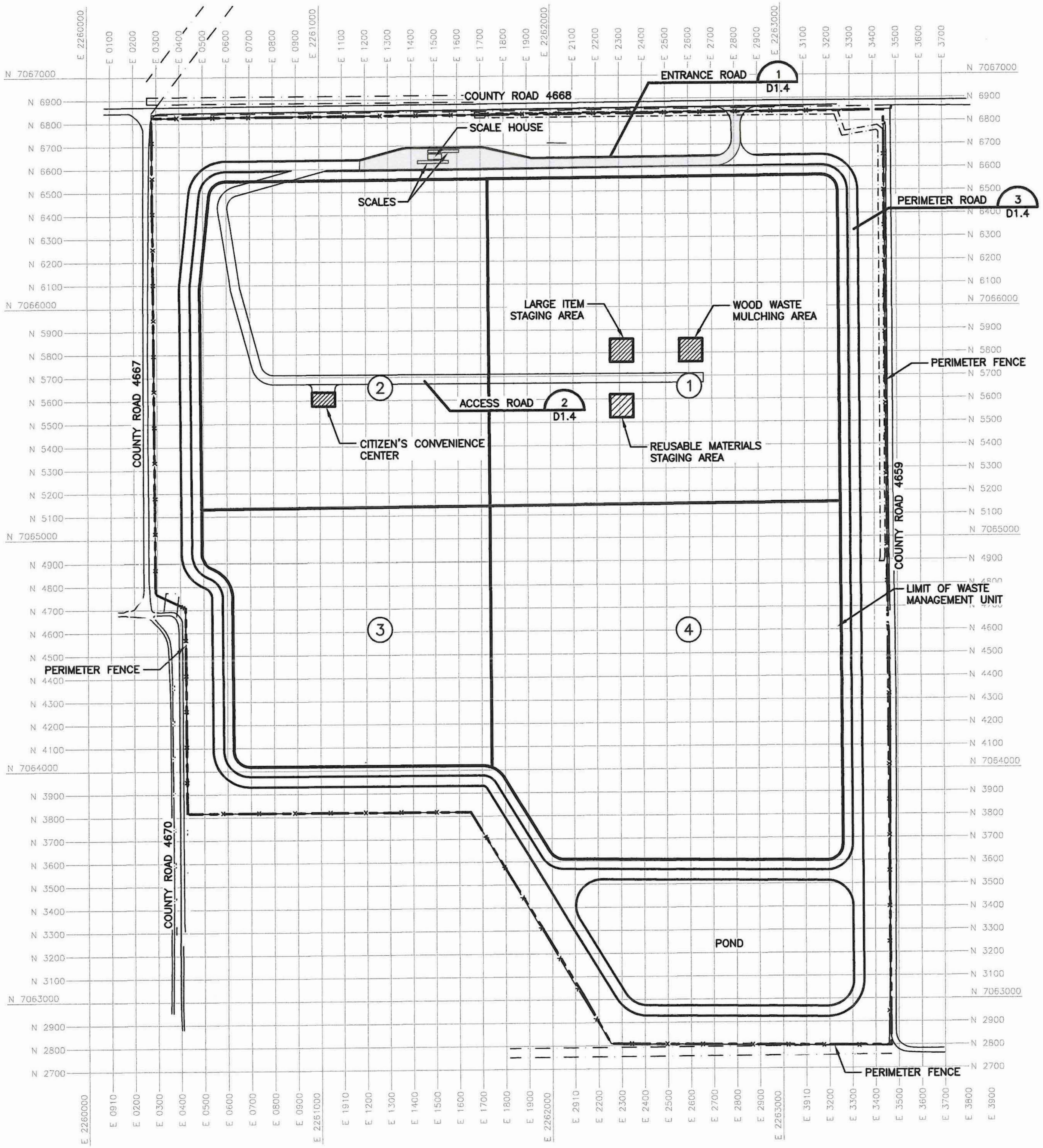
SITE PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D1.1

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D1.2-FacilityPlan.dwg Layout: Layout 1 User: awhite



0 250 500
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- WASTE MANAGEMENT UNIT
- N 7062000 — STATE PLANE COORDINATES
- N 2100 — SITE GRID
- (1) SECTOR NUMBER

NOTE(S):

1. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
2. REFER TO DRAWING D1.3 FOR ENTRANCE FACILITIES PLAN.
3. REFER TO ATTACHMENT C FOR DRAINAGE FEATURES.
4. REFER TO ATTACHMENT D3 FOR CONSTRUCTION DETAILS.

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS

REV	DATE	DESCRIPTION	DWN BY

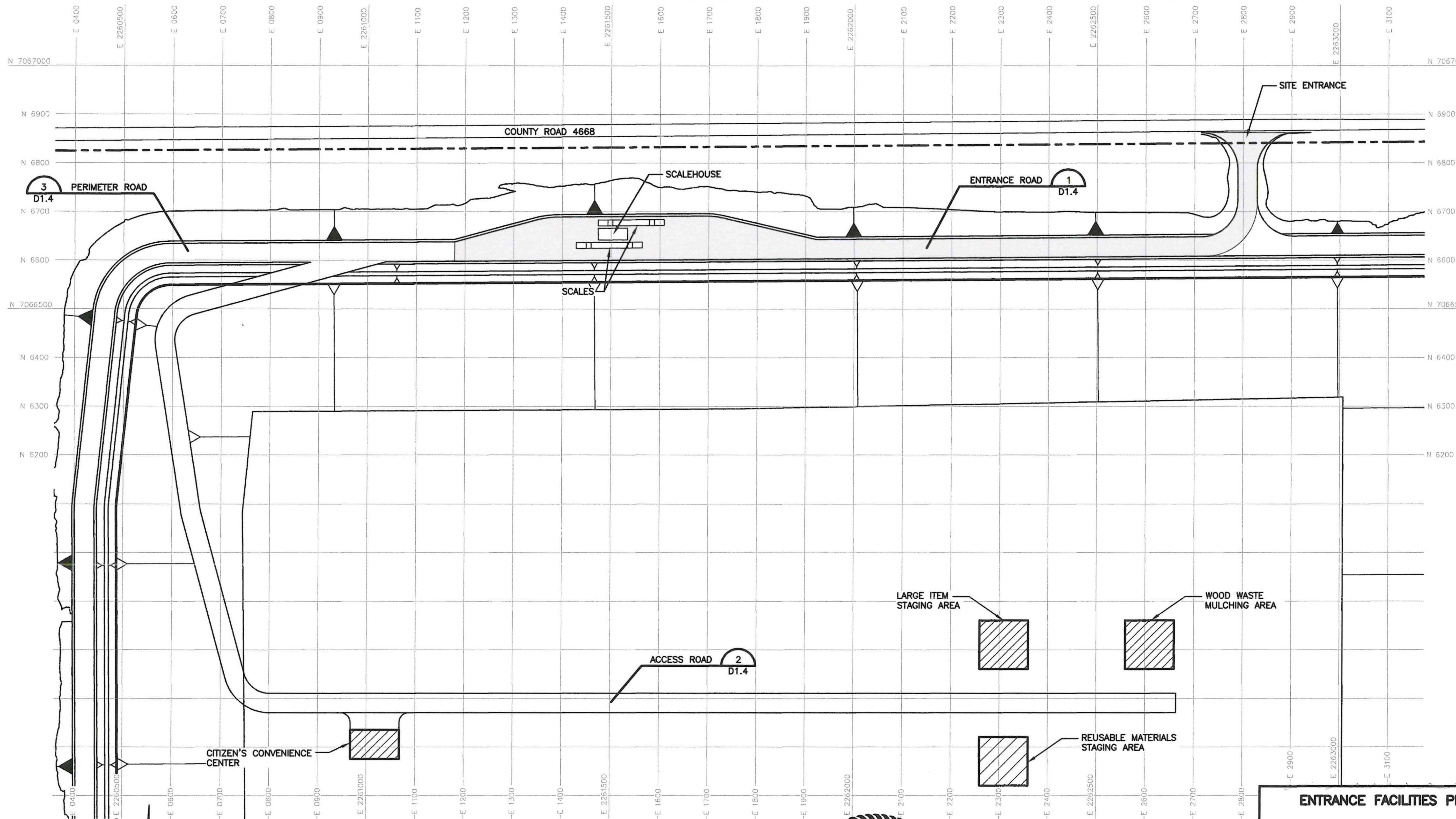
FACILITY PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D1.2



LEGEND

- PERMIT BOUNDARY
- N 7062000 STATE PLANE COORDINATES
- N 2100 SITE GRID
- —x—x— FENCE
- WASTE MANAGEMENT UNIT

NOTE(S):

1. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
GREGORY W. ADAMS
73356
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9/23/2025

FOR PERMITTING PURPOSES

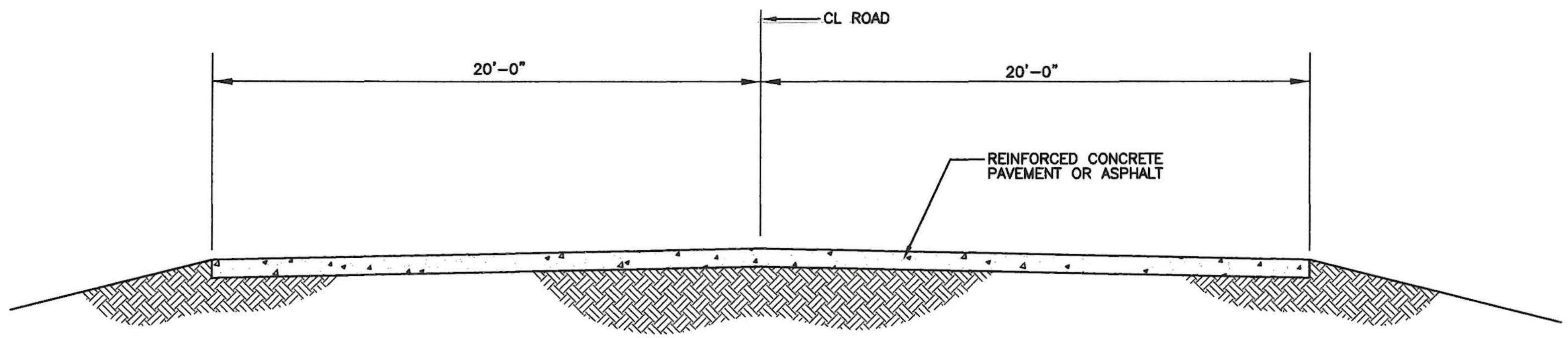
REVISIONS		
REV	DATE	DESCRIPTION

ENTRANCE FACILITIES PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

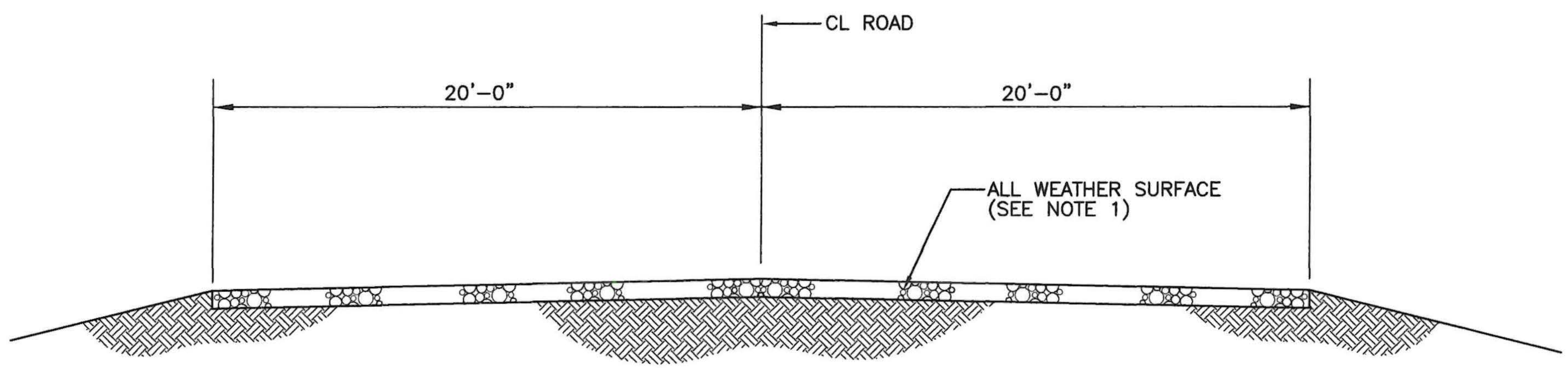
BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D1.3



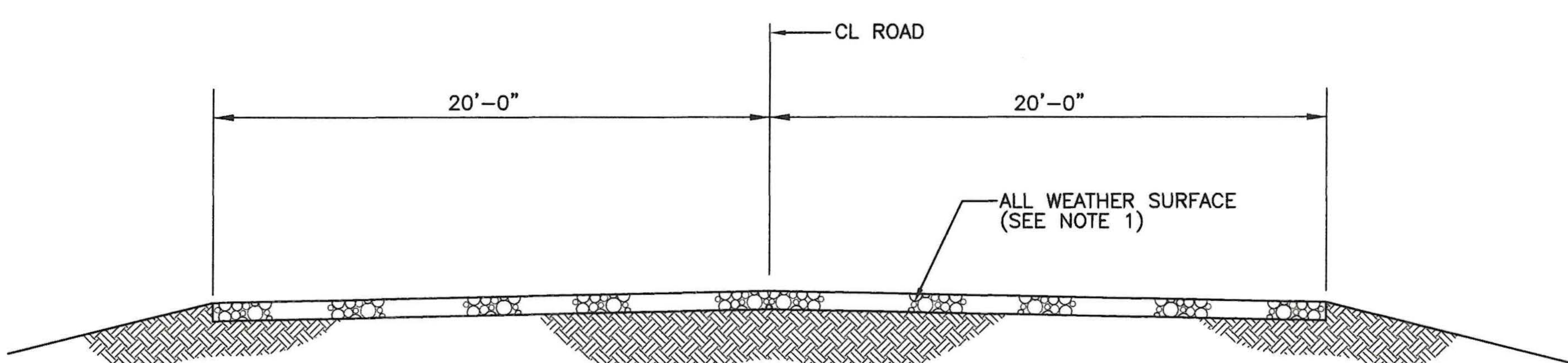
SITE ENTRANCE ROAD (R1 / D1.4)

0 3 6
SCALE IN FEET



LANDFILL ACCESS ROAD (R2 / D1.4)

0 3 6
SCALE IN FEET

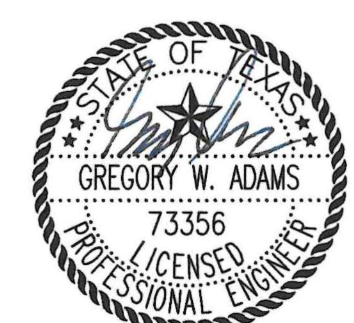


PERIMETER ROAD (3 / D1.4)

0 3 6
SCALE IN FEET

NOTE(S):

1. LANDFILL ACCESS ROAD SHALL BE MAINTAINED WITH ALL WEATHER SURFACE (CRUSHED STONE, GRAVEL, CONCRETE RUBBLE, MASONRY DEMOLITION DEBRIS, WOOD CHIPS, OR OTHER SIMILAR MATERIALS) WHERE USED AS ACCESS TO WORKING FACE BY WASTE HAUL VEHICLES.



9/23/2025

FOR PERMITTING PURPOSES

REV	DATE	DESCRIPTION
		REVISIONS

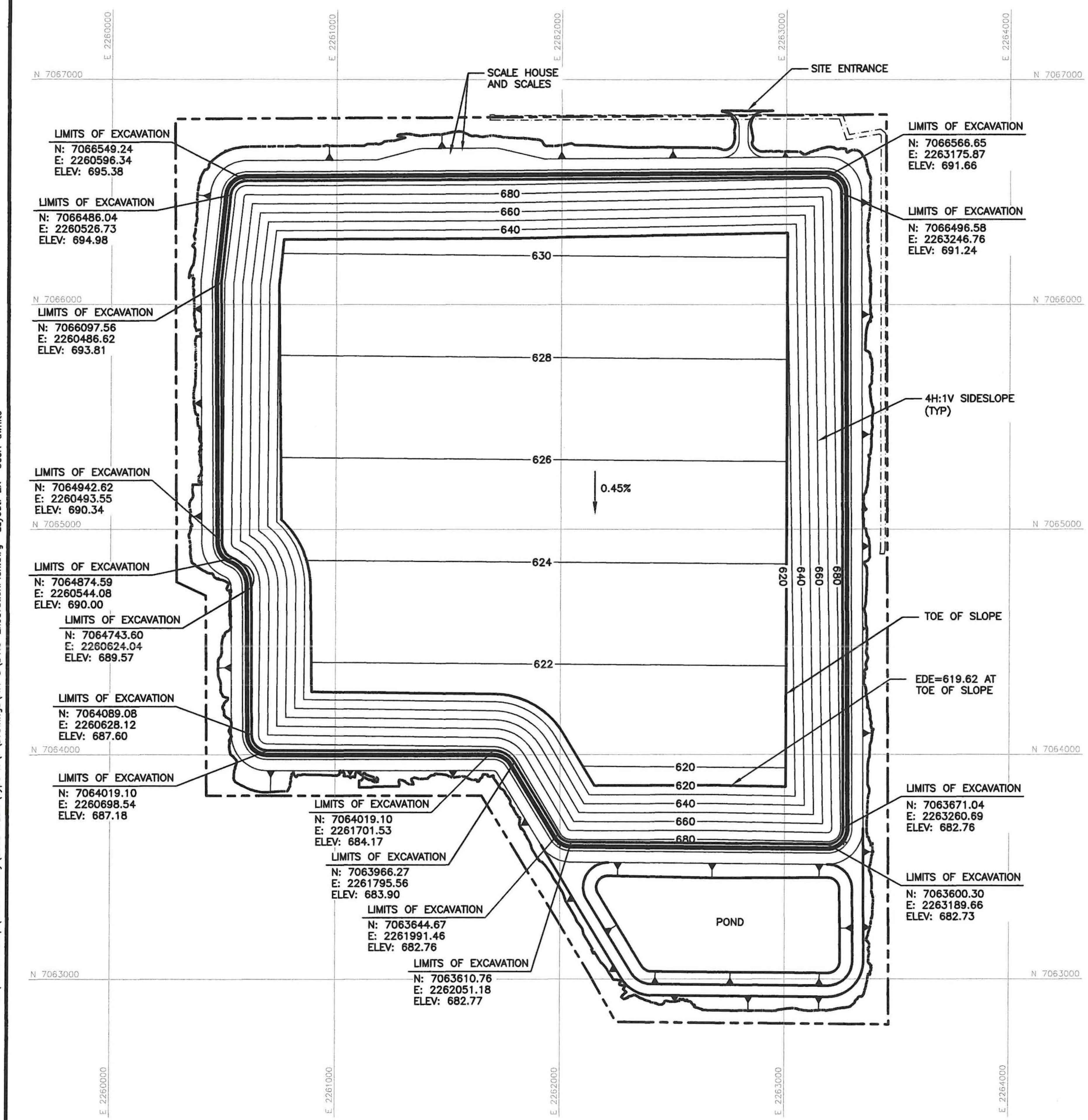
ENTRANCE FACILITIES DETAILS

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D1.4

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D1.5-ExcavationPlan.dwg Layout: EX User: awhite



0 250 500
SCALE IN FEET

LEGEND

— — —	PERMIT BOUNDARY
N 7062000	STATE PLANE COORDINATES
——620——	EXCAVATION CONTOUR

NOTE(S):

1. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
2. PROPOSED CONTOURS DEPICT EXCAVATION GRADES.
3. ELEVATION OF DEEPEST EXCAVATION IS 619.62 FT-MSL.

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS

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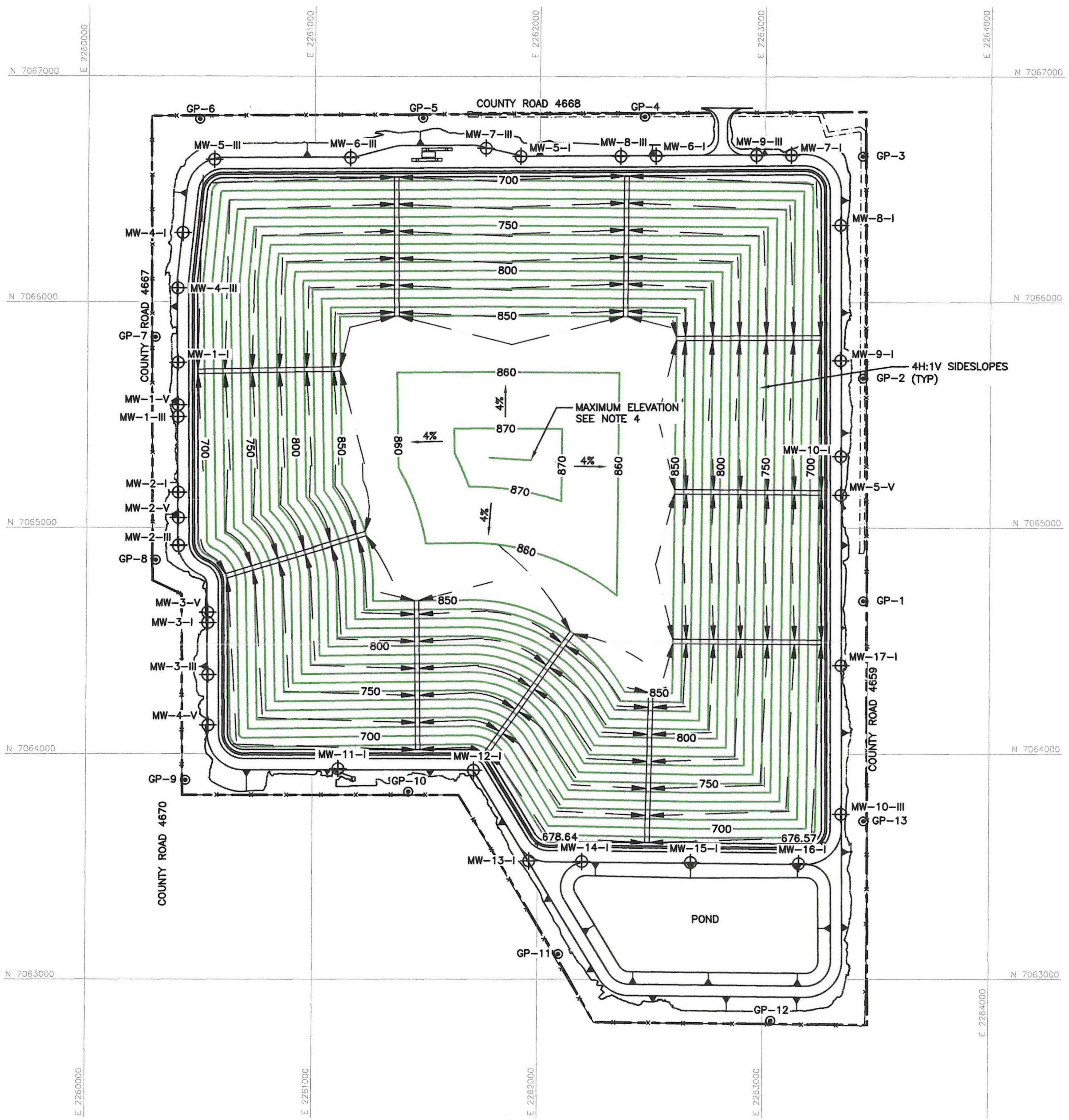
EXCAVATION PLAN

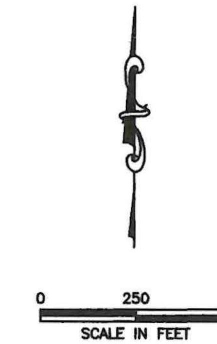
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D1.5





LEGEND

— — —	PERMIT BOUNDARY
N 7062000	STATE PLANE COORDINATES
— x — x —	FENCE
—800—	FINAL COVER CONTOUR
═══	CHUTE
——→	SWALE
MW-10-I ⊕	PROPOSED GROUNDWATER MONITORING WELL
GP-1 ◎	PROPOSED LANDFILL GAS MONITORING PROBE

NOTE(S):

1. EXISTING CONTOURS COMPILED FROM SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
3. PROPOSED CONTOURS DEPICT TOP OF FINAL COVER GRADES.
4. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL MAXIMUM WASTE FILL ELEVATION: 872.1 FT-MSL
5. REFER TO ATTACHMENT C FOR DRAINAGE FEATURES.

STATE OF TEXAS
GREGORY W. ADAMS
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9/23/2025

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LANDFILL COMPLETION PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D1.6

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D2
CROSS SECTIONS

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

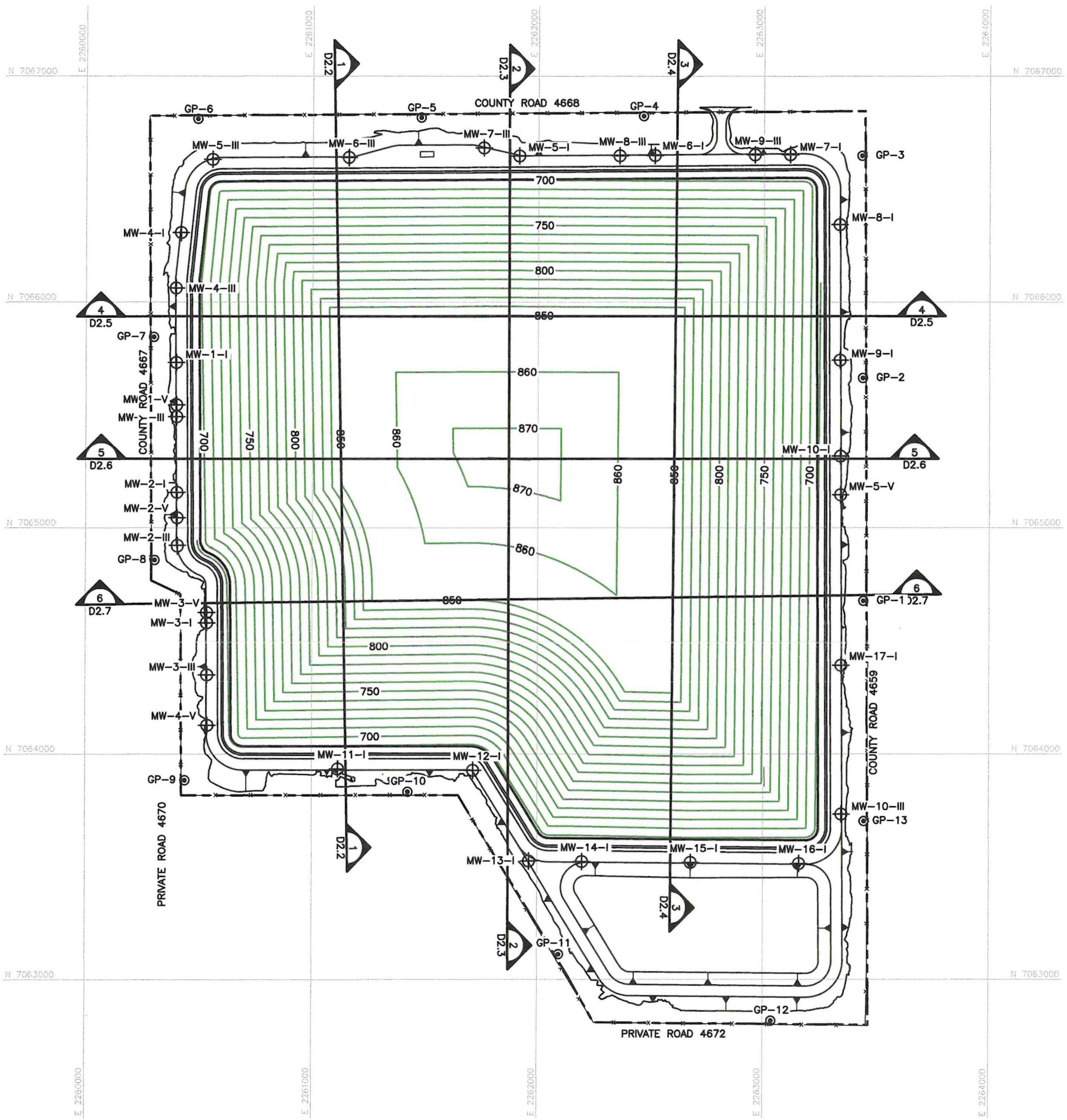
Prepared by

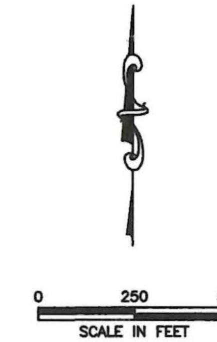
BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS
FIRM REGISTRATION NO. F-256 AND NO. 10194895

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D2.1-LFCrossSectionPlan.dwg Layout: LAYOUT 1 User: awhite





LEGEND

— — —	PERMIT BOUNDARY
705	10' CONTOUR
N 7062000	STATE PLANE COORDINATES
800	FINAL COVER CONTOUR
MW-10-I	PROPOSED GROUNDWATER MONITORING WELL
GP-1	PROPOSED LANDFILL GAS MONITORING PROBE

NOTE(S):

1. EXISTING CONTOURS COMPILED FROM SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
GREGORY W. ADAMS
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9/23/2025

FOR PERMITTING PURPOSES

REVISIONS

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LANDFILL CROSS SECTION PLAN

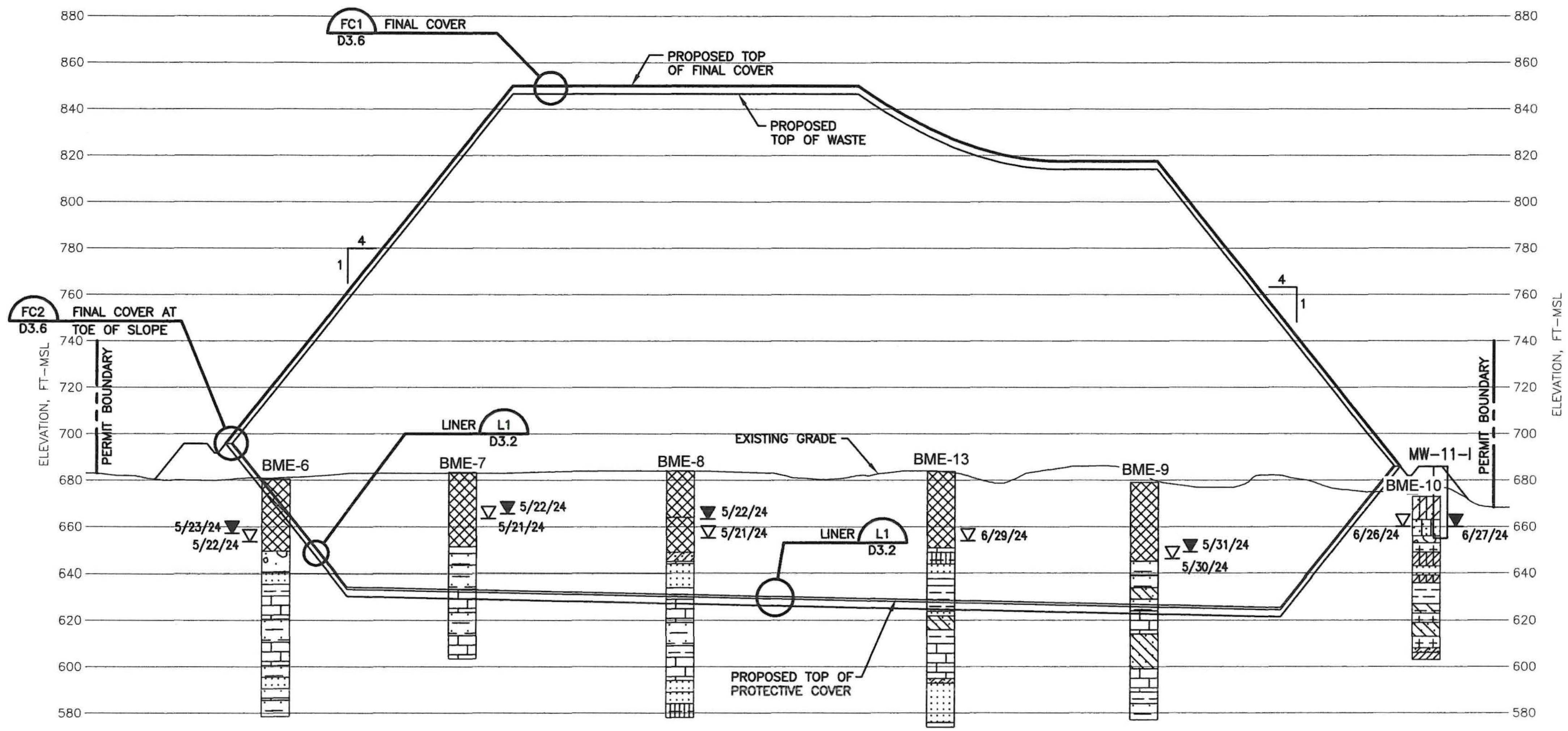
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

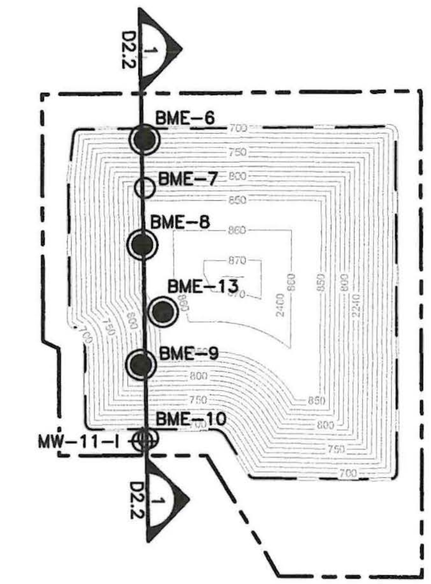
DRAWING
D2.1



TYPICAL LANDFILL SECTION 1/2.2

0 150 300
HORIZONTAL SCALE IN FEET

0 30 60
VERTICAL SCALE IN FEET



KEY MAP

NOTES:

1. REFER TO DRAWING D1.5 FOR EXCAVATION PLAN. REFER TO DRAWING D1.6 FOR LANDFILL COMPLETION PLAN.
2. REFER TO ATTACHMENT D3 FOR LINER AND FINAL COVER SYSTEM DETAILS.
3. REFER TO DRAWING D1.1 FOR BUFFER DISTANCES.
4. REFER TO ATTACHMENT E FOR SUBSURFACE CHARACTERIZATION AND GROUNDWATER ELEVATIONS.
5. REFER TO ATTACHMENT C FOR DRAINAGE SYSTEM DETAILS.
6. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL. MAXIMUM ELEVATION OF WASTE: 872.1 FT-MSL. ELEVATION OF DEEPEST EXCAVATION: 619.62 FT-MSL.
7. SOME BORINGS SHOWN ARE PROJECTED ONTO THE SECTION LINE. TOP OF BORING SHOWN IS ACTUAL ELEVATION OF BORING AND MAY NOT MATCH GROUND ELEVATION AT SECTION LOCATION.

LEGEND

- FILL
- CLAY (CL)
- CLAY W/SAND
- CLAY W/SILT
- CLAY W/SILT & SAND
- GRAVEL
- LIMESTONE
- SAND W/CLAY
- SAND W/GRAVEL
- SAND W/SILT
- SANDSTONE
- SHALE
- SHALE W/CLAY
- SHALE W/SAND
- SHALE W/SILT
- SILTSTONE
- INITIAL WATER LEVEL
- STATIC WATER LEVEL

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

TYPICAL LANDFILL SECTION 1

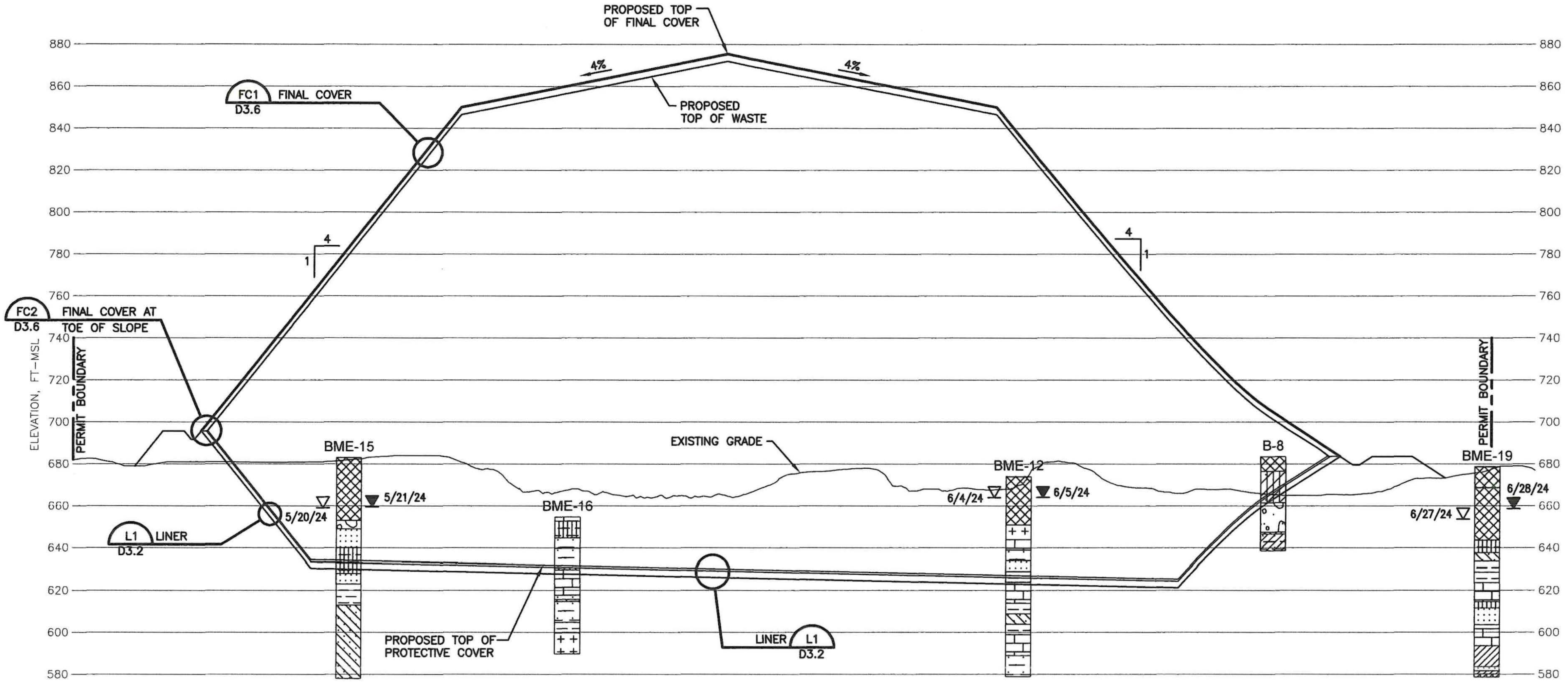
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

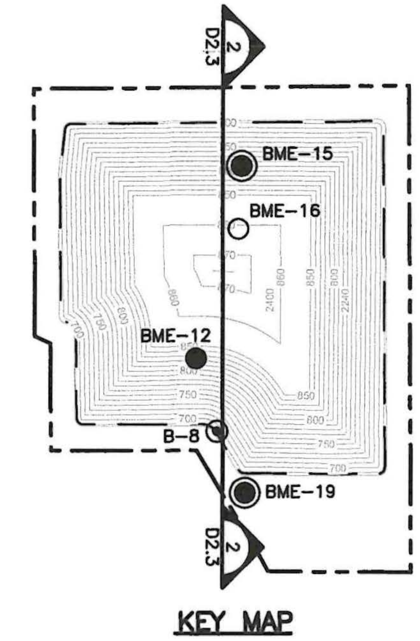
BME

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D2.2





TYPICAL LANDFILL SECTION 2/2.3

HORIZONTAL SCALE IN FEET: 0, 150, 300

VERTICAL SCALE IN FEET: 0, 30, 60

NOTES:

1. REFER TO DRAWING D1.5 FOR EXCAVATION PLAN. REFER TO DRAWING D1.6 FOR LANDFILL COMPLETION PLAN.
2. REFER TO ATTACHMENT D3 FOR LINER AND FINAL COVER SYSTEM DETAILS.
3. REFER TO DRAWING D1.1 FOR BUFFER DISTANCES.
4. REFER TO ATTACHMENT E FOR SUBSURFACE CHARACTERIZATION AND GROUNDWATER ELEVATIONS.
5. REFER TO ATTACHMENT C FOR DRAINAGE SYSTEM DETAILS.
6. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL. MAXIMUM ELEVATION OF WASTE: 872.1 FT-MSL. ELEVATION OF DEEPEST EXCAVATION: 619.62 FT-MSL.
7. SOME BORINGS SHOWN ARE PROJECTED ONTO THE SECTION LINE. TOP OF BORING SHOWN IS ACTUAL ELEVATION OF BORING AND MAY NOT MATCH GROUND ELEVATION AT SECTION LOCATION.

LEGEND

FILL; CLAY (CL); CLAY W/SAND; CLAY W/ SAND & SHALE; CLAY W/ SILT & SAND; CLAY W/SILT; GRAVEL; LIMESTONE; MARL; SAND; SAND W/CLAY; SAND W/ GRAVEL; SAND W/SILT; SANDSTONE; SHALE; SHALE W/SAND; SHALE W/SILT; SILTSTONE; ▽ INITIAL WATER LEVEL; ▼ STATIC WATER LEVEL

STATE OF TEXAS — GREGORY W. ADAMS — 73356 — LICENSED PROFESSIONAL ENGINEER

9/23/2025

FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

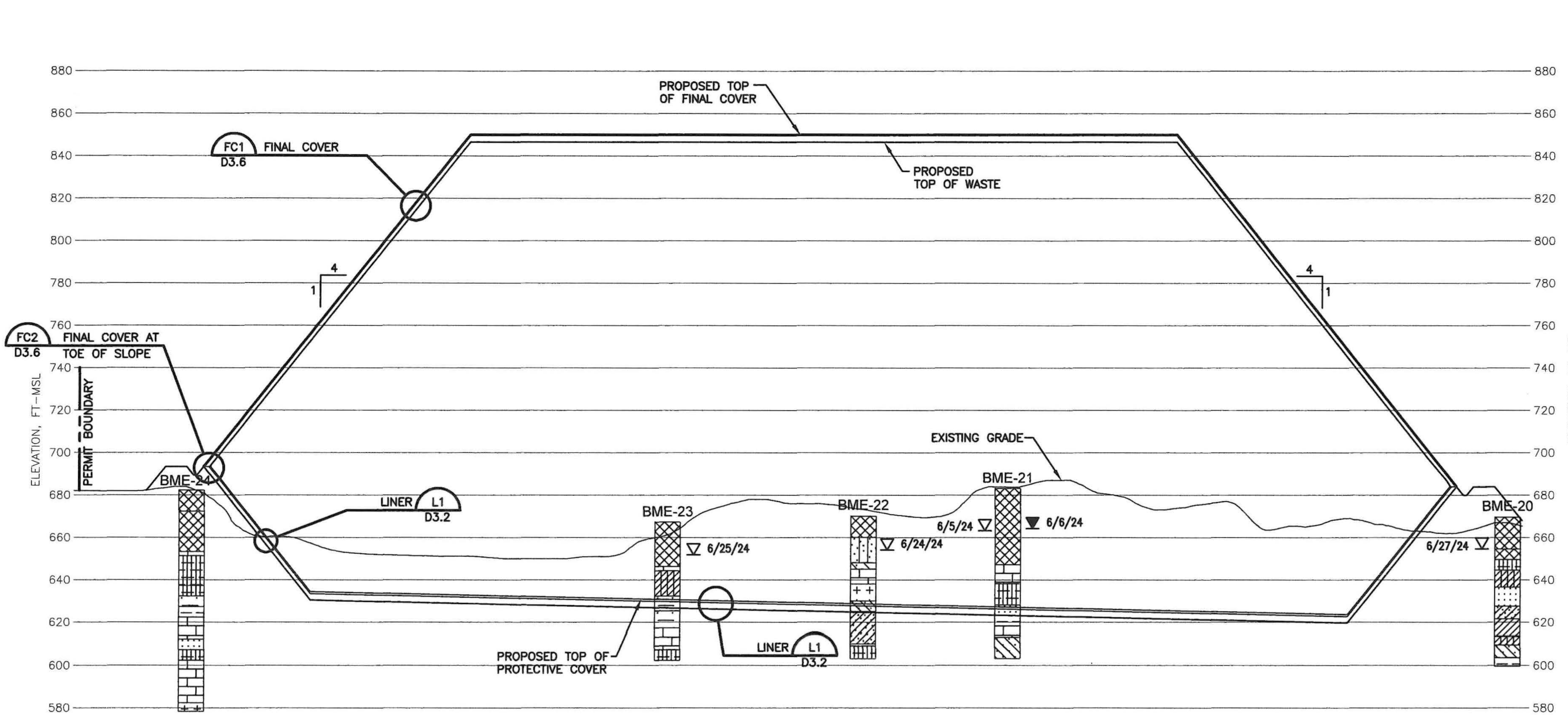
TYPICAL LANDFILL SECTION 2

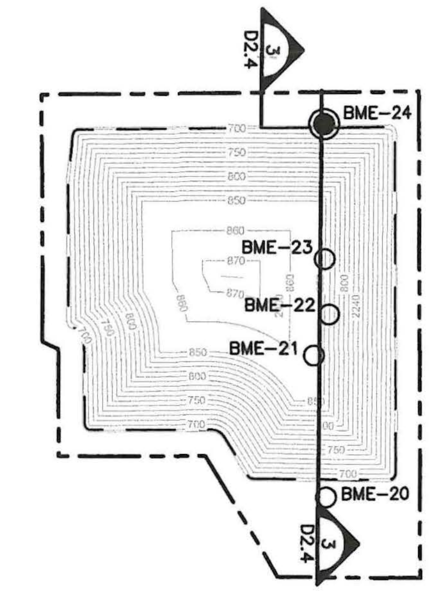
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING D2.3





KEY MAP

TYPICAL LANDFILL SECTION 3 / 2.4

0 150 300 HORIZONTAL SCALE IN FEET

0 30 60 VERTICAL SCALE IN FEET

NOTES:

1. REFER TO DRAWING D1.5 FOR EXCAVATION PLAN. REFER TO DRAWING D1.6 FOR LANDFILL COMPLETION PLAN.
2. REFER TO ATTACHMENT D3 FOR LINER AND FINAL COVER SYSTEM DETAILS.
3. REFER TO DRAWING D1.1 FOR BUFFER DISTANCES.
4. REFER TO ATTACHMENT E FOR SUBSURFACE CHARACTERIZATION AND GROUNDWATER ELEVATIONS.
5. REFER TO ATTACHMENT C FOR DRAINAGE SYSTEM DETAILS.
6. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL. MAXIMUM ELEVATION OF WASTE: 872.1 FT-MSL. ELEVATION OF DEEPEST EXCAVATION: 619.62 FT-MSL.
7. SOME BORINGS SHOWN ARE PROJECTED ONTO THE SECTION LINE. TOP OF BORING SHOWN IS ACTUAL ELEVATION OF BORING AND MAY NOT MATCH GROUND ELEVATION AT SECTION LOCATION.

LEGEND

- FILL
- CLAY (CL)
- CLAY W/SAND
- CLAY W/SILT
- LIMESTONE
- MARL
- SAND W/CLAY
- SAND W/SILT
- SANDSTONE
- SHALE
- SHALE W/ CLAY & SAND
- SHALE W/SAND
- SHALE W/SILT
- SILTSTONE
- INITIAL WATER LEVEL
- STATIC WATER LEVEL

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

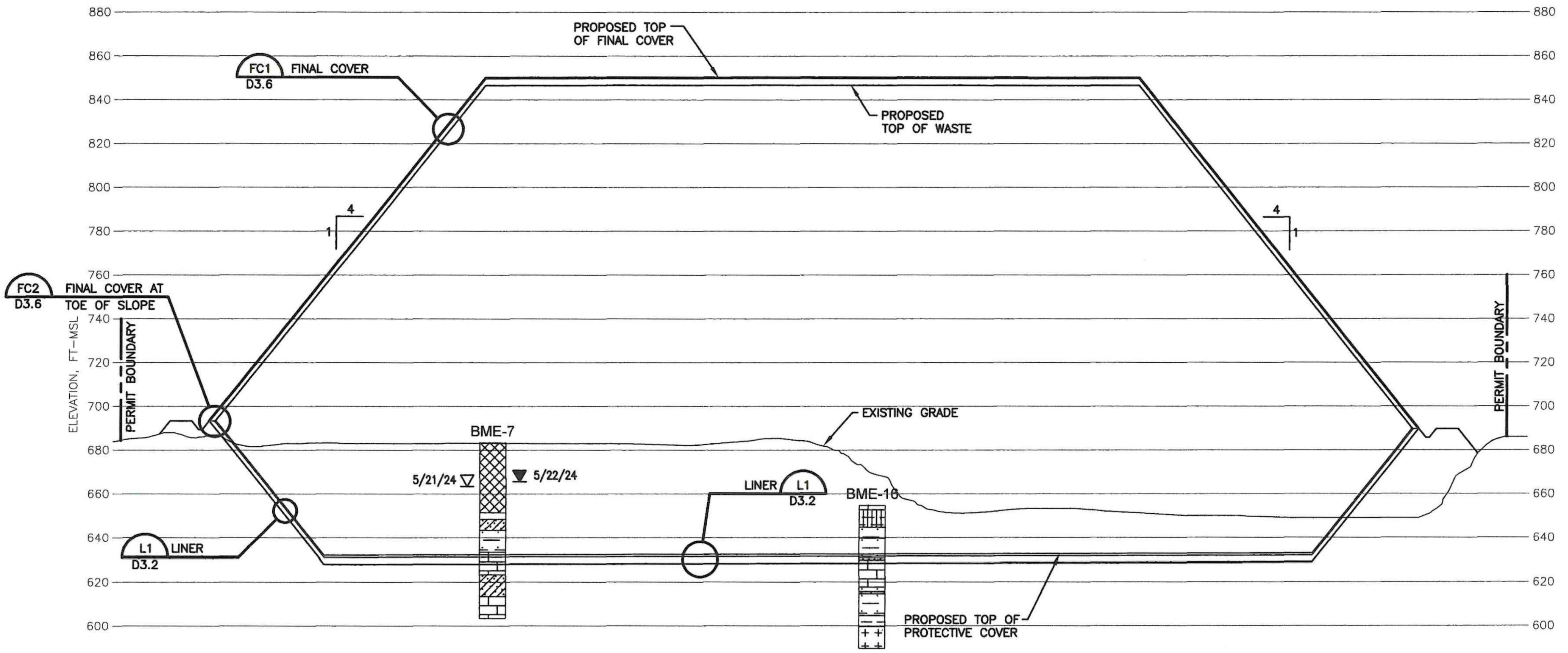
TYPICAL LANDFILL SECTION 3

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

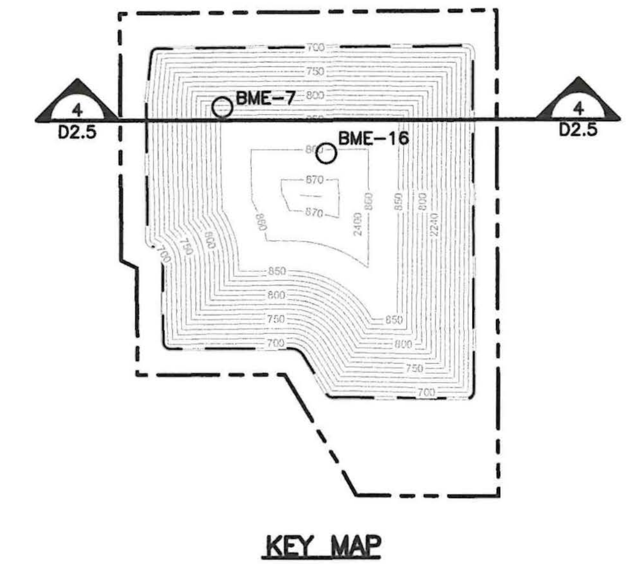
DRAWING
D2.4



TYPICAL LANDFILL SECTION 4 / 2.5

0 150 300
HORIZONTAL SCALE IN FEET

0 30 60
VERTICAL SCALE IN FEET



KEY MAP

NOTES:

1. REFER TO DRAWING D1.5 FOR EXCAVATION PLAN. REFER TO DRAWING D1.6 FOR LANDFILL COMPLETION PLAN.
2. REFER TO ATTACHMENT D3 FOR LINER AND FINAL COVER SYSTEM DETAILS.
3. REFER TO DRAWING D1.1 FOR BUFFER DISTANCES.
4. REFER TO ATTACHMENT E FOR SUBSURFACE CHARACTERIZATION AND GROUNDWATER ELEVATIONS.
5. REFER TO ATTACHMENT C FOR DRAINAGE SYSTEM DETAILS.
6. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL. MAXIMUM ELEVATION OF WASTE: 872.1 FT-MSL. ELEVATION OF DEEPEST EXCAVATION: 619.62 FT-MSL.
7. SOME BORINGS SHOWN ARE PROJECTED ONTO THE SECTION LINE. TOP OF BORING SHOWN IS ACTUAL ELEVATION OF BORING AND MAY NOT MATCH GROUND ELEVATION AT SECTION LOCATION.

LEGEND

- FILL
- CLAY W/SAND
- LIMESTONE
- SAND
- SAND W/SILT
- SHALE
- SHALE W/SAND
- SHALE W/SILT
- SILTSTONE
- INITIAL WATER LEVEL
- STATIC WATER LEVEL

FOR PERMITTING PURPOSES

REV	DATE	DESCRIPTION

REVISIONS

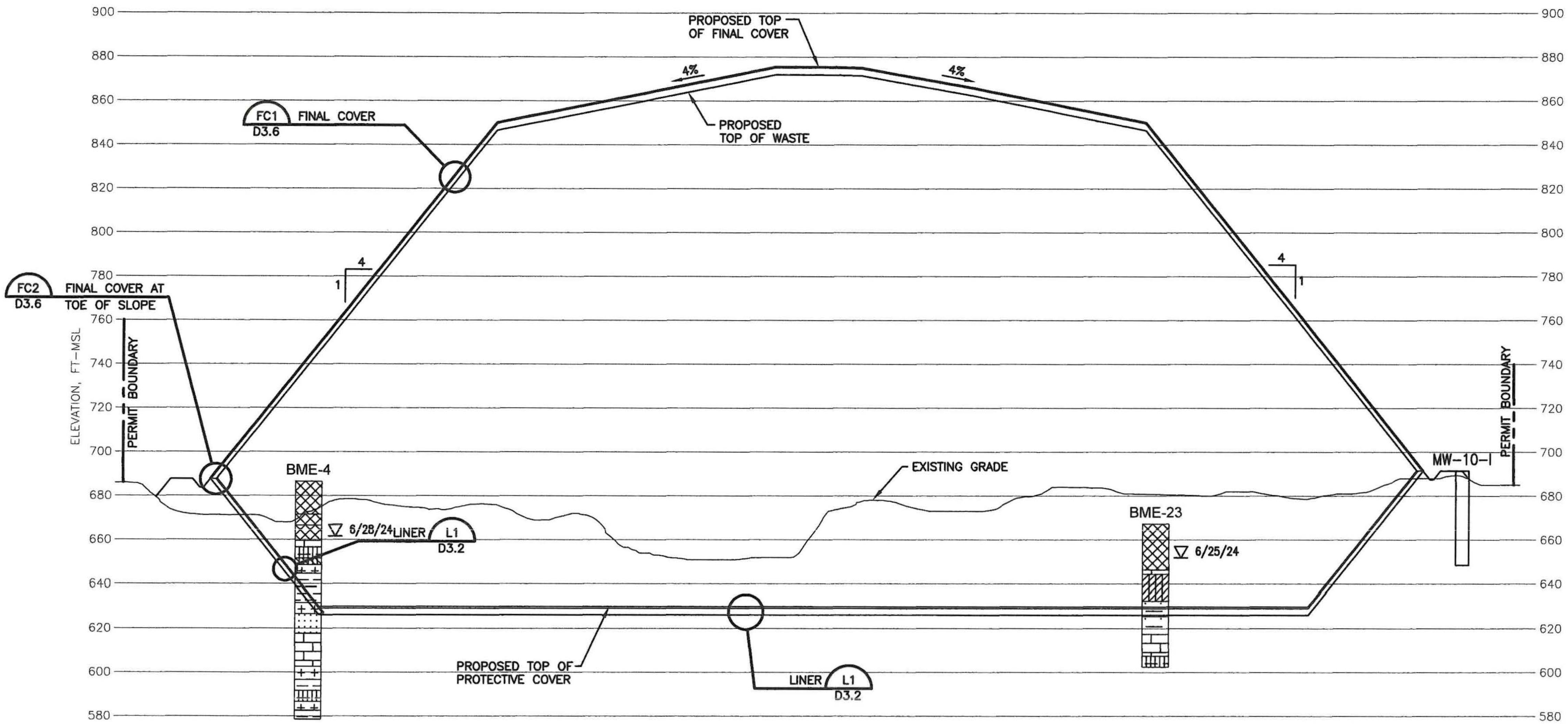
TYPICAL LANDFILL SECTION 4

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

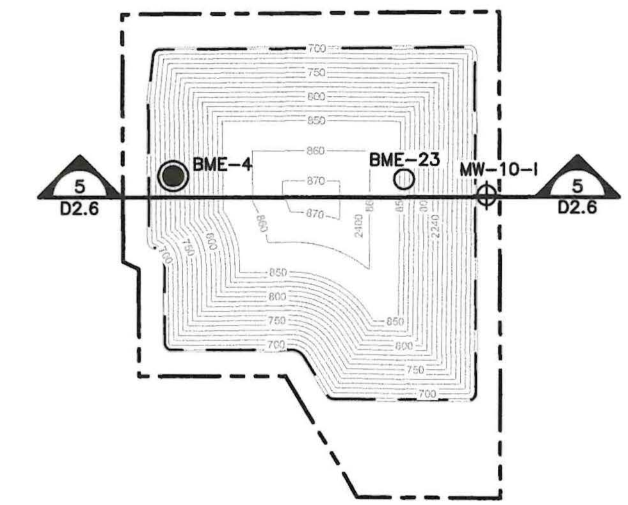
DRAWING
D2.5



TYPICAL LANDFILL SECTION 5/2.6

0 150 300
HORIZONTAL SCALE IN FEET

0 30 60
VERTICAL SCALE IN FEET



KEY MAP

NOTES:

1. REFER TO DRAWING D1.5 FOR EXCAVATION PLAN. REFER TO DRAWING D1.6 FOR LANDFILL COMPLETION PLAN.
2. REFER TO ATTACHMENT D3 FOR LINER AND FINAL COVER SYSTEM DETAILS.
3. REFER TO DRAWING D1.1 FOR BUFFER DISTANCES.
4. REFER TO ATTACHMENT E FOR SUBSURFACE CHARACTERIZATION AND GROUNDWATER ELEVATIONS.
5. REFER TO ATTACHMENT C FOR DRAINAGE SYSTEM DETAILS.
6. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL. MAXIMUM ELEVATION OF WASTE: 872.1 FT-MSL. ELEVATION OF DEEPEST EXCAVATION: 619.62 FT-MSL.
7. SOME BORINGS SHOWN ARE PROJECTED ONTO THE SECTION LINE. TOP OF BORING SHOWN IS ACTUAL ELEVATION OF BORING AND MAY NOT MATCH GROUND ELEVATION AT SECTION LOCATION.

LEGEND

FILL
CLAY (CL)
CLAY W/SAND
CLAY W/SILT
LIMESTONE
SANDSTONE
SHALE
SHALE W/SAND
SHALE W/SILT
SILT W/CLAY
SILTSTONE
INITIAL WATER LEVEL
STATIC WATER LEVEL

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

TYPICAL LANDFILL SECTION 5

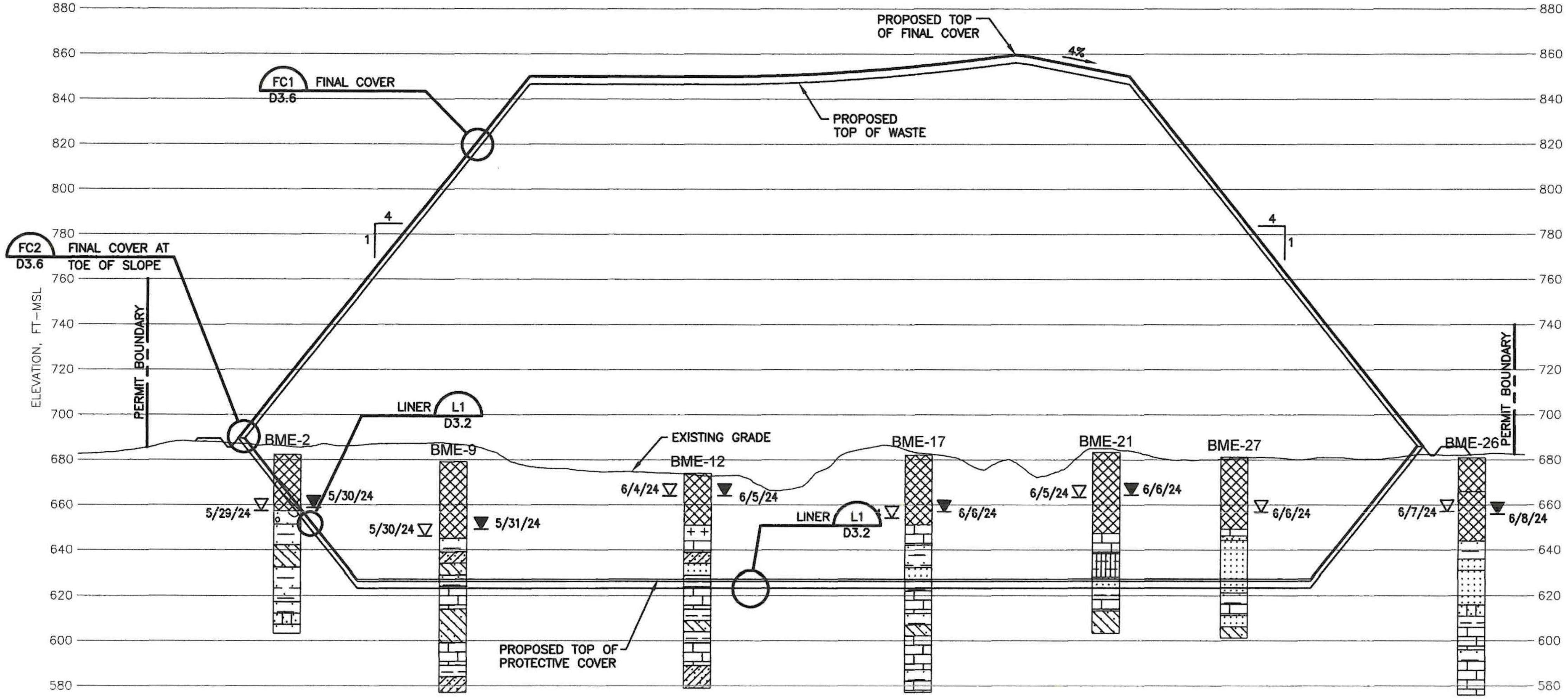
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D2.6

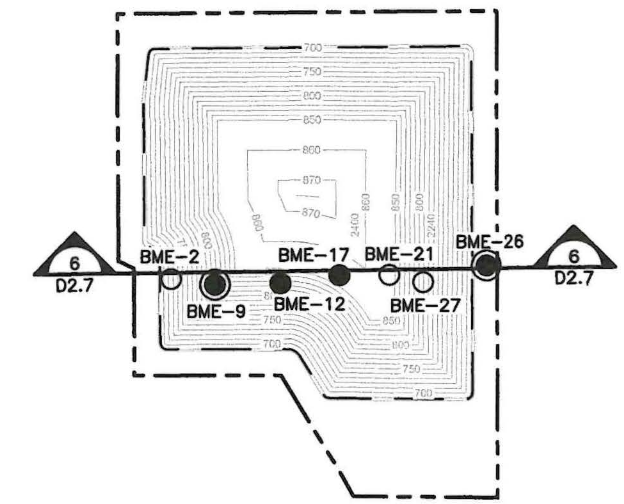
O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D2.2thru7-TypicalLandfillSections.dwg Layout: SECTION 5 User: awhite



TYPICAL LANDFILL SECTION 6 / 2.7

0 150 300 HORIZONTAL SCALE IN FEET

0 30. 60 VERTICAL SCALE IN FEET



KEY MAP

NOTES:

1. REFER TO DRAWING D1.5 FOR EXCAVATION PLAN. REFER TO DRAWING D1.6 FOR LANDFILL COMPLETION PLAN.
2. REFER TO ATTACHMENT D3 FOR LINER AND FINAL COVER SYSTEM DETAILS.
3. REFER TO DRAWING D1.1 FOR BUFFER DISTANCES.
4. REFER TO ATTACHMENT E FOR SUBSURFACE CHARACTERIZATION AND GROUNDWATER ELEVATIONS.
5. REFER TO ATTACHMENT C FOR DRAINAGE SYSTEM DETAILS.
6. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL. MAXIMUM ELEVATION OF WASTE: 872.1 FT-MSL. ELEVATION OF DEEPEST EXCAVATION: 619.62 FT-MSL.
7. SOME BORINGS SHOWN ARE PROJECTED ONTO THE SECTION LINE. TOP OF BORING SHOWN IS ACTUAL ELEVATION OF BORING AND MAY NOT MATCH GROUND ELEVATION AT SECTION LOCATION.

LEGEND

FILL · CLAY (CL) · CLAY W/SAND · CLAY W/SILT · LIMESTONE · SAND · SAND W/CLAY · SAND W/GRAVEL · SAND W/SILT · SANDSTONE · SHALE · SHALE W/SAND · SHALE W/SILT · SILTSTONE · INITIAL WATER LEVEL · STATIC WATER LEVEL

STATE OF TEXAS · GREGORY W. ADAMS · 73356 · LICENSED PROFESSIONAL ENGINEER

9/23/2025

FOR PERMITTING PURPOSES

REV	DATE	DESCRIPTION

REVISIONS

TYPICAL LANDFILL SECTION 6

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME — BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING D2.7

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D2.2thru7-TypicalLandfillSections.dwg Layout: SECTION 6 User: awhite

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D3
CONSTRUCTION DESIGN DETAILS

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

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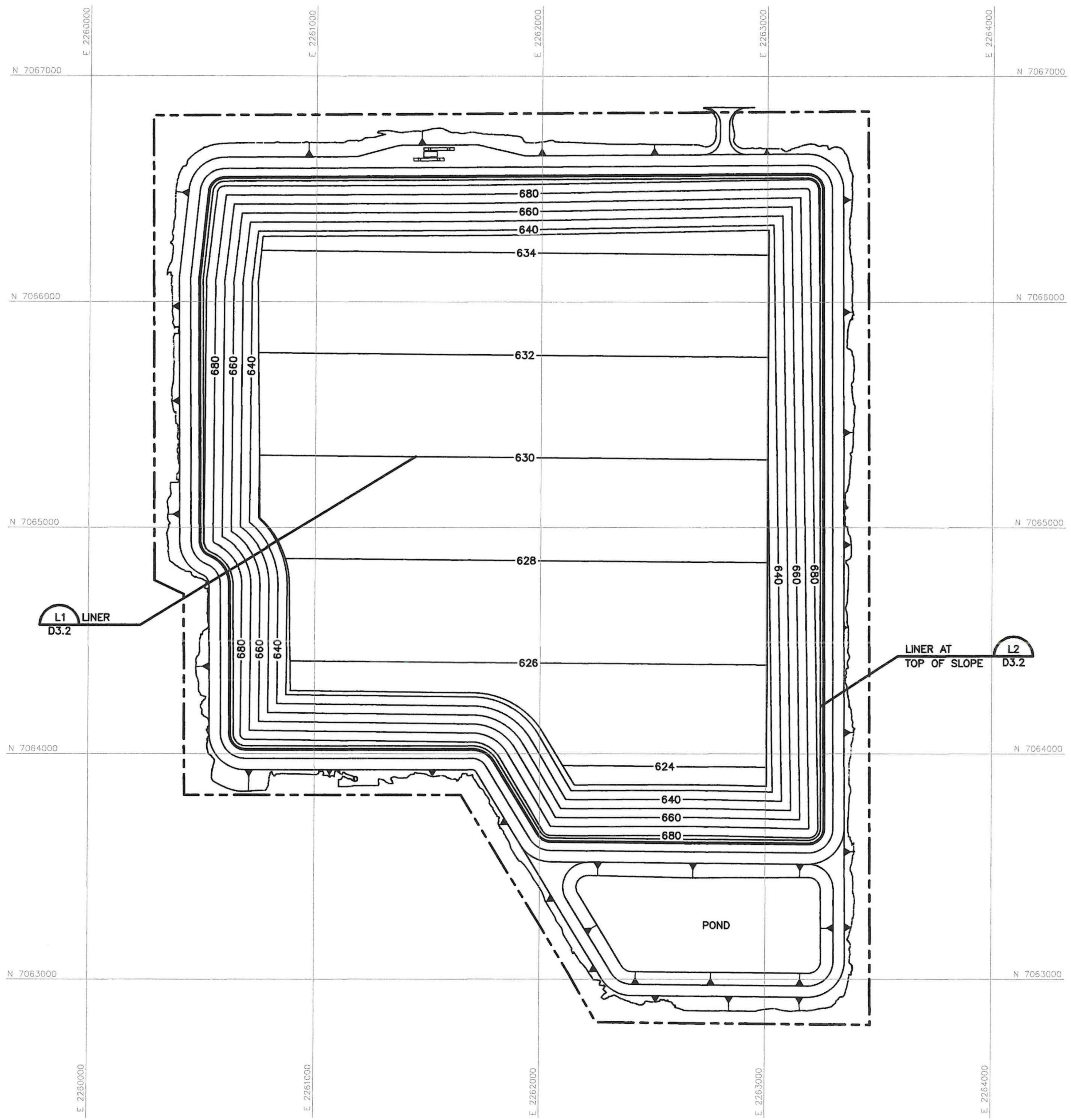
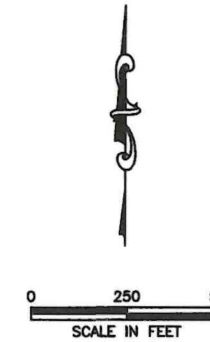
FIRM REGISTRATION NO. F-256 AND NO. 10194895

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222





LEGEND

- PERMIT BOUNDARY
- N 7062000 — STATE PLANE COORDINATES
- 620 — TOP OF PROTECTIVE COVER
- WASTE MANAGEMENT UNIT

NOTE(S):

1. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
2. CONTOURS DEPICT TOP OF PROTECTIVE GRADES.

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LINER PLAN

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CHISHOLM TRAIL DISPOSAL LANDFILL

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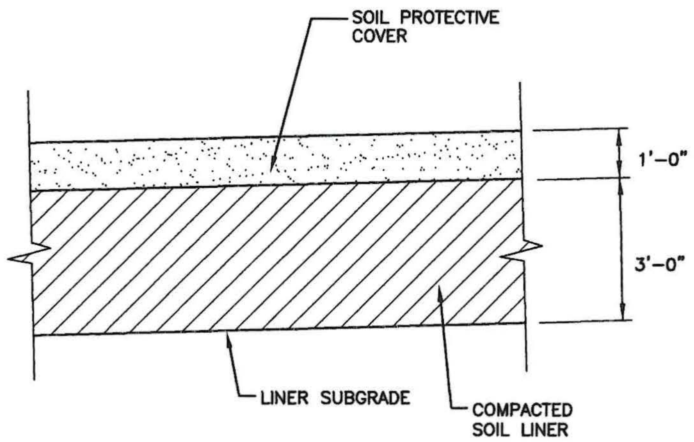
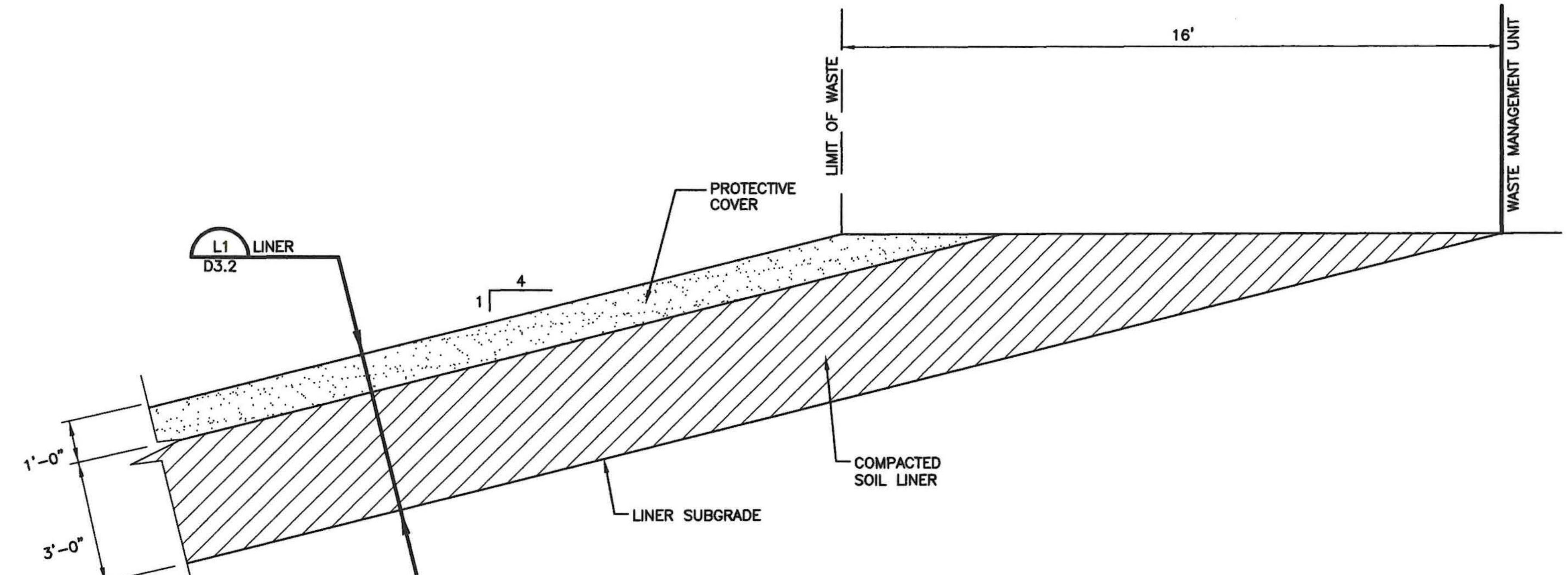
DRAWING
D3.1

O:\Green Group\Wise County\Solid Waste\Type IV\MP\Drawings\ATT D\D3.1-LinerPlan.dwg Layout: LAYOUT 1 User: awhite



LINER L1 D3.2

0 2 4
SCALE IN FEET

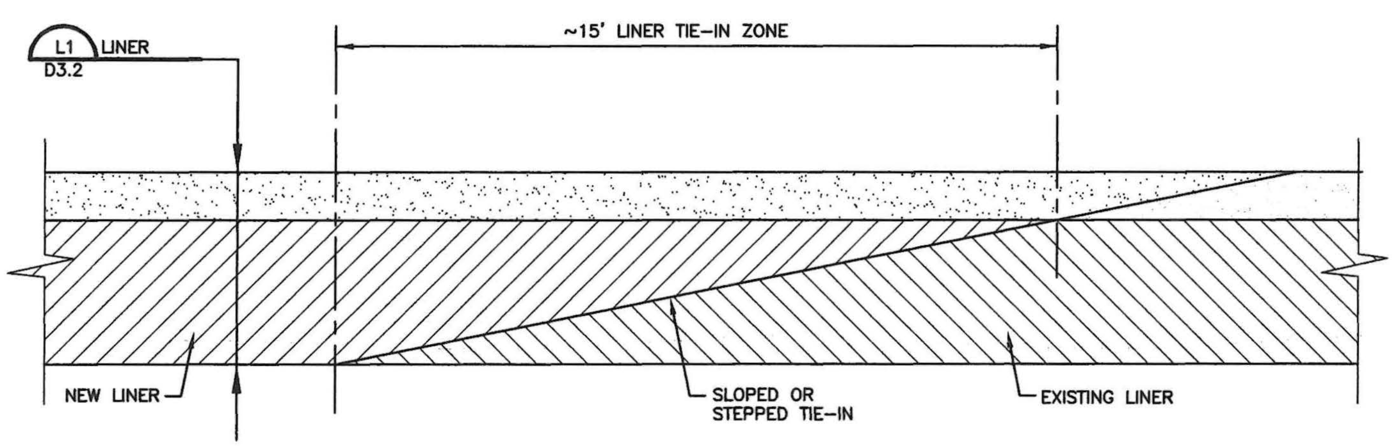


LINER AT TOP OF SLOPE L2 D3.2

0 2 4
SCALE IN FEET

NOTE:

1. ATTACHMENT D7 – LINER QUALITY CONTROL PLAN PROVIDES DETAILS AND REQUIREMENTS FOR CONSTRUCTION OF THE LINER SYSTEM INCLUDING MATERIAL, PREPARATION, THICKNESS, COMPACTION, AND PROCESSING REQUIREMENTS.



LINER TIE-IN L3 D3.2

0 2 4
SCALE IN FEET

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REV	DATE	DESCRIPTION

LINER DETAILS

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

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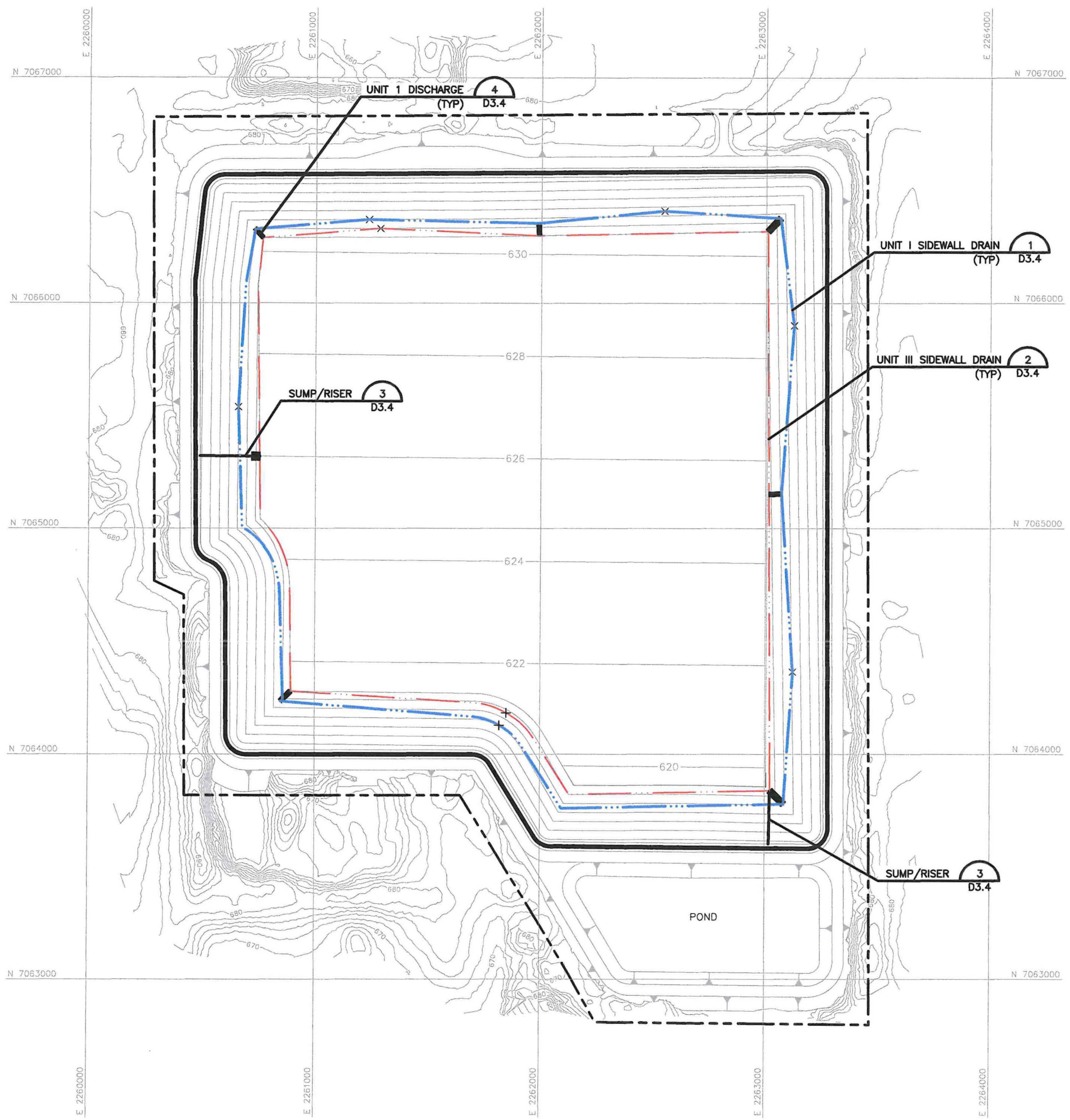
TBPG FIRM NO. 50222

DRAWING
D3.2

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D3.2-LinerDetails.dwg Layout: D3.2 User: awhite



0 250 500
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- 10' CONTOUR
- STATE PLANE COORDINATES
- EXCAVATION CONTOUR
- UNIT I SIDEWALL DRAIN WITH FLOW DIRECTION
- UNIT III SIDEWALL DRAIN WITH FLOW DIRECTION

NOTE(S):

1. EXISTING CONTOURS COMPILED FROM SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
3. ATTACHMENT D7 – LINER QUALITY CONTROL PLAN PROVIDES DETAILS AND REQUIREMENTS FOR DESIGNING THE DEWATERING SYSTEM TO FIT FIELD CONDITIONS.

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REVISIONS

REV	DATE	DESCRIPTION	DWN BY

TEMPORARY DEWATERING SYSTEM PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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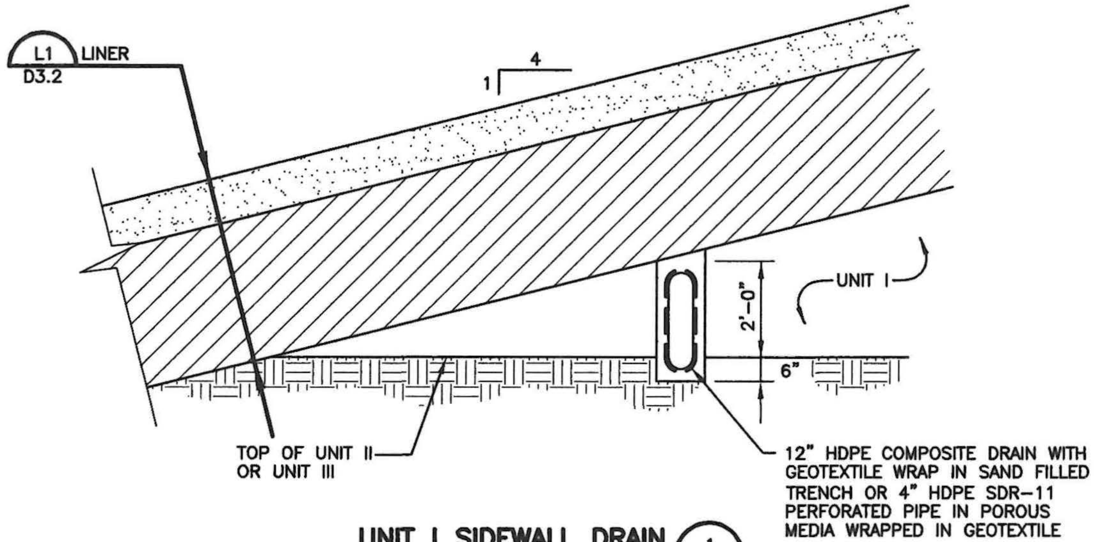
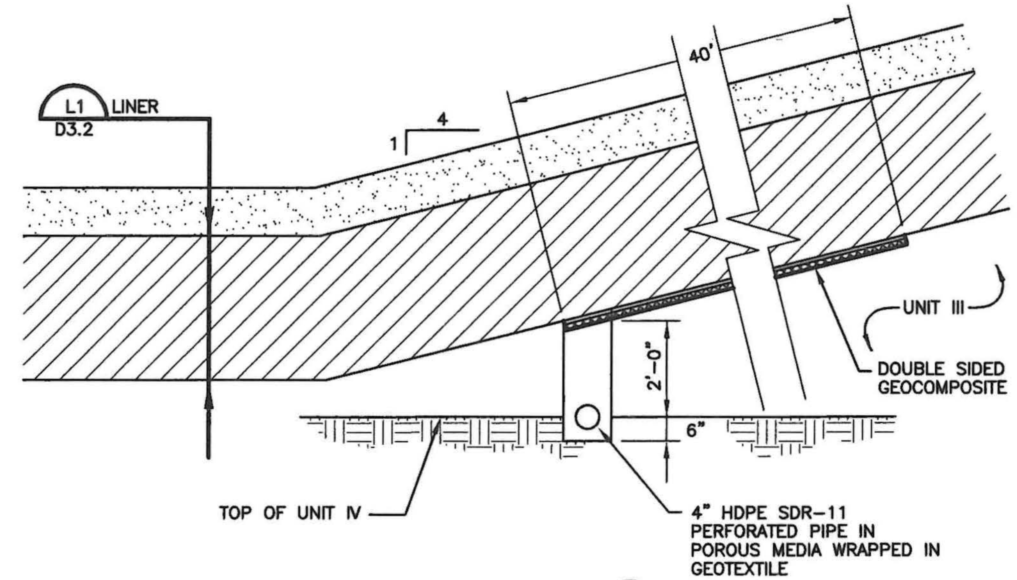
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D3.3



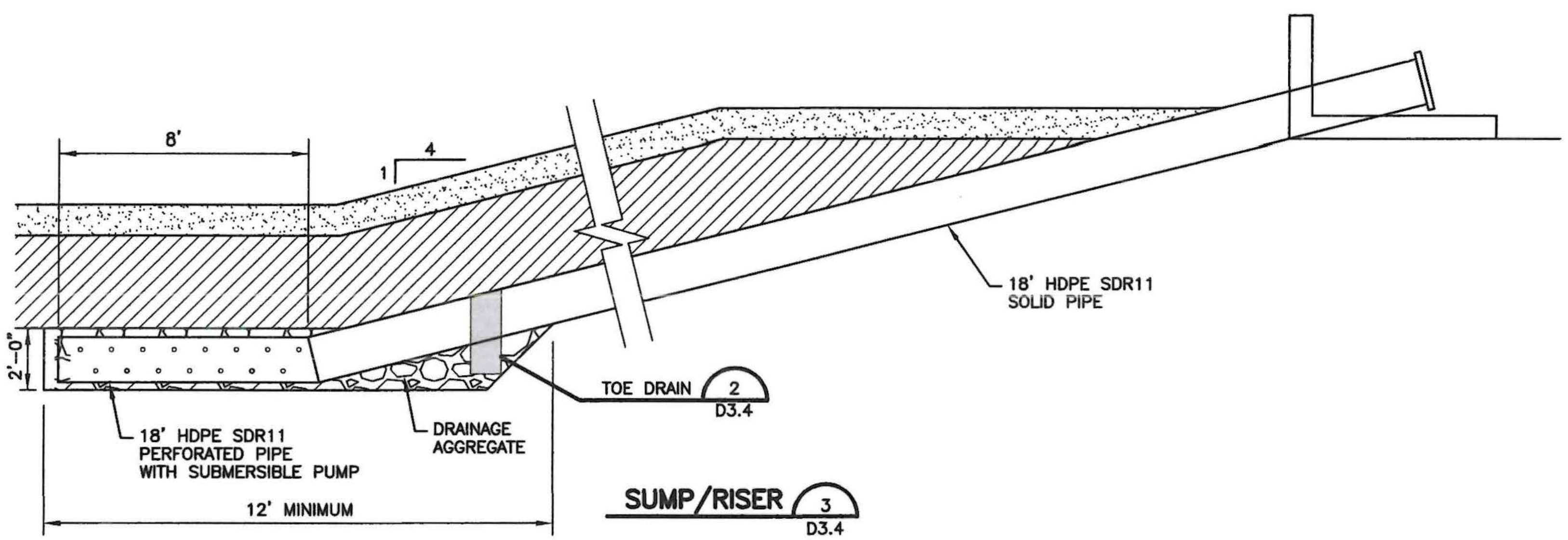
UNIT I SIDEWALL DRAIN 1 D3.4

0 2 4 SCALE IN FEET



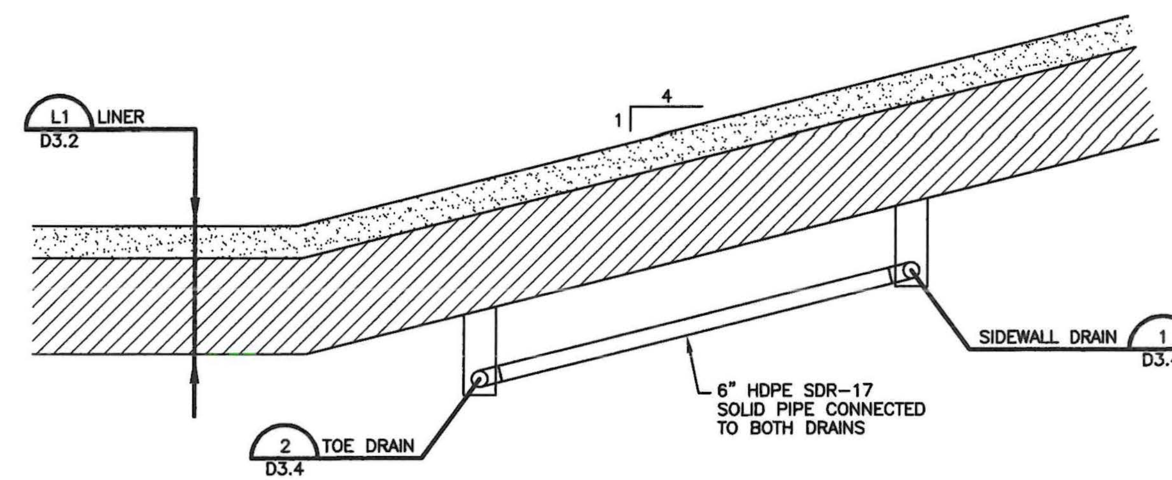
UNIT III TOE DRAIN 2 D3.4

0 2 4 SCALE IN FEET



SUMP/RISER 3 D3.4

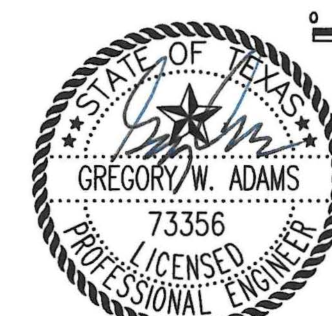
0 3 6 SCALE IN FEET



UNIT I DISCHARGE PIPE 4 D3.4

0 3 6 SCALE IN FEET

NOTE:
1. REFER TO ATTACHMENT D7 FOR DESIGN AND OPERATIONAL PROVISIONS OF THE TEMPORAY DEWATERING SYSTEM.



9/23/2025

FOR PERMITTING PURPOSES

REV	DATE	DESCRIPTION	DWN BY
REVISIONS			

TEMPORARY DEWATERING SYSTEM DETAILS

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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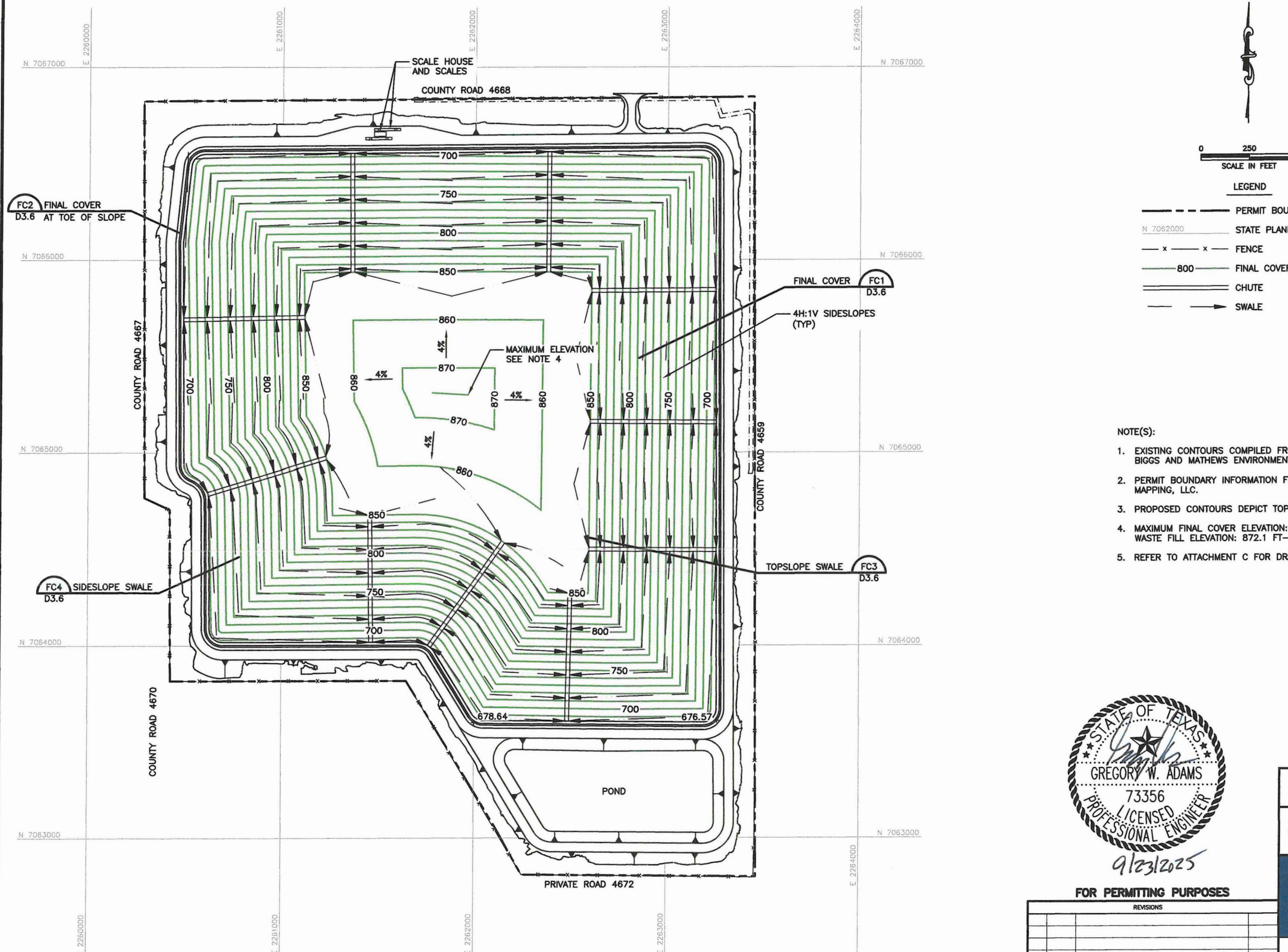
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D3.4



NOTE(S):

1. EXISTING CONTOURS COMPILED FROM SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.
3. PROPOSED CONTOURS DEPICT TOP OF FINAL COVER GRADES.
4. MAXIMUM FINAL COVER ELEVATION: 875.6 FT-MSL MAXIMUM WASTE FILL ELEVATION: 872.1 FT-MSL
5. REFER TO ATTACHMENT C FOR DRAINAGE FEATURES.

STATE OF TEXAS
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REV	DATE	DESCRIPTION	DWN BY

FINAL CONTOUR PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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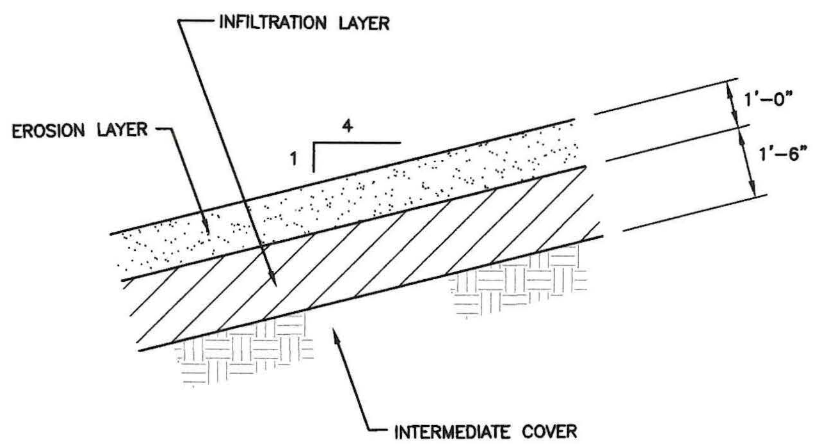
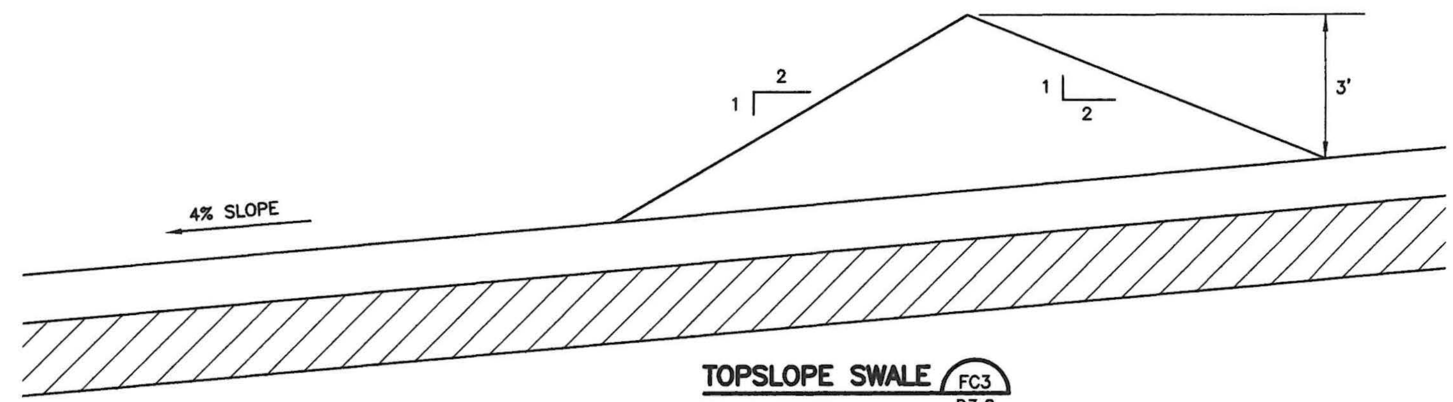
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D3.5



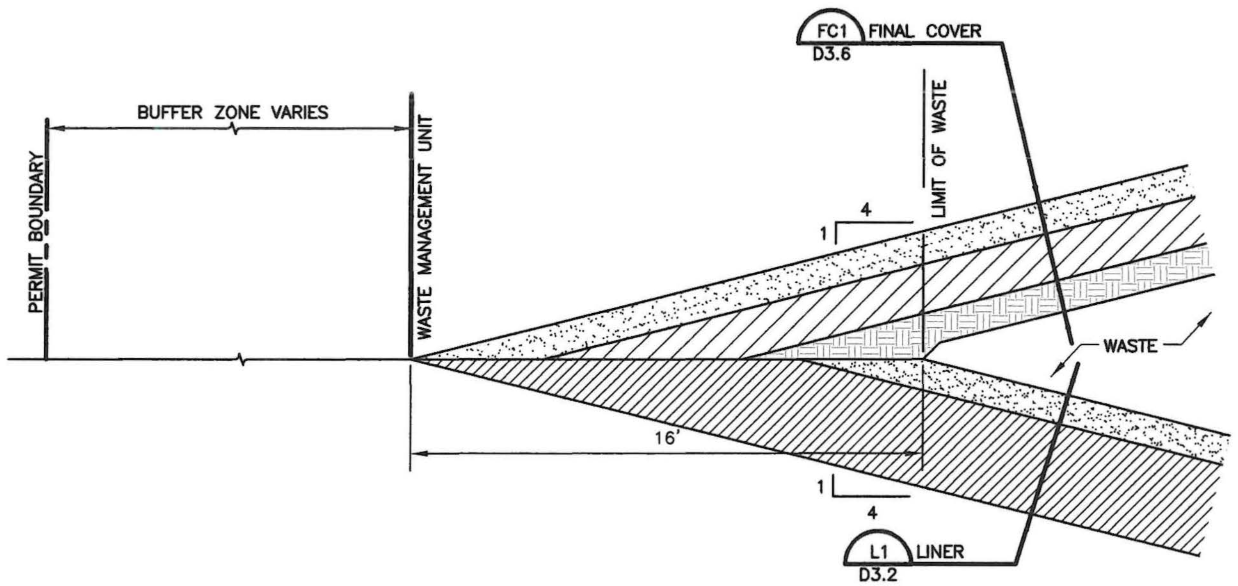
FINAL COVER FC1 D3.6

0 2 4
SCALE IN FEET



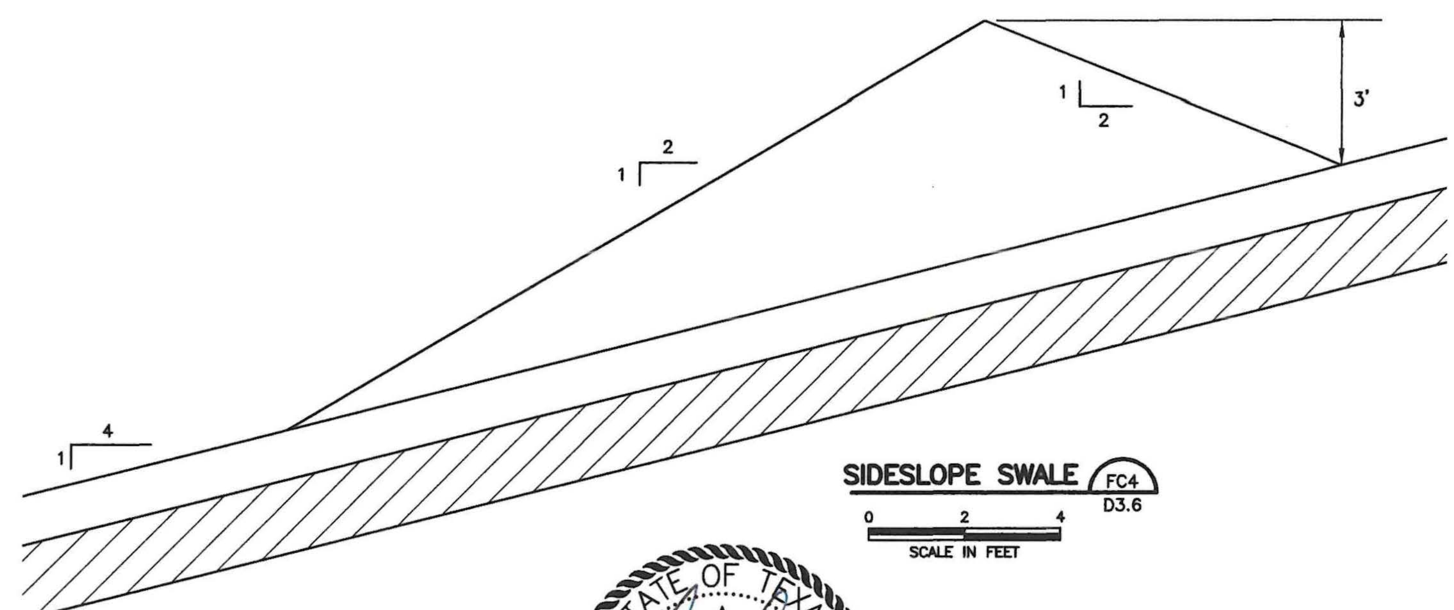
TOPSLOPE SWALE FC3 D3.6

0 2 4
SCALE IN FEET



FINAL COVER AT TOE OF SLOPE FC2 D3.6

NTS



SIDESLOPE SWALE FC4 D3.6

0 2 4
SCALE IN FEET

STATE OF TEXAS
GREGORY W. ADAMS
73356
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9/23/2025

FOR PERMITTING PURPOSES

REVISIONS		
REV	DATE	DESCRIPTION

FINAL COVER DETAILS

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

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1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D3.6

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D4
SITE LIFE

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
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Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

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Texas Board of Professional Engineers and Land Surveyors
Firm Registration No. F-256 And No. 10194895

Texas Board of Professional Geoscientists
Firm Registration No. 50222

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STATE OF TEXAS
9/23/2025

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

CONTENTS

1 SOLID WASTE GENERATION

The Chisholm Trail Disposal Landfill will accept waste generated in Wise County and surrounding Texas counties. The Chisholm Trail Disposal Landfill will initially receive approximately 750 tons of waste a per day. The facility will accept waste 6 days per week (312 days per year). The facility projects that the waste acceptance rate will increase 1 percent per year for the life of the facility.

2 SOLID WASTE COMPACTION

An airspace utilization factor (ratio of tons of waste accepted to in-place cubic yard volume of waste disposed plus weekly and intermediate cover material) of 0.7 was used to calculate the projected site life based on the total landfill capacity.

3 LANDFILL CAPACITY

The total landfill capacity is defined as the volume between the top of protective cover to the bottom of final cover, and was estimated using Civil 3D® computer software to be 39,481,000 cubic yards.

4 SITE LIFE CALCULATIONS

The proposed configuration of the disposal units will provide a site life of 78 years at the projected waste acceptance rate. See calculations below.

Initial Waste Acceptance = (750 $^{TON}/_{DAY}$)(312 $^{DAY}/_{YEAR}$) = 234,000 $^{TON}/_{YEAR}$
Initial Airspace Consumption = (234,000 $^{TON}/_{YEAR}$) / (0.7 $^{TON}/_{CY}$) = 334,286 $^{CY}/_{YEAR}$
Initial Available Airspace – 39,481,000 CY
Waste Acceptance Increase = 1%

Year	Annual Waste	Accumulated Waste (cy)	Remaining Capacity (cy)	Year	Annual Waste	Accumulated Waste (cy)	Remaining Capacity (cy)
1	334,286	334,286	39,146,714	41	497,706	16,839,737	22,641,263
2	337,629	671,915	38,809,085	42	502,683	17,342,420	22,138,580
3	341,005	1,012,920	38,468,080	43	507,710	17,850,130	21,630,870
4	344,415	1,357,335	38,123,665	44	512,787	18,362,917	21,118,083
5	347,859	1,705,195	37,775,805	45	517,915	18,880,833	20,600,167
6	351,338	2,056,533	37,424,467	46	523,094	19,403,927	20,077,073
7	354,851	2,411,384	37,069,616	47	528,325	19,932,252	19,548,748
8	358,400	2,769,784	36,711,216	48	533,609	20,465,861	19,015,139
9	361,984	3,131,768	36,349,232	49	538,945	21,004,805	18,476,195
10	365,604	3,497,371	35,983,629	50	544,334	21,549,139	17,931,861
11	369,260	3,866,631	35,614,369	51	549,777	22,098,917	17,382,083
12	372,952	4,239,583	35,241,417	52	555,275	22,654,192	16,826,808
13	376,682	4,616,265	34,864,735	53	560,828	23,215,020	16,265,980
14	380,449	4,996,714	34,484,286	54	566,436	23,781,456	15,699,544
15	384,253	5,380,967	34,100,033	55	572,101	24,353,557	15,127,443
16	388,096	5,769,062	33,711,938	56	577,822	24,931,378	14,549,622
17	391,977	6,161,039	33,319,961	57	583,600	25,514,978	13,966,022
18	395,896	6,556,936	32,924,064	58	589,436	26,104,414	13,376,586
19	399,855	6,956,791	32,524,209	59	595,330	26,699,744	12,781,256
20	403,854	7,360,645	32,120,355	60	601,283	27,301,027	12,179,973
21	407,892	7,768,537	31,712,463	61	607,296	27,908,324	11,572,676
22	411,971	8,180,509	31,300,491	62	613,369	28,521,693	10,959,307
23	416,091	8,596,600	30,884,400	63	619,503	29,141,196	10,339,804
24	420,252	9,016,852	30,464,148	64	625,698	29,766,894	9,714,106
25	424,455	9,441,306	30,039,694	65	631,955	30,398,849	9,082,151
26	428,699	9,870,005	29,610,995	66	638,274	31,037,123	8,443,877
27	432,986	10,302,991	29,178,009	67	644,657	31,681,780	7,799,220
28	437,316	10,740,307	28,740,693	68	651,104	32,332,884	7,148,116
29	441,689	11,181,996	28,299,004	69	657,615	32,990,499	6,490,501
30	446,106	11,628,102	27,852,898	70	664,191	33,654,690	5,826,310
31	450,567	12,078,669	27,402,331	71	670,833	34,325,523	5,155,477
32	455,073	12,533,742	26,947,258	72	677,541	35,003,064	4,477,936
33	459,623	12,993,365	26,487,635	73	684,317	35,687,381	3,793,619
34	464,220	13,457,585	26,023,415	74	691,160	36,378,541	3,102,459
35	468,862	13,926,447	25,554,553	75	698,071	37,076,612	2,404,388
36	473,550	14,399,997	25,081,003	76	705,052	37,781,664	1,699,336
37	478,286	14,878,283	24,602,717	77	712,103	38,493,767	987,233
38	483,069	15,361,352	24,119,648	78	719,224	39,212,990	268,010
39	487,900	15,849,252	23,631,748	79	726,416	39,939,406	-458,406
40	492,779	16,342,030	23,138,970				

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D5
GEOTECHNICAL DESIGN

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

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TEXAS BOARD OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS
FIRM REGISTRATION NO. F-256 AND NO. 10194895

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

GREGORY W. ADAMS
73356
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PROFESSIONAL ENGINEER
STATE OF TEXAS
9/23/2025

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

CONTENTS

1 SUBSURFACE CONDITIONS

30 TAC §330.337(e)

1.1 Subsurface Conditions

A field exploration was performed to characterize subsurface conditions at the site and is described in Attachment E Section 4. The field exploration included 34 borings and 20 piezometers that were drilled within the permit boundary. The borings were drilled in accordance with the approved boring plan and standard field exploration methods. Installation, abandonment, and plugging of borings was performed in accordance with TCEQ rules. The boring plan and logs are provided in Attachment E, Appendix E2.

The exploration identified seven geologic units which are described below. Generally Unit I consist of alluvium materiels (sands, silts and clays) that have been disturbed by sand mining operations. Sand has been mined from the site and the sandy, and silty clay overburden materials have been backfilled into the mining excavations. Augers were drilled through Unit I to refusal on the top of Units II or III. All Units below Unit I had to be drilled with a rock core due to the hardness and the materials. Units II through VII consist of layers of hard clay, hard sandy clay, cemented sand, limestone, shale, sandstone and siltstone. Detailed descriptions of each unit are included in Attachment E Section 4.

Site Stratigraphy

Geologic Unit	Description	Average Thickness (ft)
Unit I	Alluvium/Fill	31
Unit II	Limestone	5
Unit III	Sandstone, Sandstone with Silt, Sandy Clay	18
Unit IV	Limestone and Shale	14
Unit V	Sand, Sandstone, Sand with Silt, Sandy Clay	12
Unit VI	Limestone, Shale, Shale with Silt	14
Unit VII	Sandstone, Siltstone, Sand with Silt and Clay	12

The waste management unit will be excavated through Units I, II and will be founded in Units III and IV. Since the landfill will be excavated below the seasonal high water tables in Units I and III this foundation evaluation addresses stability, settlement and constucability of the waste management unit in accordance with 30 TAC 330.337(e).

1.2 Material Properties

Laboratory tests were performed to determine the geotechnical properties of the subsurface materials that will be encountered in the excavation and to evaluate the suitability of the materials for the proposed waste management unit design. The results of the laboratory tests are provided in Attachment E, Appendix E6 and the properties of the materials that will be encountered in the excavation are summarized below. These test results were reviewed along with the boring logs and cross sections to select the design parameters for the stability, settlement and constructability evaluations.

Average Material Properties

Unit	LL	PI	Minus No. 200 Sieve	Minus No. 4 Sieve	Moist %	Dry Wt pcf	Laboratory Permeability (cm/sec)
I	34	17	59	98	12.1	121.8	1.5 x 10-8
II	39	22	86		11.6	121.4	2.8 x 10-8
III	32	14	75		12.9	117.9	3.8 x 10-8
IV	34	14	99	100	1.3	139.4	2.6 x 10-9

1.3 Material Requirements

Soils will be required for construction of the compacted soil liner and protective cover components of the liner system, and for the infiltration unitand erosion unitcomponents of the final cover system. Soils will also be required for operational cover (weekly and intermediate) and general earthfill. Typical material requirements for the various landfill components are summarized in below.

Typical Material Requirements for Landfill Construction

Landfill Component	Classification	LL	PI	% - 200	Hydraulic Conductivity cm/sec
Soil Liner	SC, CL, CH, MH	30 min	15 min	30 min	1 x 10^{-7} max
Infiltration Layer	SC, CL, CH, MH	30 min	15 min	30 min	1 x 10^{-5} max
General Fill, Protective Cover, Operational Cover	SC, CL, CH, ML, CL-ML, MH	No large rocks, not mixed with waste			
Erosion Layer	SC, CL, CH, SM, ML, CL-ML	Suitable to support plant growth			

The soil liner and final cover infiltration unitmust be constructed from soils that can be compacted to form a low hydraulic conductivity barrier. The test results indicate that suitable materials are available in units I and III. General fill, protective cover, operational cover and erosion layer soils should not contain large rocks or be mixed with waste. Erosion unitmaterial must be capable of sustaining vegetation. The test results and boring logs indicate that any of the soil material excavated from the site will be suitable for use as general earthfill, operational and protective cover and that the surficial soils will be suitable for use as the final cover system erosion layer.

2 EARTHWORK

30 TAC §330.337(e)

2.1 Excavation

The cross sections in Attachment D2 show that the bottom of the excavation will average 40 to 50 feet below the surrounding ground surface. The excavation will encounter the materials identified in Units I through IV. The excavated materials should be visually classified and may be stockpiled separately according to the construction material properties outlined in Section 2.2. Prior to use, the soils must be tested for suitability in accordance with Attachment D7 and Attachment D8. Excavation and construction below the groundwater table is discussed in Section 4 and the stability of excavation slopes is discussed in Section 6.

2.2 Earthfill

General fill should consist of soils which are free of large rocks or deleterious materials. General fill should be spread in about 9-inch-thick loose lifts and be compacted to a minimum of 95 percent of maximum dry density as defined by the standard Proctor test (ASTM D698), within a range of two percentage points below to three percentage points above the optimum moisture content. A minimum of one standard Proctor test should be performed on each representative soil used as general fill material.

3 CONSTRUCTION BELOW THE GROUNDWATER TABLE

30 TAC §330.337

3.1 Groundwater Elevations

Groundwater may be encountered in the excavation where Units I and III are exposed in the subgrade. The highest recorded groundwater elevations in these units are included in Attachment D7, Appendix D7A.

3.2 Temporary Dewatering System

Areas where the liner is to be constructed below the highest groundwater elevations in Units I and III will be dewatered during and after construction by a temporary dewatering system. The temporary dewatering system will consist of a network of dewatering drains below the liner system. The dewatering drains may consist of prefabricated composite drains encased in sand-filled trenches or perforated pipes encased on porous media filled trenches. The trenches will gravity drain into open ditches and excavations beyond the lined areas or into closed sumps beneath the lined areas. Water in the open excavations and closed sumps will be pumped as needed into the perimeter drainage system. The temporary dewatering system will be operated until sufficient ballast has been placed to offset the potential hydrostatic forces.

The design procedures and typical details of the temporary dewatering system are provided in Attachment D7, Appendix D7B. Design and installation of the temporary dewatering system will be documented in the Soils and Liner Evaluation Report (SLER) in accordance with Attachment D7.

3.3 Hydrostatic Uplift

Liners constructed below the groundwater table may experience hydrostatic pressure. Resistance to uplift from hydrostatic forces will be provided by the weight of the protective cover, waste, weekly cover, intermediate cover, and final cover system. The temporary dewatering system will be operated to keep the groundwater lowered until sufficient ballast has been placed to offset the potential hydrostatic forces.

The ballast requirements for each lined area must be based on the highest recorded groundwater elevations as shown in Attachment D7, Appendix D7A. Ballast calculations provided in Appendix D7C show that the landfill components overlying the compacted clay liner will provide sufficient ballast to offset the potential hydrostatic forces with a minimum factor of safety of 1.5.

The highest recorded groundwater elevations must be updated before the construction of each lined area and be adjusted upward if necessary. The ballast design must be verified to be adequate for the design groundwater elevations prior to the construction of each lined area. Ballast calculation, placement, and documentation procedures are provided in Attachment D7, Appendix D7C.

Once the required ballast has been placed for each cell area, the facility will submit a Ballast Evaluation Report (BER) to the TCEQ. If the TCEQ does not provide a response within 14 days of the date of receipt of the BER, the facility will discontinue dewatering operations. Operational procedures for ballast placement are discussed in Part IV. Documentation requirements are discussed in Attachment D7.

4 SETTLEMENT AND HEAVE ANALYSIS

30 TAC §330.337(e)

4.1 Subgrade Heave

Heave or rebound occurs in cohesive soils after the removal of the overburden. Since the floor of the waste management unit will be founded within the hard sandstone in Unit III or the hard limestone and shale in Unit IV, subgrade heave will not occur.

4.2 Subgrade Settlement

Settlement occurs due to consolidation of cohesive soils from the weight of the landfill components. Since the floor of the waste management unit will be founded within the hard sandstone in Unit III and the hard limestone and shale in Unit IV, subgrade settlement will not occur.

4.3 Solid Waste Settlement

Consolidation and decomposition can produce settlement within the solid waste. Primary consolidation results from stress increase and occurs soon after load application and secondary consolidation results from the decomposition of solid waste. Due to the length of time that it will take to construct and fill the landfill, most of the consolidation in the waste will have occurred prior to construction of the final cover system. Minor settlement that occurs after the construction of the final cover system will be corrected by the addition of erosion unitmaterial in accordance with Attachment I.

5 SLOPE STABILITY ANALYSES

30 TAC §330.337(e)

Slope stability analyses were performed on representative sections to predict the stability of the excavation slope, interim waste slope, and final cover slope. The geometry of the sections was developed from the proposed excavation and final cover plans and from the boring logs. Conservative unit weights and strength parameters were selected for the types of materials that were identified in the subsurface investigation.

Summary of Material Weight and Strength Properties

Material	Description	Wet Weight (pcf)	Total Stress		Effective Stress	
			Cohesion (psf)	Friction (deg)	Cohesion (psf)	Friction (deg)
Unit I	Clayey Sand and Sandy Clay	120	500	10	300	15
Unit II	Limestone	140	5000	0	5000	0
Unit III	Sandstone, Sandstone with Silt, Hard Sandy Clay	130	1000	0	1000	0
Unit IV	Limestone and Shale	145	5000	0	5000	0
Waste	Demolition waste	65			250	23
Compacted Liner and Cover	Sandy Clay and Clay	125			300	15
Protective Cover and Erosion Layer	Silty and Clayey Sand	125			300	15

The excavation slope was analyzed for short-term conditions using total stress parameters and long-term conditions using effective stress parameters. The interim waste slope was analyzed for short-term conditions using total stress parameters. The final waste slope was analyzed for long-term conditions using effective stress parameters. Geostase, a computer program developed to evaluate the slope stability, was used to analyze the stability of the excavation slopes, interim waste slopes, and final waste slopes. The results of the stability analyses indicate that the proposed slopes are stable under the conditions analyzed. The results of the stability analyses are listed below. The recommended minimum factors of safety were selected from the Corps of Engineers "Design and Construction of Levees" manual (EM 1110-2-1913). The slope stability analyses are provided in Appendix D5B.

Summary of Slope Stability Analyses

Condition	Minimum Calculated Factor of Safety	Recommended Factor of Safety	Acceptable Factor of Safety
Excavated Slope			
Short Term	2.0	1.3	Yes
Long Term	2.0	1.5	Yes
Interim Waste Slope			
Circular Arc	1.5	1.3	Yes
Final Waste Slope			
Circular Arc	2.7	1.5	Yes

The slope stability analyses are only valid for the conditions that were analyzed. Any changes to the excavation plan, dewatering system, ballast system, liner system, final cover system, or landfill completion plan will necessitate that the slope stability analyses be revised to reflect the actual conditions. Waste must be placed and properly compacted in horizontal lifts less than 10 feet thick. Temporary construction slopes should not be steeper than the interim slopes and concentrated loadings such as heavy equipment and soil stockpiles should not be placed near the crest of slopes unless additional slope stability analyses are performed.

6 LINER CONSTRUCTION

30 TAC §330.331

The liner system will consist of a 3-foot-thick compacted soil liner overlain by a 1-foot-thick unitof protective soil cover. The liner details are provided in Attachment D3. The soil liner material must consist of relatively homogeneous cohesive materials, which are free of debris, particles greater than 1-inch diameter, frozen materials, foreign objects, and organic material. Suitable materials should be available from proposed excavations or on-site borrow sources to meet the requirements that are specified in Attachment D7. Preconstruction sampling must be performed on soils to be used as liner material. At a minimum, one liquid limit, plastic limit, percent passing the No. 200 sieve, standard Proctor (ASTM D 698), and hydraulic conductivity test should be performed for each borrow material type prior to use as liner material. Construction Quality Assurance testing and documentation are described in Attachment D7.

The soil liner material should be placed in loose lifts to produce a compacted lift thickness of approximately six inches. The material should be compacted to a minimum of 95 percent of the maximum dry density determined by standard Proctor (ASTM D 698) at a moisture content between optimum moisture and four percentage points above optimum moisture. Rocks within the liner should be less than one inch in diameter and should not total more than 10 percent by weight. The material should be processed to a maximum particle size of one inch or less before water is added to adjust the moisture content. Water used for the soil liner compaction must not be contaminated by waste or any objectionable material.

The soil liner must be compacted with a footed roller to achieve bonding between lifts, to reduce the clod size, and to achieve a blending of the soil matrix through kneading action. The compactor should weigh at least 40,000 pounds and make at least four passes across the area being compacted. A pass is defined as one pass of the compactor, front, and rear drums. The lift thickness shall be controlled to achieve total penetration into the top of the previously compacted lift; therefore, the lift thickness must not be greater than the prong length. Cleaning devices on the compaction roller must be in place and maintained to prevent the feet from becoming clogged to the point that they cannot achieve full penetration.

The protective cover should be constructed of soils that are free of debris, large rocks, frozen materials and foreign objects. Suitable protective cover materials should be available from proposed excavations or on-site borrow sources.

7 COVER CONSTRUCTION

30 TAC §§330.165, 330.457

The weekly and intermediate cover will be constructed of soils that are free of waste and debris. Suitable cover materials will be available from the proposed excavations or on-site borrow sources. Requirements for the placement of weekly, and intermediate cover are provided in Part IV.

The final cover system will consist of an 18-inch-thick compacted soil infiltration layer overlain by a 12-inch-thick erosion layer. The final cover system requirements are provided in Attachment D8 and the final cover system details are provided in Attachment D3. Construction Quality Assurance testing and documentation are described in Attachment D8.

The infiltration layer material must consist of relatively homogeneous cohesive materials that are free of debris, rock greater than one inch in diameter, plant materials, frozen materials, foreign objects, and organic material. The infiltration layer construction procedure should be the same as those outlined in Section 6 for liner construction.

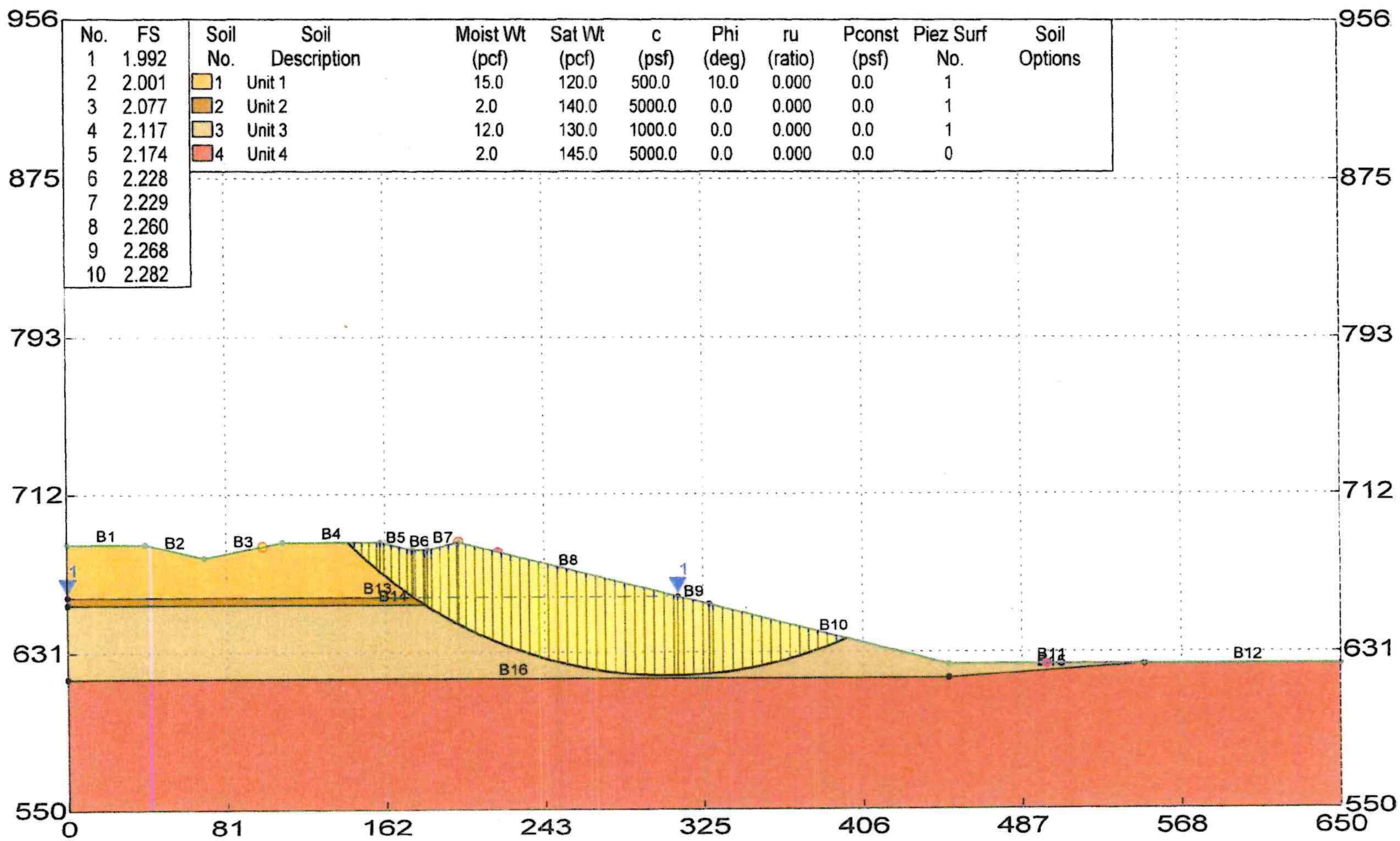
CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX D5A
STABILITY ANALYSES

Chisholm Trail Disposal Landfill
Short Term Excavation Slope

BME

\Short Term Excavation.gsd



GEOSTASE FS = 1.992

Simplified Janbu Method

GEOSTASE

Slope Stability Analysis

GEOSTASE® by GREGORY GEOTECHNICAL SOFTWARE

*** GEOSTASE(R) ***

** Current Version 4.30.27-Double Precision, November 2018 **

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SLOPE STABILITY ANALYSIS SOFTWARE
Simplified Bishop, Simplified Janbu, or General Equilibrium (GE) Options.
(Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)
Including Pier/Pile, Planar Reinf, Nail, Tieback, Line Loads
Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads
Nonlinear Undrained Shear Strength, Curved Strength Envelope,
Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown
2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.

****

Analysis Date: 11/ 4/ 2024
Analysis Time:
Analysis By: BME

Input File Name: O:\Green Group\Wise County\Solid Waste\Type IV\P\Stability\Short Term Excavation.gsd

Output File Name: O:\Green Group\Wise County\Solid Waste\Type IV\P\Stability\Short Term Excavation.OUT

Unit System: English

PROJECT: Chisholm Trail Disposal Landfill

DESCRIPTION: Short Term Excavation Slope

BOUNDARY DATA

12 Surface Boundaries

16 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	687.000	40.000	687.000	1
2	40.000	687.000	70.000	680.000	1
3	70.000	680.000	110.000	688.000	1
4	110.000	688.000	160.000	688.000	1
5	160.000	688.000	176.000	684.000	1
6	176.000	684.000	184.000	684.000	1
7	184.000	684.000	200.000	688.000	1
8	200.000	688.000	312.000	660.000	1
9	312.000	660.000	328.000	656.000	2
10	328.000	656.000	450.000	625.000	3
11	450.000	625.000	550.000	625.000	3
12	550.000	625.000	650.000	625.000	4
13	0.000	660.000	312.000	660.000	2
14	0.000	656.000	328.000	656.000	3
15	450.000	618.000	550.000	625.000	4
16	0.000	618.000	450.000	618.000	4

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 550.000(ft)

MOHR-COULOMB SOIL PARAMETERS

4 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	Pressure Constant (psf)	Water Surface No.	Water Option
1 Unit 1	15.0	120.0	500.00	10.00	0.000	0.0	1	0
2 Unit 2	2.0	140.0	5000.00	0.00	0.000	0.0	1	0
3 Unit 3	12.0	130.0	1000.00	0.00	0.000	0.0	1	0
4 Unit 4	2.0	145.0	5000.00	0.00	0.000	0.0	0	0

WATER SURFACE DATA

1 Water Surface(s) Defined

Unit Weight of Water = 62.400 (pcf)

Water Surface No. 1 Specified by 2 Coordinate Points
Pore Pressure Inclination Factor = 0.00

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	660.00
2	312.00	660.00

TRIAL FAILURE SURFACE DATA

Circular Trial Failure Surfaces Have Been Generated Using A Random Procedure.

1000 Trial Surfaces Have Been Generated.

1000 Surfaces Generated at Increments of 1.2012(in) Equally Spaced Within the Start Range

Along The Specified Surface Between X = 100.00(ft)
and X = 200.00(ft)

Each Surface Enters within a Range Between X = 220.00(ft)
and X = 500.00(ft)

Unless XCLUDE Lines Were Specified, The Minimum Elevation
To Which A Surface Extends Is Y = 550.00(ft)

Specified Maximum Radius = 5000.000(ft)

5.000(ft) Line Segments Were Used For Each Trial Failure Surface.

The Simplified Janbu Method Was Selected for FS Analysis.

Total Number of Trial Surfaces Attempted = 1000

WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 0 Iterations.

Number of Trial Surfaces with Non-Converged FS = 17

Number of Trial Surfaces With Valid FS = 983

Percentage of Trial Surfaces With Non-Converged and/or
Non-Valid FS Solutions of the Total Attempted = 1.7 %

Statistical Data On All Valid FS Values:
FS Max = 883.116 FS Min = 1.992 FS Ave = 34.048
Standard Deviation = 57.404 Coefficient of Variation = 168.60 %

Critical Surface is Sequence Number 435 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

BACK-CALCULATED CIRCULAR SURFACE PARAMETERS:

Circle Center At X = 307.061229(ft) ; Y = 848.807307(ft); and Radius = 229.411791(ft)

Circular Trial Failure Surface Generated With 57 Coordinate Points

Point No.	X-Coord. (ft)	Y-Coord. (ft)
1	143.443	688.000
2	146.987	684.472
3	150.606	681.023
4	154.300	677.653
5	158.066	674.364
6	161.904	671.159
7	165.810	668.037
8	169.783	665.002
9	173.821	662.054
10	177.923	659.194
11	182.086	656.425
12	186.308	653.747
13	190.588	651.162
14	194.923	648.670
15	199.311	646.274
16	203.751	643.974
17	208.240	641.771
18	212.775	639.666
19	217.355	637.661
20	221.978	635.756

21	226.642	633.953
22	231.343	632.251
23	236.081	630.652
24	240.852	629.157
25	245.655	627.767
26	250.486	626.481
27	255.345	625.301
28	260.229	624.227
29	265.134	623.259
30	270.060	622.399
31	275.003	621.647
32	279.961	621.002
33	284.932	620.465
34	289.914	620.037
35	294.903	619.718
36	299.899	619.507
37	304.898	619.406
38	309.898	619.413
39	314.897	619.529
40	319.891	619.755
41	324.880	620.089
42	329.861	620.531
43	334.830	621.082
44	339.787	621.742
45	344.727	622.509
46	349.650	623.383
47	354.553	624.365
48	359.433	625.453
49	364.288	626.648
50	369.116	627.948
51	373.915	629.353
52	378.682	630.862
53	383.415	632.474
54	388.111	634.190
55	392.769	636.007
56	397.386	637.926
57	398.024	638.207

Factor Of Safety For The Critical or Specified Surface = 1.992

Table 1 - Geometry Data on the 64 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length (ft)

1	3.54	1.76	145.22	686.24	688.00	-44.87	0.00	5.00
2	3.62	5.25	148.80	682.75	688.00	-43.62	0.00	5.00
3	3.69	8.66	152.45	679.34	688.00	-42.37	0.00	5.00
4	3.77	11.99	156.18	676.01	688.00	-41.13	0.00	5.00
5	1.93	14.44	159.03	673.56	688.00	-39.88	0.00	2.52
6	1.90	15.81	160.95	671.95	687.76	-39.88	-14.04	2.48
7	3.91	17.44	163.86	669.60	687.04	-38.63	-14.04	5.00
8	3.97	19.53	167.80	666.52	686.05	-37.38	-14.04	5.00
9	4.04	21.52	171.80	663.53	685.05	-36.13	-14.04	5.00
10	2.18	22.98	174.91	661.29	684.27	-34.88	-14.04	2.66
11	0.77	23.73	176.38	660.27	684.00	-34.88	0.00	0.94
12	1.16	24.40	177.35	659.60	684.00	-34.88	0.00	1.41
13	4.16	26.19	180.00	657.81	684.00	-33.63	0.00	5.00
14	0.67	27.79	182.42	656.21	684.00	-32.38	0.00	0.79
15	1.24	28.39	183.38	655.61	684.00	-32.38	0.00	1.47
16	2.31	29.81	185.15	654.48	684.29	-32.38	14.04	2.73
17	4.28	32.66	188.45	652.45	685.11	-31.14	14.04	5.00
18	4.34	36.27	192.76	649.92	686.19	-29.89	14.04	5.00
19	4.39	39.81	197.12	647.47	687.28	-28.64	14.04	5.00
20	0.69	41.82	199.66	646.10	687.91	-27.39	14.04	0.78
21	3.75	42.59	201.88	644.95	687.53	-27.39	-14.04	4.22
22	4.49	43.63	206.00	642.87	686.50	-26.14	-14.04	5.00
23	4.54	44.65	210.51	640.72	685.37	-24.89	-14.04	5.00
24	4.58	45.57	215.07	638.66	684.23	-23.64	-14.04	5.00
25	4.62	46.37	219.67	636.71	683.08	-22.39	-14.04	

5.00							
26	4.66	47.07	224.31	634.85	681.92	-21.15	-14.04
5.00							
27	4.70	47.65	228.99	633.10	680.75	-19.90	-14.04
5.00							
28	4.74	48.12	233.71	631.45	679.57	-18.65	-14.04
5.00							
29	4.77	48.48	238.47	629.90	678.38	-17.40	-14.04
5.00							
30	4.80	48.72	243.25	628.46	677.19	-16.15	-14.04
5.00							
31	4.83	48.86	248.07	627.12	675.98	-14.90	-14.04
5.00							
32	4.86	48.88	252.92	625.89	674.77	-13.65	-14.04
5.00							
33	4.88	48.79	257.79	624.76	673.55	-12.40	-14.04
5.00							
34	4.91	48.59	262.68	623.74	672.33	-11.15	-14.04
5.00							
35	4.93	48.27	267.60	622.83	671.10	-9.91	-14.04
5.00							
36	4.94	47.84	272.53	622.02	669.87	-8.66	-14.04
5.00							
37	4.96	47.31	277.48	621.32	668.63	-7.41	-14.04
5.00							
38	4.97	46.65	282.45	620.73	667.39	-6.16	-14.04
5.00							
39	4.98	45.89	287.42	620.25	666.14	-4.91	-14.04
5.00							
40	4.99	45.02	292.41	619.88	664.90	-3.66	-14.04
5.00							
41	5.00	44.04	297.40	619.61	663.65	-2.41	-14.04
5.00							
42	5.00	42.94	302.40	619.46	662.40	-1.16	-14.04
5.00							
43	5.00	41.74	307.40	619.41	661.15	0.08	-14.04
5.00							
44	2.10	40.83	310.95	619.44	660.26	1.33	-14.04
2.10							
45	2.90	40.14	313.45	619.50	659.64	1.33	-14.04
2.90							
46	4.99	39.01	317.39	619.64	658.65	2.58	-14.04
5.00							
47	4.99	37.48	322.39	619.92	657.40	3.83	-14.04
5.00							
48	3.12	36.16	326.44	620.23	656.39	5.08	-14.04
3.13							
49	1.86	35.32	328.93	620.45	655.76	5.08	-14.26
1.87							
50	4.97	34.09	332.35	620.81	654.90	6.33	-14.26

								5.00
51	4.96	32.22	337.31	621.41	653.63	7.58	-14.26	5.00
52	4.94	30.25	342.26	622.13	652.38	8.83	-14.26	5.00
53	4.92	28.18	347.19	622.95	651.12	10.07	-14.26	5.00
54	4.90	26.00	352.10	623.87	649.88	11.32	-14.26	5.00
55	4.88	23.72	356.99	624.91	648.63	12.57	-14.26	5.00
56	4.86	21.35	361.86	626.05	647.40	13.82	-14.26	5.00
57	4.83	18.87	366.70	627.30	646.17	15.07	-14.26	5.00
58	4.80	16.29	371.52	628.65	644.94	16.32	-14.26	5.00
59	4.77	13.62	376.30	630.11	643.73	17.57	-14.26	5.00
60	4.73	10.85	381.05	631.67	642.52	18.82	-14.26	5.00
61	4.70	7.99	385.76	633.33	641.32	20.06	-14.26	5.00
62	4.66	5.04	390.44	635.10	640.13	21.31	-14.26	5.00
63	4.62	1.99	395.08	636.97	638.96	22.56	-14.26	5.00
64	0.64	0.22	397.71	638.07	638.29	23.81	-14.26	0.70

Table 2 - Force Data On The 64 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force Top (lbs)	Ualpha Force Bot (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Distributed Load (lbs)
1	93.7	0.0	0.0	0.0	0.0	0.0
2	285.2	0.0	0.0	0.0	0.0	0.0
3	479.9	0.0	0.0	0.0	0.0	0.0
4	677.5	0.0	0.0	0.0	0.0	0.0
5	418.9	0.0	0.0	0.0	0.0	0.0
6	451.4	0.0	0.0	0.0	0.0	0.0
7	1021.7	0.0	0.0	0.0	0.0	0.0
8	1164.0	0.0	0.0	0.0	0.0	0.0
9	1303.7	0.0	0.0	0.0	0.0	0.0
10	751.0	0.0	0.0	0.0	0.0	0.0
11	273.1	0.0	0.0	0.0	0.0	0.0

12	481.2	0.0	35.4	0.0	0.0	0.0
13	2775.2	0.0	683.4	0.0	0.0	0.0
14	596.6	0.0	187.6	0.0	0.0	0.0
15	1208.2	0.0	403.9	0.0	0.0	0.0
16	2590.0	0.0	941.7	0.0	0.0	0.0
17	5981.4	0.0	2354.2	0.0	0.0	0.0
18	7559.3	0.0	3146.2	0.0	0.0	0.0
19	9118.1	0.0	3908.7	0.0	0.0	0.0
20	1560.5	0.0	672.9	0.0	0.0	0.0
21	9039.9	0.0	3968.5	0.0	0.0	0.0
22	11958.1	0.0	5343.8	0.0	0.0	0.0
23	13276.2	0.0	6015.8	0.0	0.0	0.0
24	14552.6	0.0	6656.9	0.0	0.0	0.0
25	15783.1	0.0	7266.8	0.0	0.0	0.0
26	16964.0	0.0	7845.4	0.0	0.0	0.0
27	18091.6	0.0	8392.2	0.0	0.0	0.0
28	19162.5	0.0	8907.0	0.0	0.0	0.0
29	20173.3	0.0	9389.7	0.0	0.0	0.0
30	21121.0	0.0	9839.9	0.0	0.0	0.0
31	22002.6	0.0	10257.4	0.0	0.0	0.0
32	22815.5	0.0	10642.1	0.0	0.0	0.0
33	23557.1	0.0	10993.7	0.0	0.0	0.0
34	24225.3	0.0	11312.2	0.0	0.0	0.0
35	24817.9	0.0	11597.3	0.0	0.0	0.0
36	25333.2	0.0	11848.9	0.0	0.0	0.0
37	25769.6	0.0	12066.9	0.0	0.0	0.0
38	26125.6	0.0	12251.1	0.0	0.0	0.0
39	26400.2	0.0	12401.6	0.0	0.0	0.0
40	26592.5	0.0	12518.2	0.0	0.0	0.0
41	26701.8	0.0	12600.9	0.0	0.0	0.0
42	26727.8	0.0	12649.6	0.0	0.0	0.0
43	26670.2	0.0	12664.3	0.0	0.0	0.0
44	11177.1	0.0	5322.1	0.0	0.0	0.0
45	1289.9	0.0	0.0	0.0	0.0	0.0
46	2205.8	0.0	0.0	0.0	0.0	0.0
47	2173.9	0.0	0.0	0.0	0.0	0.0
48	1341.6	0.0	0.0	0.0	0.0	0.0
49	788.5	0.0	0.0	0.0	0.0	0.0
50	2032.9	0.0	0.0	0.0	0.0	0.0
51	1916.5	0.0	0.0	0.0	0.0	0.0
52	1793.6	0.0	0.0	0.0	0.0	0.0
53	1664.6	0.0	0.0	0.0	0.0	0.0
54	1529.7	0.0	0.0	0.0	0.0	0.0
55	1389.3	0.0	0.0	0.0	0.0	0.0
56	1243.6	0.0	0.0	0.0	0.0	0.0
57	1093.1	0.0	0.0	0.0	0.0	0.0
58	938.2	0.0	0.0	0.0	0.0	0.0
59	779.1	0.0	0.0	0.0	0.0	0.0
60	616.4	0.0	0.0	0.0	0.0	0.0
61	450.3	0.0	0.0	0.0	0.0	0.0

62	281.5	0.0	0.0	0.0	0.0	0.0
63	110.2	0.0	0.0	0.0	0.0	0.0
64	1.7	0.0	0.0	0.0	0.0	0.0

TOTAL WEIGHT OF SLIDING MASS = 561469.82(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 324707.67(lbs)

TOTAL AREA OF SLIDING MASS = 8409.90(ft2)

TABLE 2A - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 64 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	1	500.00	10.00	
2	1	500.00	10.00	
3	1	500.00	10.00	
4	1	500.00	10.00	
5	1	500.00	10.00	
6	1	500.00	10.00	
7	1	500.00	10.00	
8	1	500.00	10.00	
9	1	500.00	10.00	
10	1	500.00	10.00	
11	1	500.00	10.00	
12	2	5000.00	0.00	
13	2	5000.00	0.00	
14	2	5000.00	0.00	
15	3	1000.00	0.00	
16	3	1000.00	0.00	
17	3	1000.00	0.00	
18	3	1000.00	0.00	
19	3	1000.00	0.00	
20	3	1000.00	0.00	
21	3	1000.00	0.00	
22	3	1000.00	0.00	
23	3	1000.00	0.00	
24	3	1000.00	0.00	
25	3	1000.00	0.00	
26	3	1000.00	0.00	
27	3	1000.00	0.00	
28	3	1000.00	0.00	
29	3	1000.00	0.00	
30	3	1000.00	0.00	
31	3	1000.00	0.00	
32	3	1000.00	0.00	
33	3	1000.00	0.00	
34	3	1000.00	0.00	
35	3	1000.00	0.00	

36	3	1000.00	0.00
37	3	1000.00	0.00
38	3	1000.00	0.00
39	3	1000.00	0.00
40	3	1000.00	0.00
41	3	1000.00	0.00
42	3	1000.00	0.00
43	3	1000.00	0.00
44	3	1000.00	0.00
45	3	1000.00	0.00
46	3	1000.00	0.00
47	3	1000.00	0.00
48	3	1000.00	0.00
49	3	1000.00	0.00
50	3	1000.00	0.00
51	3	1000.00	0.00
52	3	1000.00	0.00
53	3	1000.00	0.00
54	3	1000.00	0.00
55	3	1000.00	0.00
56	3	1000.00	0.00
57	3	1000.00	0.00
58	3	1000.00	0.00
59	3	1000.00	0.00
60	3	1000.00	0.00
61	3	1000.00	0.00
62	3	1000.00	0.00
63	3	1000.00	0.00
64	3	1000.00	0.00

SOIL OPTIONS: A = ANISOTROPIC, C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C),
F = FIBER-REINFORCED SOIL (FRS), N = NONLINEAR UNDRAINED SHEAR STRENGTH,
R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH
NOTE: Phi and C in Table 4 are modified values based on specified
Soil Options (if any).

TABLE 3 - Effective and Base Shear Stress Data on the 64 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Stress (psf)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-44.87	145.22	5.00	24.31	4.29	2.15
2	-43.62	148.80	5.00	72.66	12.81	6.43

3	-42.37	152.45	5.00	120.22	21.20	10.64
4	-41.13	156.18	5.00	166.97	29.44	14.78
5	-39.88	159.03	2.52	201.73	35.57	17.85
6	-39.88	160.95	2.48	220.80	38.93	19.54
7	-38.63	163.86	5.00	244.29	43.07	21.62
8	-37.38	167.80	5.00	94.82	516.72	259.34
9	-36.13	171.80	5.00	131.14	523.12	262.55
10	-34.88	174.91	2.66	159.85	528.19	265.09
11	-34.88	176.38	0.94	170.51	530.07	266.04
12	-34.88	177.35	1.41	391.26	0.00	0.00
13	-33.63	180.00	5.00	529.97	0.00	0.00
14	-32.38	182.42	0.79	653.91	0.00	0.00
15	-32.38	183.38	1.47	378.72	1000.00	501.89
16	-32.38	185.15	2.73	459.20	1000.00	501.89
17	-31.14	188.45	5.00	623.55	1000.00	501.89
18	-29.89	192.76	5.00	826.04	1000.00	501.89
19	-28.64	197.12	5.00	1021.98	1000.00	501.89
20	-27.39	199.66	0.78	1138.59	1000.00	501.89
21	-27.39	201.88	4.22	1210.59	1000.00	501.89
22	-26.14	206.00	5.00	1349.01	1000.00	501.89
23	-24.89	210.51	5.00	1491.11	1000.00	501.89
24	-23.64	215.07	5.00	1626.09	1000.00	501.89
25	-22.39	219.67	5.00	1753.91	1000.00	501.89
26	-21.15	224.31	5.00	1874.53	1000.00	501.89
27	-19.90	228.99	5.00	1987.92	1000.00	501.89

28	-18.65	233.71	5.00	2094.05	1000.00	501.89
29	-17.40	238.47	5.00	2192.89	1000.00	501.89
30	-16.15	243.25	5.00	2284.42	1000.00	501.89
31	-14.90	248.07	5.00	2368.61	1000.00	501.89
32	-13.65	252.92	5.00	2445.43	1000.00	501.89
33	-12.40	257.79	5.00	2514.88	1000.00	501.89
34	-11.15	262.68	5.00	2576.94	1000.00	501.89
35	-9.91	267.60	5.00	2631.60	1000.00	501.89
36	-8.66	272.53	5.00	2678.84	1000.00	501.89
37	-7.41	277.48	5.00	2718.66	1000.00	501.89
38	-6.16	282.45	5.00	2751.06	1000.00	501.89
39	-4.91	287.42	5.00	2776.05	1000.00	501.89
40	-3.66	292.41	5.00	2793.62	1000.00	501.89
41	-2.41	297.40	5.00	2803.78	1000.00	501.89
42	-1.16	302.40	5.00	2806.54	1000.00	501.89
43	0.08	307.40	5.00	2801.92	1000.00	501.89
44	1.33	310.95	2.10	2797.64	1000.00	501.89
45	1.33	313.45	2.90	457.01	1000.00	501.89
46	2.58	317.39	5.00	464.23	1000.00	501.89
47	3.83	322.39	5.00	469.35	1000.00	501.89
48	5.08	326.44	3.13	474.67	1000.00	501.89
49	5.08	328.93	1.87	468.39	1000.00	501.89
50	6.33	332.35	5.00	464.73	1000.00	501.89
51	7.58	337.31	5.00	453.44	1000.00	501.89
52	8.83	342.26	5.00	440.96	1000.00	501.89

53	10.07	347.19	5.00	427.31	1000.00	501.89
54	11.32	352.10	5.00	412.53	1000.00	501.89
55	12.57	356.99	5.00	396.62	1000.00	501.89
56	13.82	361.86	5.00	379.63	1000.00	501.89
57	15.07	366.70	5.00	361.56	1000.00	501.89
58	16.32	371.52	5.00	342.46	1000.00	501.89
59	17.57	376.30	5.00	322.35	1000.00	501.89
60	18.82	381.05	5.00	301.26	1000.00	501.89
61	20.06	385.76	5.00	279.22	1000.00	501.89
62	21.31	390.44	5.00	256.26	1000.00	501.89
63	22.56	395.08	5.00	232.42	1000.00	501.89
64	23.81	397.71	0.70	224.16	1000.00	501.89

Table 4 - Base Force Data on the 64 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force (lbs)
1	-44.87	145.22	5.00	121.57	21.44	10.76
2	-43.62	148.80	5.00	363.29	64.06	32.15
3	-42.37	152.45	5.00	601.12	105.99	53.20
4	-41.13	156.18	5.00	834.84	147.20	73.88
5	-39.88	159.03	2.52	508.27	89.62	44.98
6	-39.88	160.95	2.48	547.68	96.57	48.47
7	-38.63	163.86	5.00	1221.45	215.37	108.09

8	-37.38	167.80	5.00	474.10	2583.60	1296.69
9	-36.13	171.80	5.00	655.68	2615.61	1312.76
10	-34.88	174.91	2.66	424.55	1402.85	704.08
11	-34.88	176.38	0.94	159.48	495.79	248.83
12	-34.88	177.35	1.41	551.16	0.00	0.00
13	-33.63	180.00	5.00	2649.83	0.00	0.00
14	-32.38	182.42	0.79	518.93	0.00	0.00
15	-32.38	183.38	1.47	557.87	1473.03	739.30
16	-32.38	185.15	2.73	1255.17	2733.39	1371.87
17	-31.14	188.45	5.00	3117.75	5000.00	2509.46
18	-29.89	192.76	5.00	4130.19	5000.00	2509.46
19	-28.64	197.12	5.00	5109.88	5000.00	2509.46
20	-27.39	199.66	0.78	882.99	775.51	389.22
21	-27.39	201.88	4.22	5114.13	4224.49	2120.24
22	-26.14	206.00	5.00	6745.04	5000.00	2509.46
23	-24.89	210.51	5.00	7455.55	5000.00	2509.46
24	-23.64	215.07	5.00	8130.44	5000.00	2509.46
25	-22.39	219.67	5.00	8769.53	5000.00	2509.46
26	-21.15	224.31	5.00	9372.64	5000.00	2509.46
27	-19.90	228.99	5.00	9939.60	5000.00	2509.46
28	-18.65	233.71	5.00	10470.26	5000.00	2509.46
29	-17.40	238.47	5.00	10964.46	5000.00	2509.46
30	-16.15	243.25	5.00	11422.09	5000.00	2509.46
31	-14.90	248.07	5.00	11843.03	5000.00	2509.46
32	-13.65	252.92	5.00	12227.17	5000.00	2509.46

33	-12.40	257.79	5.00	12574.42	5000.00	2509.46
34	-11.15	262.68	5.00	12884.71	5000.00	2509.46
35	-9.91	267.60	5.00	13157.98	5000.00	2509.46
36	-8.66	272.53	5.00	13394.19	5000.00	2509.46
37	-7.41	277.48	5.00	13593.31	5000.00	2509.46
38	-6.16	282.45	5.00	13755.32	5000.00	2509.46
39	-4.91	287.42	5.00	13880.24	5000.00	2509.46
40	-3.66	292.41	5.00	13968.08	5000.00	2509.46
41	-2.41	297.40	5.00	14018.88	5000.00	2509.46
42	-1.16	302.40	5.00	14032.70	5000.00	2509.46
43	0.08	307.40	5.00	14009.60	5000.00	2509.46
44	1.33	310.95	2.10	5882.56	2102.68	1055.32
45	1.33	313.45	2.90	1324.09	2897.32	1454.14
46	2.58	317.39	5.00	2321.16	5000.00	2509.46
47	3.83	322.39	5.00	2346.77	5000.00	2509.46
48	5.08	326.44	3.13	1486.66	3132.01	1571.93
49	5.08	328.93	1.87	874.95	1867.99	937.53
50	6.33	332.35	5.00	2323.66	5000.00	2509.46
51	7.58	337.31	5.00	2267.19	5000.00	2509.46
52	8.83	342.26	5.00	2204.80	5000.00	2509.46
53	10.07	347.19	5.00	2136.57	5000.00	2509.46
54	11.32	352.10	5.00	2062.63	5000.00	2509.46
55	12.57	356.99	5.00	1983.11	5000.00	2509.46
56	13.82	361.86	5.00	1898.13	5000.00	2509.46
57	15.07	366.70	5.00	1807.81	5000.00	2509.46

58	16.32	371.52	5.00	1712.30	5000.00	2509.46
59	17.57	376.30	5.00	1611.75	5000.00	2509.46
60	18.82	381.05	5.00	1506.29	5000.00	2509.46
61	20.06	385.76	5.00	1396.09	5000.00	2509.46
62	21.31	390.44	5.00	1281.30	5000.00	2509.46
63	22.56	395.08	5.00	1162.10	5000.00	2509.46
64	23.81	397.71	0.70	156.26	697.11	349.88

Sum of the Resisting Forces = 221553.14 (lbs)

Average Available Shear Strength = 803.61(psf)

Sum of the Driving Forces = -111195.76 (lbs)

Average Mobilized Shear Stress = -403.33(psf)

Total length of the failure surface = 275.70(ft)

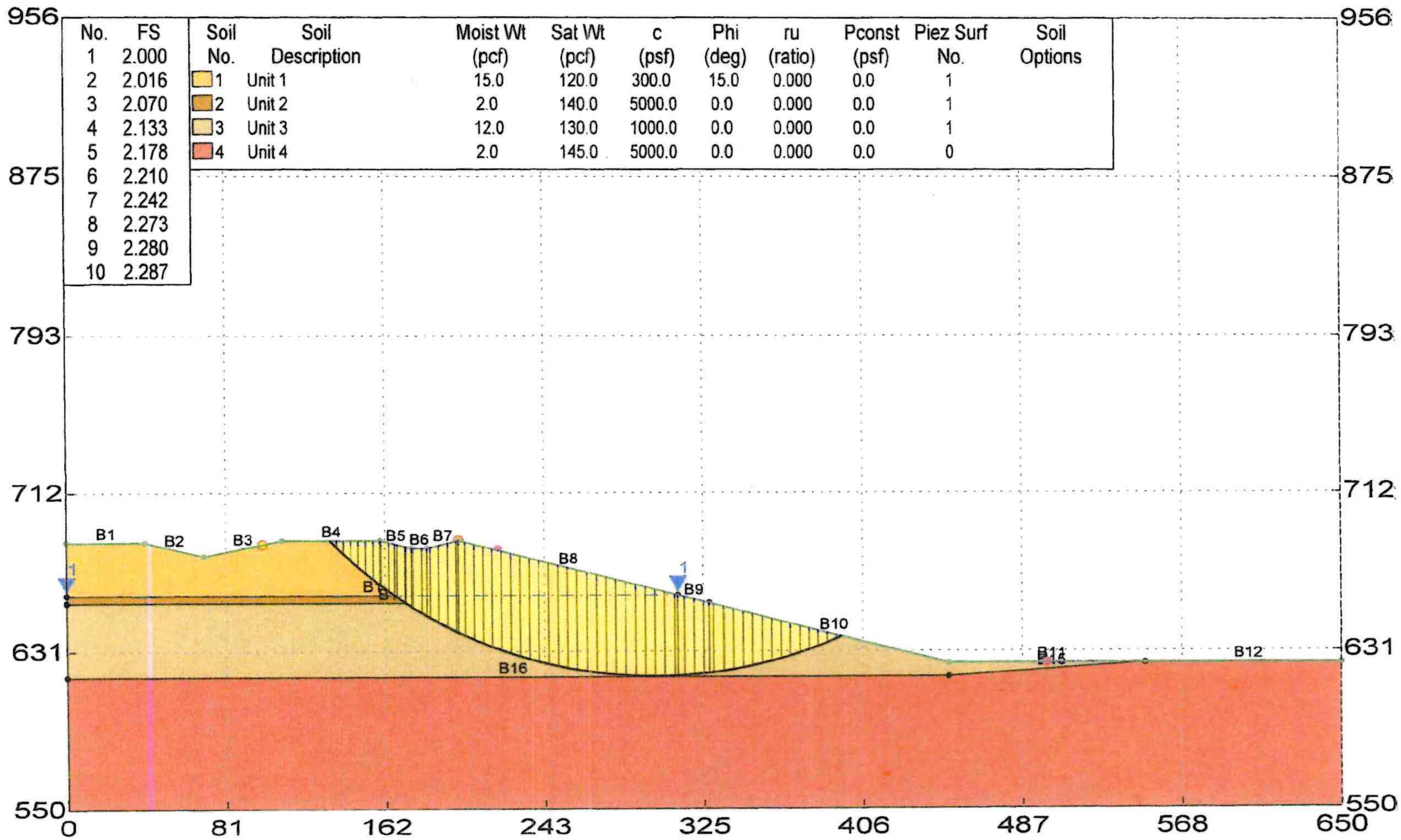
Factor of Safety Balance Check: FS = 1.99246

**** END OF GEOSTASE OUTPUT ****

Chisholm Trail Disposal Landfill
Long Term Excavation Slope

BME

\Long Term Term Excavation.gsd



No.	FS
1	2.000
2	2.016
3	2.070
4	2.133
5	2.178
6	2.210
7	2.242
8	2.273
9	2.280
10	2.287

Soil No.	Soil Description	Moist Wt (pcf)	Sat Wt (pcf)	c (psf)	Phi (deg)	ru (ratio)	Pconst (psf)	Piez Surf No.	Soil Options
1	Unit 1	15.0	120.0	300.0	15.0	0.000	0.0	1	
2	Unit 2	2.0	140.0	5000.0	0.0	0.000	0.0	1	
3	Unit 3	12.0	130.0	1000.0	0.0	0.000	0.0	1	
4	Unit 4	2.0	145.0	5000.0	0.0	0.000	0.0	0	

GEOSTASE FS = 2.000

Simplified Janbu Method

GEOSTASE Slope Stability Analysis

GEOSTASE® by GREGORY GEOTECHNICAL SOFTWARE

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                    ***  GEOSTASE(R)  ***

      ** GEOSTASE(R) (c)Copyright by Garry H. Gregory, Ph.D., P.E.,D.GE **

        ** Current Version 4.30.27-Double Precision, November 2018 **
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*********************************************************************************
                     SLOPE STABILITY ANALYSIS SOFTWARE
         Simplified Bishop, Simplified Janbu, or General Equilibrium (GE)
Options.
            (Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)
            Including Pier/Pile, Planar Reinf,  Nail, Tieback, Line Loads
            Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads
            Nonlinear Undrained Shear Strength, Curved Strength Envelope,
            Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown
            2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.

*********************************************************************************


          Analysis Date:            11/  4/ 2024
          Analysis Time:
          Analysis By:              BME


          Input File Name:          O:\Green Group\Wise County\Solid Waste\Type
IV\P\Stability\Long Term Term Excavation.gsd


          Output File Name:         O:\Green Group\Wise County\Solid Waste\Type
IV\P\Stability\Long Term Term Excavation.OUT


          Unit System:              English


          PROJECT: Chisholm Trail Disposal Landfill


          DESCRIPTION: Long Term Excavation Slope


          BOUNDARY DATA

             12 Surface Boundaries
```

16 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	687.000	40.000	687.000	1
2	40.000	687.000	70.000	680.000	1
3	70.000	680.000	110.000	688.000	1
4	110.000	688.000	160.000	688.000	1
5	160.000	688.000	176.000	684.000	1
6	176.000	684.000	184.000	684.000	1
7	184.000	684.000	200.000	688.000	1
8	200.000	688.000	312.000	660.000	1
9	312.000	660.000	328.000	656.000	2
10	328.000	656.000	450.000	625.000	3
11	450.000	625.000	550.000	625.000	3
12	550.000	625.000	650.000	625.000	4
13	0.000	660.000	312.000	660.000	2
14	0.000	656.000	328.000	656.000	3
15	450.000	618.000	550.000	625.000	4
16	0.000	618.000	450.000	618.000	4

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 550.000(ft)

MOHR-COULOMB SOIL PARAMETERS

4 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	Pressure Constant (psf)	Water Surface No.	Water Option
1 Unit 1	15.0	120.0	300.00	15.00	0.000	0.0	1	0
2 Unit 2	2.0	140.0	5000.00	0.00	0.000	0.0	1	0
3 Unit 3	12.0	130.0	1000.00	0.00	0.000	0.0	1	0
4 Unit 4	2.0	145.0	5000.00	0.00	0.000	0.0	0	0

WATER SURFACE DATA

1 Water Surface(s) Defined

Unit Weight of Water = 62.400 (pcf)

Water Surface No. 1 Specified by 2 Coordinate Points
Pore Pressure Inclination Factor = 0.00

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	660.00
2	312.00	660.00

TRIAL FAILURE SURFACE DATA

Circular Trial Failure Surfaces Have Been Generated Using A Random Procedure.

1000 Trial Surfaces Have Been Generated.

1000 Surfaces Generated at Increments of 1.2012(in) Equally Spaced Within the Start Range

Along The Specified Surface Between X = 100.00(ft)
and X = 200.00(ft)

Each Surface Enters within a Range Between X = 220.00(ft)
and X = 500.00(ft)

Unless XCLUDE Lines Were Specified, The Minimum Elevation
To Which A Surface Extends Is Y = 550.00(ft)

Specified Maximum Radius = 5000.000(ft)

5.000(ft) Line Segments Were Used For Each Trial Failure Surface.

The Simplified Janbu Method Was Selected for FS Analysis.

Total Number of Trial Surfaces Attempted = 1000

WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 0 Iterations.

Number of Trial Surfaces with Non-Converged FS = 12

Number of Trial Surfaces With Valid FS = 988

Percentage of Trial Surfaces With Non-Converged and/or
Non-Valid FS Solutions of the Total Attempted = 1.2 %

Statistical Data On All Valid FS Values:
FS Max = 851.460 FS Min = 2.000 FS Ave = 27.176
Standard Deviation = 48.893 Coefficient of Variation = 179.91 %

Critical Surface is Sequence Number 343 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

BACK-CALCULATED CIRCULAR SURFACE PARAMETERS:

Circle Center At X = 300.118985(ft) ; Y = 850.604843(ft); and Radius = 232.288798(ft)

Circular Trial Failure Surface Generated With 58 Coordinate Points

Point No.	X-Coord. (ft)	Y-Coord. (ft)
1	134.234	688.000
2	137.773	684.467
3	141.386	681.011
4	145.073	677.634
5	148.832	674.337
6	152.661	671.122
7	156.558	667.989
8	160.522	664.942
9	164.551	661.980
10	168.642	659.106
11	172.794	656.320
12	177.005	653.625
13	181.274	651.021
14	185.597	648.509
15	189.973	646.091
16	194.401	643.767
17	198.877	641.540
18	203.400	639.409
19	207.968	637.376
20	212.579	635.442

21	217.231	633.608
22	221.920	631.874
23	226.646	630.242
24	231.406	628.711
25	236.198	627.284
26	241.020	625.960
27	245.869	624.740
28	250.743	623.625
29	255.640	622.614
30	260.557	621.710
31	265.493	620.911
32	270.445	620.219
33	275.410	619.634
34	280.387	619.156
35	285.374	618.785
36	290.367	618.521
37	295.364	618.365
38	300.364	618.316
39	305.364	618.375
40	310.361	618.542
41	315.353	618.816
42	320.339	619.198
43	325.315	619.687
44	330.279	620.282
45	335.230	620.985
46	340.164	621.794
47	345.079	622.709
48	349.974	623.729
49	354.846	624.855
50	359.692	626.085
51	364.511	627.419
52	369.300	628.857
53	374.056	630.397
54	378.779	632.040
55	383.465	633.783
56	388.113	635.628
57	392.719	637.571
58	395.546	638.837

Factor Of Safety For The Critical or Specified Surface = 2.000

Table 1 - Geometry Data on the 65 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length

(ft)

1	3.54	1.77	136.00	686.23	688.00	-44.96	0.00	5.00
2	3.61	5.26	139.58	682.74	688.00	-43.72	0.00	5.00
3	3.69	8.68	143.23	679.32	688.00	-42.49	0.00	5.00
4	3.76	12.01	146.95	675.99	688.00	-41.26	0.00	5.00
5	3.83	15.27	150.75	672.73	688.00	-40.02	0.00	5.00
6	3.90	18.44	154.61	669.56	688.00	-38.79	0.00	5.00
7	3.44	21.33	158.28	666.67	688.00	-37.56	0.00	4.34
8	0.52	22.79	160.26	665.14	687.93	-37.56	-14.04	0.66
9	4.03	23.90	162.54	663.46	687.37	-36.32	-14.04	5.00
10	2.82	25.52	165.96	660.99	686.51	-35.09	-14.04	3.44
11	1.27	26.45	168.01	659.55	686.00	-35.09	-14.04	1.56
12	4.15	27.61	170.72	657.71	685.32	-33.86	-14.04	5.00
13	0.50	28.58	173.04	656.16	684.74	-32.62	-14.04	0.59
14	2.71	29.20	174.65	655.13	684.34	-32.62	-14.04	3.21
15	1.01	30.05	176.50	653.95	684.00	-32.62	0.00	1.19
16	4.27	31.68	179.14	652.32	684.00	-31.39	0.00	5.00
17	2.73	33.77	182.64	650.23	684.00	-30.16	0.00	3.15
18	1.60	35.23	184.80	648.97	684.20	-30.16	14.04	1.85
19	4.38	37.65	187.79	647.30	684.95	-28.92	14.04	5.00
20	4.43	41.12	192.19	644.93	686.05	-27.69	14.04	5.00
21	4.48	44.51	196.64	642.65	687.16	-26.46	14.04	5.00
22	1.12	46.58	199.44	641.28	687.86	-25.22	14.04	1.24
23	3.40	47.36	201.70	640.21	687.57	-25.22	-14.04	3.76
24	4.57	48.19	205.68	638.39	686.58	-23.99	-14.04	5.00

25	4.61	49.02	210.27	636.41	685.43	-22.76	-14.04	5.00
26	4.65	49.75	214.90	634.53	684.27	-21.52	-14.04	5.00
27	4.69	50.36	219.58	632.74	683.11	-20.29	-14.04	5.00
28	4.73	50.87	224.28	631.06	681.93	-19.06	-14.04	5.00
29	4.76	51.27	229.03	629.48	680.74	-17.82	-14.04	5.00
30	4.79	51.55	233.80	628.00	679.55	-16.59	-14.04	5.00
31	4.82	51.73	238.61	626.62	678.35	-15.36	-14.04	5.00
32	4.85	51.79	243.44	625.35	677.14	-14.12	-14.04	5.00
33	4.87	51.74	248.31	624.18	675.92	-12.89	-14.04	5.00
34	4.90	51.58	253.19	623.12	674.70	-11.66	-14.04	5.00
35	4.92	51.31	258.10	622.16	673.48	-10.42	-14.04	5.00
36	4.94	50.93	263.03	621.31	672.24	-9.19	-14.04	5.00
37	4.95	50.44	267.97	620.57	671.01	-7.96	-14.04	5.00
38	4.97	49.84	272.93	619.93	669.77	-6.72	-14.04	5.00
39	4.98	49.13	277.90	619.39	668.53	-5.49	-14.04	5.00
40	4.99	48.31	282.88	618.97	667.28	-4.26	-14.04	5.00
41	4.99	47.38	287.87	618.65	666.03	-3.02	-14.04	5.00
42	5.00	46.34	292.87	618.44	664.78	-1.79	-14.04	5.00
43	5.00	45.19	297.86	618.34	663.53	-0.56	-14.04	5.00
44	5.00	43.94	302.86	618.35	662.28	0.68	-14.04	5.00
45	5.00	42.58	307.86	618.46	661.03	1.91	-14.04	5.00
46	1.64	41.62	311.18	618.59	660.20	3.14	-14.04	1.64
47	3.35	40.86	313.68	618.72	659.58	3.14	-14.04	3.36
48	4.99	39.53	317.85	619.01	658.54	4.38	-14.04	5.00
49	4.98	37.85	322.83	619.44	657.29	5.61	-14.04	5.00

50	2.69	36.49	326.66	619.85	656.34	6.84	-14.04	2.70
51	2.28	35.56	329.14	620.15	655.71	6.84	-14.26	2.30
52	4.95	34.16	332.75	620.63	654.79	8.08	-14.26	5.00
53	4.93	32.15	337.70	621.39	653.54	9.31	-14.26	5.00
54	4.92	30.03	342.62	622.25	652.28	10.54	-14.26	5.00
55	4.89	27.82	347.53	623.22	651.04	11.78	-14.26	5.00
56	4.87	25.51	352.41	624.29	649.80	13.01	-14.26	5.00
57	4.85	23.09	357.27	625.47	648.56	14.24	-14.26	5.00
58	4.82	20.58	362.10	626.75	647.33	15.48	-14.26	5.00
59	4.79	17.98	366.91	628.14	646.11	16.71	-14.26	5.00
60	4.76	15.27	371.68	629.63	644.90	17.94	-14.26	5.00
61	4.72	12.48	376.42	631.22	643.70	19.18	-14.26	5.00
62	4.69	9.59	381.12	632.91	642.50	20.41	-14.26	5.00
63	4.65	6.61	385.79	634.71	641.32	21.64	-14.26	5.00
64	4.61	3.54	390.42	636.60	640.14	22.88	-14.26	5.00
65	2.83	0.99	394.13	638.20	639.20	24.11	-14.26	3.10

Table 2 - Force Data On The 65 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force Top (lbs)	Ualpha Force Bot (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Distributed Load (lbs)
1	93.7	0.0	0.0	0.0	0.0	0.0
2	285.1	0.0	0.0	0.0	0.0	0.0
3	479.9	0.0	0.0	0.0	0.0	0.0
4	677.4	0.0	0.0	0.0	0.0	0.0
5	877.1	0.0	0.0	0.0	0.0	0.0
6	1078.3	0.0	0.0	0.0	0.0	0.0
7	1101.4	0.0	0.0	0.0	0.0	0.0
8	178.5	0.0	0.0	0.0	0.0	0.0

9	1444.5	0.0	0.0	0.0	0.0	0.0
10	1079.0	0.0	0.0	0.0	0.0	0.0
11	576.0	0.0	43.4	0.0	0.0	0.0
12	2906.4	0.0	713.5	0.0	0.0	0.0
13	454.8	0.0	142.4	0.0	0.0	0.0
14	2807.2	0.0	975.3	0.0	0.0	0.0
15	1193.2	0.0	450.8	0.0	0.0	0.0
16	5967.2	0.0	2395.3	0.0	0.0	0.0
17	4554.0	0.0	1922.6	0.0	0.0	0.0
18	2932.7	0.0	1270.8	0.0	0.0	0.0
19	9038.2	0.0	3962.4	0.0	0.0	0.0
20	10581.1	0.0	4702.1	0.0	0.0	0.0
21	12097.1	0.0	5412.1	0.0	0.0	0.0
22	3247.7	0.0	1450.4	0.0	0.0	0.0
23	10290.5	0.0	4641.6	0.0	0.0	0.0
24	14835.5	0.0	6741.4	0.0	0.0	0.0
25	16083.7	0.0	7360.3	0.0	0.0	0.0
26	17283.7	0.0	7948.1	0.0	0.0	0.0
27	18431.9	0.0	8504.8	0.0	0.0	0.0
28	19525.0	0.0	9029.9	0.0	0.0	0.0
29	20559.5	0.0	9523.3	0.0	0.0	0.0
30	21532.5	0.0	9984.7	0.0	0.0	0.0
31	22441.0	0.0	10414.0	0.0	0.0	0.0
32	23282.4	0.0	10810.8	0.0	0.0	0.0
33	24054.1	0.0	11175.2	0.0	0.0	0.0
34	24753.8	0.0	11506.7	0.0	0.0	0.0
35	25379.5	0.0	11805.4	0.0	0.0	0.0
36	25929.3	0.0	12071.1	0.0	0.0	0.0
37	26401.6	0.0	12303.6	0.0	0.0	0.0
38	26794.8	0.0	12502.9	0.0	0.0	0.0
39	27107.9	0.0	12668.8	0.0	0.0	0.0
40	27339.8	0.0	12801.3	0.0	0.0	0.0
41	27489.9	0.0	12900.4	0.0	0.0	0.0
42	27557.5	0.0	12965.9	0.0	0.0	0.0
43	27542.5	0.0	12997.8	0.0	0.0	0.0
44	27444.7	0.0	12996.1	0.0	0.0	0.0
45	27264.3	0.0	12960.9	0.0	0.0	0.0
46	8894.7	0.0	4242.0	0.0	0.0	0.0
47	1524.0	0.0	0.0	0.0	0.0	0.0
48	2238.4	0.0	0.0	0.0	0.0	0.0
49	2195.8	0.0	0.0	0.0	0.0	0.0
50	1166.7	0.0	0.0	0.0	0.0	0.0
51	972.7	0.0	0.0	0.0	0.0	0.0
52	2029.2	0.0	0.0	0.0	0.0	0.0
53	1903.4	0.0	0.0	0.0	0.0	0.0
54	1771.6	0.0	0.0	0.0	0.0	0.0
55	1634.0	0.0	0.0	0.0	0.0	0.0
56	1491.0	0.0	0.0	0.0	0.0	0.0
57	1343.0	0.0	0.0	0.0	0.0	0.0
58	1190.2	0.0	0.0	0.0	0.0	0.0

59	1033.0	0.0	0.0	0.0	0.0	0.0
60	871.9	0.0	0.0	0.0	0.0	0.0
61	707.2	0.0	0.0	0.0	0.0	0.0
62	539.3	0.0	0.0	0.0	0.0	0.0
63	368.7	0.0	0.0	0.0	0.0	0.0
64	195.7	0.0	0.0	0.0	0.0	0.0
65	33.6	0.0	0.0	0.0	0.0	0.0

TOTAL WEIGHT OF SLIDING MASS = 625080.06(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 359630.05(lbs)

TOTAL AREA OF SLIDING MASS = 9093.57(ft2)

TABLE 2A - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 65 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	1	300.00	15.00	
2	1	300.00	15.00	
3	1	300.00	15.00	
4	1	300.00	15.00	
5	1	300.00	15.00	
6	1	300.00	15.00	
7	1	300.00	15.00	
8	1	300.00	15.00	
9	1	300.00	15.00	
10	1	300.00	15.00	
11	2	5000.00	0.00	
12	2	5000.00	0.00	
13	2	5000.00	0.00	
14	3	1000.00	0.00	
15	3	1000.00	0.00	
16	3	1000.00	0.00	
17	3	1000.00	0.00	
18	3	1000.00	0.00	
19	3	1000.00	0.00	
20	3	1000.00	0.00	
21	3	1000.00	0.00	
22	3	1000.00	0.00	
23	3	1000.00	0.00	
24	3	1000.00	0.00	
25	3	1000.00	0.00	
26	3	1000.00	0.00	
27	3	1000.00	0.00	
28	3	1000.00	0.00	
29	3	1000.00	0.00	
30	3	1000.00	0.00	
31	3	1000.00	0.00	

32	3	1000.00	0.00
33	3	1000.00	0.00
34	3	1000.00	0.00
35	3	1000.00	0.00
36	3	1000.00	0.00
37	3	1000.00	0.00
38	3	1000.00	0.00
39	3	1000.00	0.00
40	3	1000.00	0.00
41	3	1000.00	0.00
42	3	1000.00	0.00
43	3	1000.00	0.00
44	3	1000.00	0.00
45	3	1000.00	0.00
46	3	1000.00	0.00
47	3	1000.00	0.00
48	3	1000.00	0.00
49	3	1000.00	0.00
50	3	1000.00	0.00
51	3	1000.00	0.00
52	3	1000.00	0.00
53	3	1000.00	0.00
54	3	1000.00	0.00
55	3	1000.00	0.00
56	3	1000.00	0.00
57	3	1000.00	0.00
58	3	1000.00	0.00
59	3	1000.00	0.00
60	3	1000.00	0.00
61	3	1000.00	0.00
62	3	1000.00	0.00
63	3	1000.00	0.00
64	3	1000.00	0.00
65	3	1000.00	0.00

SOIL OPTIONS: A = ANISOTROPIC, C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C),
F = FIBER-REINFORCED SOIL (FRS), N = NONLINEAR UNDRAINED SHEAR STRENGTH,
R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH
NOTE: Phi and C in Table 4 are modified values based on specified
Soil Options (if any).

TABLE 3 - Effective and Base Shear Stress Data on the 65 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Stress (psf)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)

1	-44.96	136.00	5.00	23.37	6.26	3.13
2	-43.72	139.58	5.00	69.95	18.74	9.37
3	-42.49	143.23	5.00	115.93	31.06	15.53
4	-41.26	146.95	5.00	43.52	311.66	155.83
5	-40.02	150.75	5.00	92.66	324.83	162.41
6	-38.79	154.61	5.00	140.93	337.76	168.88
7	-37.56	158.28	4.34	185.55	349.72	174.86
8	-37.56	160.26	0.66	205.39	355.03	177.52
9	-36.32	162.54	5.00	226.02	360.56	180.28
10	-35.09	165.96	3.44	253.55	367.94	183.97
11	-35.09	168.01	1.56	424.67	0.00	0.00
12	-33.86	170.72	5.00	557.27	0.00	0.00
13	-32.62	173.04	0.59	669.05	0.00	0.00
14	-32.62	174.65	3.21	413.94	1000.00	500.00
15	-32.62	176.50	1.19	489.14	1000.00	500.00
16	-31.39	179.14	5.00	613.88	1000.00	500.00
17	-30.16	182.64	3.15	770.03	1000.00	500.00
18	-30.16	184.80	1.85	857.92	1000.00	500.00
19	-28.92	187.79	5.00	996.43	1000.00	500.00
20	-27.69	192.19	5.00	1187.09	1000.00	500.00
21	-26.46	196.64	5.00	1371.18	1000.00	500.00
22	-25.22	199.44	1.24	1488.13	1000.00	500.00
23	-25.22	201.70	3.76	1555.88	1000.00	500.00
24	-23.99	205.68	5.00	1676.81	1000.00	500.00
25	-22.76	210.27	5.00	1806.45	1000.00	

						500.00
26	-21.52	214.90	5.00	1929.00	1000.00	500.00
27	-20.29	219.58	5.00	2044.42	1000.00	500.00
28	-19.06	224.28	5.00	2152.69	1000.00	500.00
29	-17.82	229.03	5.00	2253.77	1000.00	500.00
30	-16.59	233.80	5.00	2347.63	1000.00	500.00
31	-15.36	238.61	5.00	2434.25	1000.00	500.00
32	-14.12	243.44	5.00	2513.62	1000.00	500.00
33	-12.89	248.31	5.00	2585.71	1000.00	500.00
34	-11.66	253.19	5.00	2650.51	1000.00	500.00
35	-10.42	258.10	5.00	2708.00	1000.00	500.00
36	-9.19	263.03	5.00	2758.17	1000.00	500.00
37	-7.96	267.97	5.00	2801.02	1000.00	500.00
38	-6.72	272.93	5.00	2836.54	1000.00	500.00
39	-5.49	277.90	5.00	2864.74	1000.00	500.00
40	-4.26	282.88	5.00	2885.61	1000.00	500.00
41	-3.02	287.87	5.00	2899.16	1000.00	500.00
42	-1.79	292.87	5.00	2905.40	1000.00	500.00
43	-0.56	297.86	5.00	2904.34	1000.00	500.00
44	0.68	302.86	5.00	2896.00	1000.00	500.00
45	1.91	307.86	5.00	2880.39	1000.00	500.00
46	3.14	311.18	1.64	2870.06	1000.00	500.00
47	3.14	313.68	3.36	481.94	1000.00	500.00
48	4.38	317.85	5.00	487.27	1000.00	500.00
49	5.61	322.83	5.00	490.40	1000.00	500.00
50	6.84	326.66	2.70	494.51	1000.00	

						500.00
51	6.84	329.14	2.30	486.79	1000.00	500.00
52	8.08	332.75	5.00	480.86	1000.00	500.00
53	9.31	337.70	5.00	467.74	1000.00	500.00
54	10.54	342.62	5.00	453.47	1000.00	500.00
55	11.78	347.53	5.00	438.09	1000.00	500.00
56	13.01	352.41	5.00	421.60	1000.00	500.00
57	14.24	357.27	5.00	404.05	1000.00	500.00
58	15.48	362.10	5.00	385.45	1000.00	500.00
59	16.71	366.91	5.00	365.83	1000.00	500.00
60	17.94	371.68	5.00	345.22	1000.00	500.00
61	19.18	376.42	5.00	323.65	1000.00	500.00
62	20.41	381.12	5.00	301.15	1000.00	500.00
63	21.64	385.79	5.00	277.75	1000.00	500.00
64	22.88	390.42	5.00	253.48	1000.00	500.00
65	24.11	394.13	3.10	235.69	1000.00	500.00

Table 4 - Base Force Data on the 65 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force * (lbs)
1	-44.96	136.00	5.00	116.85	31.31	15.65
2	-43.72	139.58	5.00	349.74	93.71	46.86
3	-42.49	143.23	5.00	579.65	155.32	77.66
4	-41.26	146.95	5.00	217.59	1558.30	

						779.15
5	-40.02	150.75	5.00	463.29	1624.14	812.07
6	-38.79	154.61	5.00	704.63	1688.80	844.40
7	-37.56	158.28	4.34	805.56	1518.30	759.15
8	-37.56	160.26	0.66	135.25	233.79	116.90
9	-36.32	162.54	5.00	1130.12	1802.82	901.41
10	-35.09	165.96	3.44	873.37	1267.41	633.71
11	-35.09	168.01	1.56	660.52	0.00	0.00
12	-33.86	170.72	5.00	2786.34	0.00	0.00
13	-32.62	173.04	0.59	397.62	0.00	0.00
14	-32.62	174.65	3.21	1329.61	3212.13	1606.07
15	-32.62	176.50	1.19	583.82	1193.57	596.79
16	-31.39	179.14	5.00	3069.41	5000.00	2500.01
17	-30.16	182.64	3.15	2428.06	3153.21	1576.61
18	-30.16	184.80	1.85	1584.39	1846.79	923.40
19	-28.92	187.79	5.00	4982.15	5000.00	2500.01
20	-27.69	192.19	5.00	5935.43	5000.00	2500.01
21	-26.46	196.64	5.00	6855.88	5000.00	2500.01
22	-25.22	199.44	1.24	1847.24	1241.31	620.66
23	-25.22	201.70	3.76	5848.07	3758.69	1879.35
24	-23.99	205.68	5.00	8384.04	5000.00	2500.01
25	-22.76	210.27	5.00	9032.26	5000.00	2500.01
26	-21.52	214.90	5.00	9645.01	5000.00	2500.01
27	-20.29	219.58	5.00	10222.12	5000.00	2500.01
28	-19.06	224.28	5.00	10763.44	5000.00	2500.01
29	-17.82	229.03	5.00	11268.83	5000.00	

2500.01

30	-16.59	233.80	5.00	11738.15	5000.00	2500.01
31	-15.36	238.61	5.00	12171.27	5000.00	2500.01
32	-14.12	243.44	5.00	12568.11	5000.00	2500.01
33	-12.89	248.31	5.00	12928.55	5000.00	2500.01
34	-11.66	253.19	5.00	13252.53	5000.00	2500.01
35	-10.42	258.10	5.00	13539.98	5000.00	2500.01
36	-9.19	263.03	5.00	13790.84	5000.00	2500.01
37	-7.96	267.97	5.00	14005.09	5000.00	2500.01
38	-6.72	272.93	5.00	14182.71	5000.00	2500.01
39	-5.49	277.90	5.00	14323.69	5000.00	2500.01
40	-4.26	282.88	5.00	14428.04	5000.00	2500.01
41	-3.02	287.87	5.00	14495.80	5000.00	2500.01
42	-1.79	292.87	5.00	14527.00	5000.00	2500.01
43	-0.56	297.86	5.00	14521.70	5000.00	2500.01
44	0.68	302.86	5.00	14480.00	5000.00	2500.01
45	1.91	307.86	5.00	14401.97	5000.00	2500.01
46	3.14	311.18	1.64	4711.26	1641.52	820.76
47	3.14	313.68	3.36	1618.58	3358.48	1679.25
48	4.38	317.85	5.00	2436.34	5000.00	2500.01
49	5.61	322.83	5.00	2452.01	5000.00	2500.01
50	6.84	326.66	2.70	1337.35	2704.38	1352.19
51	6.84	329.14	2.30	1117.49	2295.62	1147.81
52	8.08	332.75	5.00	2404.31	5000.00	2500.01
53	9.31	337.70	5.00	2338.69	5000.00	2500.01
54	10.54	342.62	5.00	2267.36	5000.00	

```
2500.01
  55      11.78      347.53       5.00         2190.43        5000.00
2500.01
  56      13.01      352.41       5.00         2108.02        5000.00
2500.01
  57      14.24      357.27       5.00         2020.25        5000.00
2500.01
  58      15.48      362.10       5.00         1927.25        5000.00
2500.01
  59      16.71      366.91       5.00         1829.15        5000.00
2500.01
  60      17.94      371.68       5.00         1726.11        5000.00
2500.01
  61      19.18      376.42       5.00         1618.25        5000.00
2500.01
  62      20.41      381.12       5.00         1505.74        5000.00
2500.01
  63      21.64      385.79       5.00         1388.73        5000.00
2500.01
  64      22.88      390.42       5.00         1267.38        5000.00
2500.01
  65      24.11      394.13       3.10          730.00        3097.32
1548.67
```

Sum of the Resisting Forces = 230066.40 (lbs)

Average Available Shear Strength = 812.68(psf)

Sum of the Driving Forces = -115033.58 (lbs)

Average Mobilized Shear Stress = -406.34(psf)

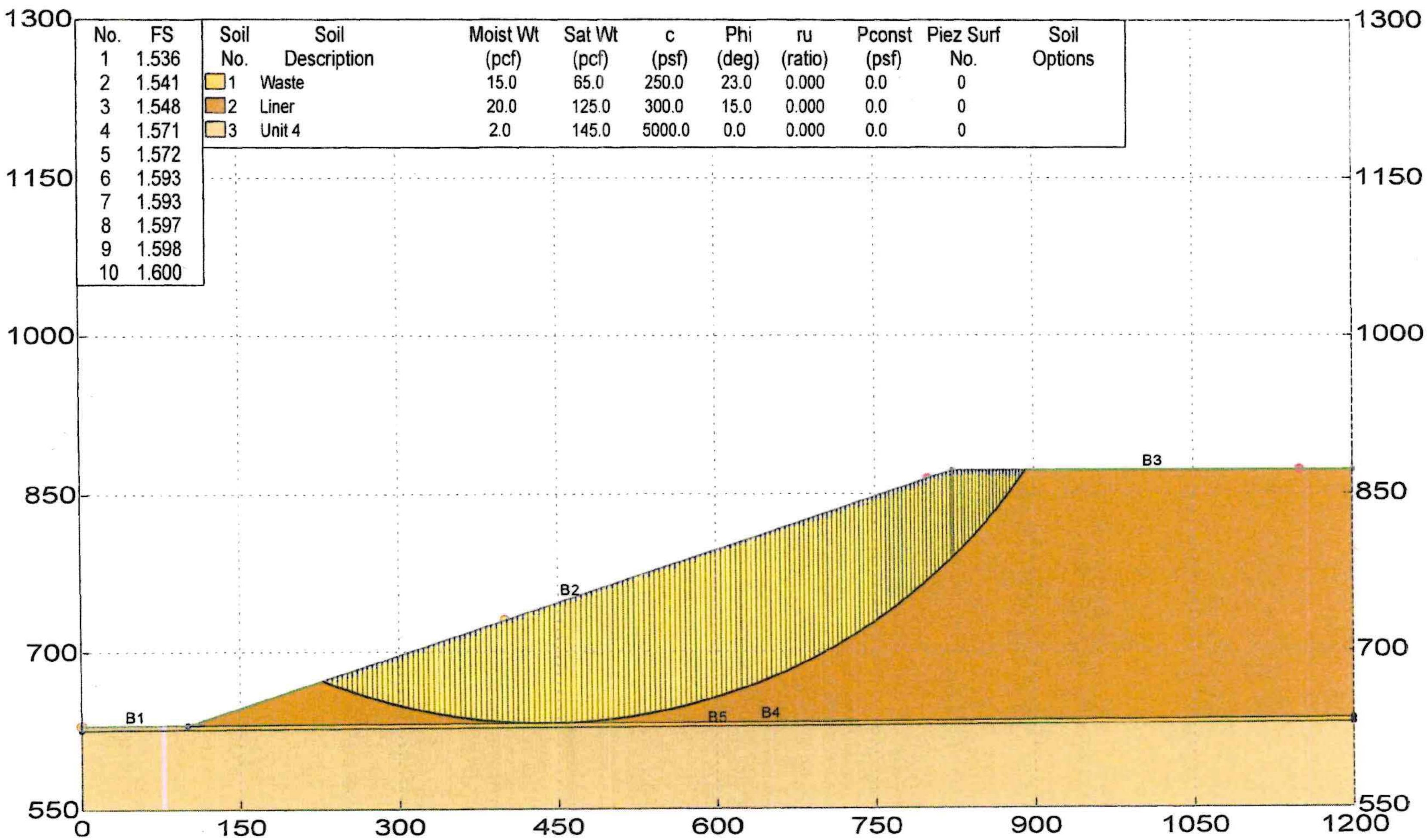
Total length of the failure surface = 283.10(ft)

Factor of Safety Balance Check: FS = 1.99999

**** END OF GEOSTASE OUTPUT ****

Chisholm Trail Disposal Landfill
Interim Waste Slope

BME \Interim Waste Slope.gsd



GEOSTASE FS = 1.536

Simplified Janbu Method

GEOSTASE Slope Stability Analysis

GEOSTASE® by GREGORY GEOTECHNICAL SOFTWARE

*** GEOSTASE(R) ***

** Current Version 4.30.27-Double Precision, November 2018 **

****

SLOPE STABILITY ANALYSIS SOFTWARE
Simplified Bishop, Simplified Janbu, or General Equilibrium (GE)
Options.
(Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)
Including Pier/Pile, Planar Reinf, Nail, Tieback, Line Loads
Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads
Nonlinear Undrained Shear Strength, Curved Strength Envelope,
Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown
2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.

****

Analysis Date: 11/ 4/ 2024
Analysis Time:
Analysis By: BME

Input File Name: O:\Green Group\Wise County\Solid Waste\Type IV\P\Stability\Interim Waste Slope.gsd

Output File Name: O:\Green Group\Wise County\Solid Waste\Type IV\P\Stability\Interim Waste Slope.OUT

Unit System: English

PROJECT: Chisholm Trail Disposal Landfill

DESCRIPTION: Interim Waste Slope

BOUNDARY DATA

3 Surface Boundaries

5 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	629.000	100.000	629.500	1
2	100.000	629.500	823.000	872.000	2
3	823.000	872.000	1200.000	872.000	2
4	100.000	629.500	1200.000	634.500	1
5	0.000	625.000	1200.000	630.500	3

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 550.000(ft)

MOHR-COULOMB SOIL PARAMETERS

3 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	Pressure Constant (psf)	Water Surface No.	Water Option
1 Waste	15.0	65.0	250.00	23.00	0.000	0.0	0	0
2 Liner	20.0	125.0	300.00	15.00	0.000	0.0	0	0
3 Unit 4	2.0	145.0	5000.00	0.00	0.000	0.0	0	0

TRIAL FAILURE SURFACE DATA

Circular Trial Failure Surfaces Have Been Generated Using A Random Procedure.

500 Trial Surfaces Have Been Generated.

500 Surfaces Generated at Increments of 9.6192(in) Equally Spaced Within the Start Range

Along The Specified Surface Between X = 0.00(ft)
and X = 400.00(ft)

Each Surface Enters within a Range Between X = 800.00(ft) and X =1150.00(ft)

Unless XCLUDE Lines Were Specified, The Minimum Elevation
To Which A Surface Extends Is Y = 550.00(ft)

Specified Maximum Radius = 5000.000(ft)

5.000(ft) Line Segments Were Used For Each Trial Failure Surface.

The Simplified Janbu Method Was Selected for FS Analysis.

Total Number of Trial Surfaces Attempted = 500

Number of Trial Surfaces With Valid FS = 500

Statistical Data On All Valid FS Values:
FS Max = 6.034 FS Min = 1.536 FS Ave = 3.745
Standard Deviation = 1.393 Coefficient of Variation = 37.20 %

Critical Surface is Sequence Number 285 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

BACK-CALCULATED CIRCULAR SURFACE PARAMETERS:

Circle Center At X = 436.606895(ft) ; Y = 1182.065744(ft); and Radius = 550.912823(ft)

Circular Trial Failure Surface Generated With152 Coordinate Points

Point No.	X-Coord. (ft)	Y-Coord. (ft)
1	227.655	672.317
2	232.290	670.441
3	236.942	668.608
4	241.610	666.817
5	246.295	665.068
6	250.995	663.363
7	255.710	661.699
8	260.440	660.079
9	265.185	658.502

10	269.943	656.967
11	274.716	655.476
12	279.502	654.029
13	284.301	652.625
14	289.112	651.264
15	293.936	649.948
16	298.771	648.675
17	303.617	647.446
18	308.475	646.261
19	313.343	645.120
20	318.221	644.023
21	323.109	642.971
22	328.007	641.963
23	332.913	641.000
24	337.828	640.081
25	342.751	639.207
26	347.682	638.377
27	352.620	637.593
28	357.565	636.853
29	362.516	636.158
30	367.474	635.508
31	372.437	634.903
32	377.405	634.343
33	382.379	633.828
34	387.357	633.359
35	392.339	632.934
36	397.324	632.555
37	402.313	632.221
38	407.305	631.933
39	412.299	631.689
40	417.295	631.492
41	422.293	631.339
42	427.292	631.232
43	432.291	631.170
44	437.291	631.153
45	442.291	631.182
46	447.290	631.257
47	452.289	631.376
48	457.286	631.541
49	462.282	631.752
50	467.275	632.007
51	472.266	632.308
52	477.254	632.654
53	482.239	633.046
54	487.220	633.483
55	492.197	633.965
56	497.169	634.492
57	502.136	635.064
58	507.098	635.681
59	512.054	636.344

60	517.003	637.051
61	521.946	637.803
62	526.882	638.600
63	531.811	639.441
64	536.732	640.328
65	541.644	641.259
66	546.548	642.234
67	551.443	643.254
68	556.329	644.319
69	561.204	645.428
70	566.069	646.581
71	570.924	647.778
72	575.768	649.019
73	580.600	650.304
74	585.420	651.632
75	590.228	653.005
76	595.023	654.421
77	599.805	655.880
78	604.574	657.383
79	609.329	658.929
80	614.070	660.518
81	618.796	662.150
82	623.507	663.825
83	628.203	665.543
84	632.883	667.303
85	637.547	669.106
86	642.194	670.950
87	646.824	672.837
88	651.437	674.766
89	656.032	676.737
90	660.610	678.749
91	665.168	680.803
92	669.708	682.898
93	674.229	685.034
94	678.730	687.211
95	683.211	689.429
96	687.672	691.687
97	692.112	693.986
98	696.532	696.325
99	700.929	698.704
100	705.305	701.123
101	709.659	703.581
102	713.991	706.079
103	718.299	708.616
104	722.584	711.192
105	726.846	713.807
106	731.084	716.461
107	735.298	719.152
108	739.487	721.882
109	743.651	724.650

110	747.789	727.456
111	751.902	730.298
112	755.990	733.179
113	760.050	736.096
114	764.085	739.050
115	768.092	742.040
116	772.072	745.067
117	776.024	748.129
118	779.948	751.227
119	783.844	754.361
120	787.712	757.530
121	791.550	760.734
122	795.360	763.973
123	799.139	767.246
124	802.889	770.554
125	806.609	773.895
126	810.298	777.270
127	813.957	780.678
128	817.584	784.119
129	821.180	787.593
130	824.744	791.100
131	828.276	794.639
132	831.777	798.209
133	835.244	801.811
134	838.679	805.445
135	842.080	809.110
136	845.448	812.805
137	848.783	816.531
138	852.083	820.287
139	855.350	824.072
140	858.582	827.887
141	861.779	831.732
142	864.941	835.605
143	868.067	839.507
144	871.159	843.437
145	874.214	847.394
146	877.233	851.380
147	880.217	855.392
148	883.163	859.432
149	886.073	863.498
150	888.946	867.590
151	891.781	871.709
152	891.978	872.000

Factor Of Safety For The Critical or Specified Surface = 1.536

Table 1 - Geometry Data on the 152 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length (ft)
1	4.63	1.72	229.97	671.38	673.09	-22.03	18.54	5.00
2	4.65	5.13	234.62	669.52	674.65	-21.51	18.54	5.00
3	4.67	8.50	239.28	667.71	676.21	-20.99	18.54	5.00
4	4.68	11.84	243.95	665.94	677.78	-20.47	18.54	5.00
5	4.70	15.14	248.64	664.22	679.36	-19.95	18.54	5.00
6	4.72	18.40	253.35	662.53	680.94	-19.43	18.54	5.00
7	4.73	21.63	258.07	660.89	682.52	-18.91	18.54	5.00
8	4.74	24.82	262.81	659.29	684.11	-18.39	18.54	5.00
9	4.76	27.97	267.56	657.73	685.70	-17.87	18.54	5.00
10	4.77	31.08	272.33	656.22	687.30	-17.35	18.54	5.00
11	4.79	34.15	277.11	654.75	688.90	-16.83	18.54	5.00
12	4.80	37.18	281.90	653.33	690.51	-16.31	18.54	5.00
13	4.81	40.18	286.71	651.94	692.12	-15.79	18.54	5.00
14	4.82	43.13	291.52	650.61	693.74	-15.27	18.54	5.00
15	4.84	46.05	296.35	649.31	695.36	-14.75	18.54	5.00
16	4.85	48.92	301.19	648.06	696.98	-14.23	18.54	5.00
17	4.86	51.76	306.05	646.85	698.61	-13.71	18.54	5.00
18	4.87	54.55	310.91	645.69	700.24	-13.19	18.54	5.00
19	4.88	57.30	315.78	644.57	701.88	-12.67	18.54	5.00
20	4.89	60.02	320.67	643.50	703.51	-12.15	18.54	5.00
21	4.90	62.69	325.56	642.47	705.15	-11.63	18.54	5.00
22	4.91	65.32	330.46	641.48	706.80	-11.11	18.54	

5.00								
23	4.91	67.90	335.37	640.54	708.45	-10.59	18.54	
5.00								
24	4.92	70.45	340.29	639.64	710.09	-10.07	18.54	
5.00								
25	4.93	72.96	345.22	638.79	711.75	-9.55	18.54	
5.00								
26	4.94	75.42	350.15	637.98	713.40	-9.03	18.54	
5.00								
27	4.94	77.84	355.09	637.22	715.06	-8.51	18.54	
5.00								
28	4.95	80.21	360.04	636.51	716.72	-7.99	18.54	
5.00								
29	4.96	82.55	364.99	635.83	718.38	-7.47	18.54	
5.00								
30	4.96	84.84	369.96	635.21	720.05	-6.95	18.54	
5.00								
31	4.97	87.09	374.92	634.62	721.71	-6.43	18.54	
5.00								
32	4.97	89.29	379.89	634.09	723.38	-5.91	18.54	
5.00								
33	4.98	91.45	384.87	633.59	725.05	-5.39	18.54	
5.00								
34	4.98	93.57	389.85	633.15	726.72	-4.87	18.54	
5.00								
35	4.99	95.64	394.83	632.74	728.39	-4.35	18.54	
5.00								
36	4.99	97.67	399.82	632.39	730.06	-3.83	18.54	
5.00								
37	4.99	99.66	404.81	632.08	731.74	-3.31	18.54	
5.00								
38	4.99	101.60	409.80	631.81	733.41	-2.79	18.54	
5.00								
39	5.00	103.49	414.80	631.59	735.09	-2.27	18.54	
5.00								
40	5.00	105.35	419.79	631.42	736.76	-1.75	18.54	
5.00								
41	5.00	107.15	424.79	631.29	738.44	-1.23	18.54	
5.00								
42	5.00	108.91	429.79	631.20	740.11	-0.71	18.54	
5.00								
43	5.00	110.63	434.79	631.16	741.79	-0.19	18.54	
5.00								
44	5.00	112.30	439.79	631.17	743.47	0.33	18.54	
5.00								
45	5.00	113.93	444.79	631.22	745.15	0.85	18.54	
5.00								
46	5.00	115.51	449.79	631.32	746.82	1.37	18.54	
5.00								
47	5.00	117.04	454.79	631.46	748.50	1.89	18.54	

5.00	48	5.00	118.53	459.78	631.65	750.17	2.41	18.54
5.00	49	4.99	119.97	464.78	631.88	751.85	2.93	18.54
5.00	50	4.99	121.37	469.77	632.16	753.52	3.45	18.54
5.00	51	4.99	122.72	474.76	632.48	755.20	3.97	18.54
5.00	52	4.98	124.02	479.75	632.85	756.87	4.49	18.54
5.00	53	4.98	125.28	484.73	633.26	758.54	5.01	18.54
5.00	54	4.98	126.49	489.71	633.72	760.21	5.53	18.54
5.00	55	4.97	127.65	494.68	634.23	761.88	6.05	18.54
5.00	56	4.97	128.77	499.65	634.78	763.55	6.57	18.54
5.00	57	4.96	129.84	504.62	635.37	765.21	7.09	18.54
5.00	58	4.96	130.86	509.58	636.01	766.87	7.61	18.54
5.00	59	4.95	131.84	514.53	636.70	768.54	8.13	18.54
5.00	60	4.94	132.77	519.47	637.43	770.20	8.65	18.54
5.00	61	4.94	133.65	524.41	638.20	771.85	9.17	18.54
5.00	62	4.93	134.49	529.35	639.02	773.51	9.69	18.54
5.00	63	4.92	135.27	534.27	639.88	775.16	10.21	18.54
5.00	64	4.91	136.01	539.19	640.79	776.81	10.73	18.54
5.00	65	4.90	136.71	544.10	641.75	778.45	11.25	18.54
5.00	66	4.89	137.35	549.00	642.74	780.10	11.77	18.54
5.00	67	4.89	137.95	553.89	643.79	781.74	12.29	18.54
5.00	68	4.88	138.50	558.77	644.87	783.37	12.81	18.54
5.00	69	4.87	139.00	563.64	646.00	785.01	13.33	18.54
5.00	70	4.85	139.46	568.50	647.18	786.64	13.85	18.54
5.00	71	4.84	139.87	573.35	648.40	788.26	14.37	18.54
5.00	72	4.83	140.23	578.18	649.66	789.89	14.89	18.54

5.00							
73	4.82	140.54	583.01	650.97	791.51	15.41	18.54
5.00							
74	4.81	140.80	587.82	652.32	793.12	15.93	18.54
5.00							
75	4.80	141.02	592.63	653.71	794.73	16.45	18.54
5.00							
76	4.78	141.19	597.41	655.15	796.34	16.97	18.54
5.00							
77	4.77	141.31	602.19	656.63	797.94	17.49	18.54
5.00							
78	4.75	141.38	606.95	658.16	799.54	18.01	18.54
5.00							
79	4.74	141.40	611.70	659.72	801.13	18.53	18.54
5.00							
80	4.73	141.38	616.43	661.33	802.72	19.05	18.54
5.00							
81	4.71	141.31	621.15	662.99	804.30	19.57	18.54
5.00							
82	4.70	141.19	625.85	664.68	805.88	20.09	18.54
5.00							
83	4.68	141.03	630.54	666.42	807.45	20.61	18.54
5.00							
84	4.66	140.81	635.21	668.20	809.02	21.13	18.54
5.00							
85	4.65	140.55	639.87	670.03	810.58	21.65	18.54
5.00							
86	4.63	140.24	644.51	671.89	812.13	22.17	18.54
5.00							
87	4.61	139.88	649.13	673.80	813.68	22.69	18.54
5.00							
88	4.60	139.48	653.73	675.75	815.23	23.21	18.54
5.00							
89	4.58	139.02	658.32	677.74	816.77	23.73	18.54
5.00							
90	4.56	138.52	662.89	679.78	818.30	24.25	18.54
5.00							
91	4.54	137.97	667.44	681.85	819.82	24.77	18.54
5.00							
92	4.52	137.38	671.97	683.97	821.34	25.29	18.54
5.00							
93	4.50	136.73	676.48	686.12	822.86	25.81	18.54
5.00							
94	4.48	136.04	680.97	688.32	824.36	26.33	18.54
5.00							
95	4.46	135.30	685.44	690.56	825.86	26.85	18.54
5.00							
96	4.44	134.52	689.89	692.84	827.35	27.37	18.54
5.00							
97	4.42	133.68	694.32	695.16	828.84	27.89	18.54

5.00							
98	4.40	132.80	698.73	697.51	830.32	28.41	18.54
5.00							
99	4.38	131.88	703.12	699.91	831.79	28.93	18.54
5.00							
100	4.35	130.90	707.48	702.35	833.25	29.45	18.54
5.00							
101	4.33	129.88	711.82	704.83	834.71	29.97	18.54
5.00							
102	4.31	128.81	716.14	707.35	836.16	30.49	18.54
5.00							
103	4.29	127.70	720.44	709.90	837.60	31.01	18.54
5.00							
104	4.26	126.53	724.72	712.50	839.03	31.53	18.54
5.00							
105	4.24	125.33	728.97	715.13	840.46	32.05	18.54
5.00							
106	4.21	124.07	733.19	717.81	841.88	32.57	18.54
5.00							
107	4.19	122.77	737.39	720.52	843.29	33.09	18.54
5.00							
108	4.16	121.42	741.57	723.27	844.69	33.61	18.54
5.00							
109	4.14	120.03	745.72	726.05	846.08	34.13	18.54
5.00							
110	4.11	118.59	749.85	728.88	847.46	34.65	18.54
5.00							
111	4.09	117.10	753.95	731.74	848.84	35.17	18.54
5.00							
112	4.06	115.57	758.02	734.64	850.21	35.69	18.54
5.00							
113	4.03	113.99	762.07	737.57	851.56	36.21	18.54
5.00							
114	4.01	112.37	766.09	740.54	852.91	36.73	18.54
5.00							
115	3.98	110.70	770.08	743.55	854.25	37.25	18.54
5.00							
116	3.95	108.98	774.05	746.60	855.58	37.77	18.54
5.00							
117	3.92	107.22	777.99	749.68	856.90	38.29	18.54
5.00							
118	3.90	105.42	781.90	752.79	858.21	38.81	18.54
5.00							
119	3.87	103.57	785.78	755.95	859.52	39.33	18.54
5.00							
120	3.84	101.68	789.63	759.13	860.81	39.85	18.54
5.00							
121	3.81	99.74	793.45	762.35	862.09	40.37	18.54
5.00							
122	3.78	97.75	797.25	765.61	863.36	40.89	18.54

5.00							
123	3.75	95.73	801.01	768.90	864.63	41.41	18.54
5.00							
124	3.72	93.65	804.75	772.22	865.88	41.93	18.54
5.00							
125	3.69	91.54	808.45	775.58	867.12	42.45	18.54
5.00							
126	3.66	89.38	812.13	778.97	868.35	42.97	18.54
5.00							
127	3.63	87.18	815.77	782.40	869.58	43.49	18.54
5.00							
128	3.60	84.93	819.38	785.86	870.79	44.01	18.54
5.00							
129	1.82	83.21	822.09	788.49	871.69	44.53	18.54
2.55							
130	1.74	81.76	823.87	790.24	872.00	44.53	0.00
2.45							
131	3.53	79.13	826.51	792.87	872.00	45.05	0.00
5.00							
132	3.50	75.58	830.03	796.42	872.00	45.57	0.00
5.00							
133	3.47	71.99	833.51	800.01	872.00	46.09	0.00
5.00							
134	3.43	68.37	836.96	803.63	872.00	46.61	0.00
5.00							
135	3.40	64.72	840.38	807.28	872.00	47.13	0.00
5.00							
136	3.37	61.04	843.76	810.96	872.00	47.65	0.00
5.00							
137	3.33	57.33	847.12	814.67	872.00	48.17	0.00
5.00							
138	3.30	53.59	850.43	818.41	872.00	48.69	0.00
5.00							
139	3.27	49.82	853.72	822.18	872.00	49.21	0.00
5.00							
140	3.23	46.02	856.97	825.98	872.00	49.73	0.00
5.00							
141	3.20	42.19	860.18	829.81	872.00	50.25	0.00
5.00							
142	3.16	38.33	863.36	833.67	872.00	50.77	0.00
5.00							
143	3.13	34.44	866.50	837.56	872.00	51.29	0.00
5.00							
144	3.09	30.53	869.61	841.47	872.00	51.81	0.00
5.00							
145	3.06	26.58	872.69	845.42	872.00	52.33	0.00
5.00							
146	3.02	22.61	875.72	849.39	872.00	52.85	0.00
5.00							
147	2.98	18.61	878.72	853.39	872.00	53.37	0.00

5.00								
148	2.95	14.59	881.69	857.41	872.00	53.89	0.00	5.00
149	2.91	10.53	884.62	861.47	872.00	54.41	0.00	5.00
150	2.87	6.46	887.51	865.54	872.00	54.93	0.00	5.00
151	2.84	2.35	890.36	869.65	872.00	55.45	0.00	5.00
152	0.20	0.15	891.88	871.85	872.00	55.97	0.00	0.35

Table 2 - Force Data On The 152 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force Top (lbs)	Ualpha Force Bot (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Distributed Load (lbs)
1	159.0	0.0	0.0	0.0	0.0	0.0
2	477.0	0.0	0.0	0.0	0.0	0.0
3	793.8	0.0	0.0	0.0	0.0	0.0
4	1109.2	0.0	0.0	0.0	0.0	0.0
5	1423.3	0.0	0.0	0.0	0.0	0.0
6	1735.7	0.0	0.0	0.0	0.0	0.0
7	2046.3	0.0	0.0	0.0	0.0	0.0
8	2355.1	0.0	0.0	0.0	0.0	0.0
9	2661.9	0.0	0.0	0.0	0.0	0.0
10	2966.5	0.0	0.0	0.0	0.0	0.0
11	3268.8	0.0	0.0	0.0	0.0	0.0
12	3568.8	0.0	0.0	0.0	0.0	0.0
13	3866.2	0.0	0.0	0.0	0.0	0.0
14	4161.0	0.0	0.0	0.0	0.0	0.0
15	4453.0	0.0	0.0	0.0	0.0	0.0
16	4742.1	0.0	0.0	0.0	0.0	0.0
17	5028.2	0.0	0.0	0.0	0.0	0.0
18	5311.1	0.0	0.0	0.0	0.0	0.0
19	5590.8	0.0	0.0	0.0	0.0	0.0
20	5867.2	0.0	0.0	0.0	0.0	0.0
21	6140.0	0.0	0.0	0.0	0.0	0.0
22	6409.3	0.0	0.0	0.0	0.0	0.0
23	6674.9	0.0	0.0	0.0	0.0	0.0
24	6936.6	0.0	0.0	0.0	0.0	0.0
25	7194.5	0.0	0.0	0.0	0.0	0.0
26	7448.3	0.0	0.0	0.0	0.0	0.0
27	7698.1	0.0	0.0	0.0	0.0	0.0
28	7943.6	0.0	0.0	0.0	0.0	0.0
29	8184.8	0.0	0.0	0.0	0.0	0.0

30	8421.7	0.0	0.0	0.0	0.0	0.0
31	8654.0	0.0	0.0	0.0	0.0	0.0
32	8881.8	0.0	0.0	0.0	0.0	0.0
33	9104.9	0.0	0.0	0.0	0.0	0.0
34	9323.3	0.0	0.0	0.0	0.0	0.0
35	9536.9	0.0	0.0	0.0	0.0	0.0
36	9745.5	0.0	0.0	0.0	0.0	0.0
37	9949.2	0.0	0.0	0.0	0.0	0.0
38	10147.9	0.0	0.0	0.0	0.0	0.0
39	10341.4	0.0	0.0	0.0	0.0	0.0
40	10529.7	0.0	0.0	0.0	0.0	0.0
41	10712.8	0.0	0.0	0.0	0.0	0.0
42	10890.6	0.0	0.0	0.0	0.0	0.0
43	11062.9	0.0	0.0	0.0	0.0	0.0
44	11229.9	0.0	0.0	0.0	0.0	0.0
45	11391.4	0.0	0.0	0.0	0.0	0.0
46	11547.3	0.0	0.0	0.0	0.0	0.0
47	11697.6	0.0	0.0	0.0	0.0	0.0
48	11842.3	0.0	0.0	0.0	0.0	0.0
49	11981.3	0.0	0.0	0.0	0.0	0.0
50	12114.6	0.0	0.0	0.0	0.0	0.0
51	12242.2	0.0	0.0	0.0	0.0	0.0
52	12363.9	0.0	0.0	0.0	0.0	0.0
53	12479.8	0.0	0.0	0.0	0.0	0.0
54	12589.9	0.0	0.0	0.0	0.0	0.0
55	12694.0	0.0	0.0	0.0	0.0	0.0
56	12792.3	0.0	0.0	0.0	0.0	0.0
57	12884.6	0.0	0.0	0.0	0.0	0.0
58	12971.0	0.0	0.0	0.0	0.0	0.0
59	13051.4	0.0	0.0	0.0	0.0	0.0
60	13125.8	0.0	0.0	0.0	0.0	0.0
61	13194.2	0.0	0.0	0.0	0.0	0.0
62	13256.6	0.0	0.0	0.0	0.0	0.0
63	13313.1	0.0	0.0	0.0	0.0	0.0
64	13363.5	0.0	0.0	0.0	0.0	0.0
65	13407.9	0.0	0.0	0.0	0.0	0.0
66	13446.4	0.0	0.0	0.0	0.0	0.0
67	13478.8	0.0	0.0	0.0	0.0	0.0
68	13505.3	0.0	0.0	0.0	0.0	0.0
69	13525.8	0.0	0.0	0.0	0.0	0.0
70	13540.3	0.0	0.0	0.0	0.0	0.0
71	13548.9	0.0	0.0	0.0	0.0	0.0
72	13551.6	0.0	0.0	0.0	0.0	0.0
73	13548.4	0.0	0.0	0.0	0.0	0.0
74	13539.3	0.0	0.0	0.0	0.0	0.0
75	13524.5	0.0	0.0	0.0	0.0	0.0
76	13503.8	0.0	0.0	0.0	0.0	0.0
77	13477.3	0.0	0.0	0.0	0.0	0.0
78	13445.1	0.0	0.0	0.0	0.0	0.0
79	13407.3	0.0	0.0	0.0	0.0	0.0

80	13363.7	0.0	0.0	0.0	0.0	0.0
81	13314.6	0.0	0.0	0.0	0.0	0.0
82	13260.0	0.0	0.0	0.0	0.0	0.0
83	13199.8	0.0	0.0	0.0	0.0	0.0
84	13134.2	0.0	0.0	0.0	0.0	0.0
85	13063.2	0.0	0.0	0.0	0.0	0.0
86	12986.9	0.0	0.0	0.0	0.0	0.0
87	12905.4	0.0	0.0	0.0	0.0	0.0
88	12818.6	0.0	0.0	0.0	0.0	0.0
89	12726.7	0.0	0.0	0.0	0.0	0.0
90	12629.7	0.0	0.0	0.0	0.0	0.0
91	12527.8	0.0	0.0	0.0	0.0	0.0
92	12420.9	0.0	0.0	0.0	0.0	0.0
93	12309.2	0.0	0.0	0.0	0.0	0.0
94	12192.7	0.0	0.0	0.0	0.0	0.0
95	12071.5	0.0	0.0	0.0	0.0	0.0
96	11945.8	0.0	0.0	0.0	0.0	0.0
97	11815.5	0.0	0.0	0.0	0.0	0.0
98	11680.8	0.0	0.0	0.0	0.0	0.0
99	11541.8	0.0	0.0	0.0	0.0	0.0
100	11398.6	0.0	0.0	0.0	0.0	0.0
101	11251.2	0.0	0.0	0.0	0.0	0.0
102	11099.8	0.0	0.0	0.0	0.0	0.0
103	10944.4	0.0	0.0	0.0	0.0	0.0
104	10785.2	0.0	0.0	0.0	0.0	0.0
105	10622.3	0.0	0.0	0.0	0.0	0.0
106	10455.7	0.0	0.0	0.0	0.0	0.0
107	10285.6	0.0	0.0	0.0	0.0	0.0
108	10112.0	0.0	0.0	0.0	0.0	0.0
109	9935.2	0.0	0.0	0.0	0.0	0.0
110	9755.2	0.0	0.0	0.0	0.0	0.0
111	9572.1	0.0	0.0	0.0	0.0	0.0
112	9386.1	0.0	0.0	0.0	0.0	0.0
113	9197.2	0.0	0.0	0.0	0.0	0.0
114	9005.5	0.0	0.0	0.0	0.0	0.0
115	8811.3	0.0	0.0	0.0	0.0	0.0
116	8614.6	0.0	0.0	0.0	0.0	0.0
117	8415.6	0.0	0.0	0.0	0.0	0.0
118	8214.3	0.0	0.0	0.0	0.0	0.0
119	8011.0	0.0	0.0	0.0	0.0	0.0
120	7805.7	0.0	0.0	0.0	0.0	0.0
121	7598.5	0.0	0.0	0.0	0.0	0.0
122	7389.6	0.0	0.0	0.0	0.0	0.0
123	7179.2	0.0	0.0	0.0	0.0	0.0
124	6967.3	0.0	0.0	0.0	0.0	0.0
125	6754.1	0.0	0.0	0.0	0.0	0.0
126	6539.8	0.0	0.0	0.0	0.0	0.0
127	6324.4	0.0	0.0	0.0	0.0	0.0
128	6108.1	0.0	0.0	0.0	0.0	0.0
129	3028.9	0.0	0.0	0.0	0.0	0.0

130	2852.0	0.0	0.0	0.0	0.0	0.0
131	5590.3	0.0	0.0	0.0	0.0	0.0
132	5290.4	0.0	0.0	0.0	0.0	0.0
133	4992.5	0.0	0.0	0.0	0.0	0.0
134	4696.7	0.0	0.0	0.0	0.0	0.0
135	4403.2	0.0	0.0	0.0	0.0	0.0
136	4112.0	0.0	0.0	0.0	0.0	0.0
137	3823.5	0.0	0.0	0.0	0.0	0.0
138	3537.6	0.0	0.0	0.0	0.0	0.0
139	3254.6	0.0	0.0	0.0	0.0	0.0
140	2974.6	0.0	0.0	0.0	0.0	0.0
141	2697.7	0.0	0.0	0.0	0.0	0.0
142	2424.1	0.0	0.0	0.0	0.0	0.0
143	2154.0	0.0	0.0	0.0	0.0	0.0
144	1887.4	0.0	0.0	0.0	0.0	0.0
145	1624.5	0.0	0.0	0.0	0.0	0.0
146	1365.5	0.0	0.0	0.0	0.0	0.0
147	1110.5	0.0	0.0	0.0	0.0	0.0
148	859.7	0.0	0.0	0.0	0.0	0.0
149	613.1	0.0	0.0	0.0	0.0	0.0
150	370.9	0.0	0.0	0.0	0.0	0.0
151	133.3	0.0	0.0	0.0	0.0	0.0
152	0.6	0.0	0.0	0.0	0.0	0.0

TOTAL WEIGHT OF SLIDING MASS = 1302340.94(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 1302340.94(lbs)

TOTAL AREA OF SLIDING MASS = 65117.05(ft2)

TABLE 2A - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 152 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	2	300.00	15.00	
2	2	300.00	15.00	
3	2	300.00	15.00	
4	2	300.00	15.00	
5	2	300.00	15.00	
6	2	300.00	15.00	
7	2	300.00	15.00	
8	2	300.00	15.00	
9	2	300.00	15.00	
10	2	300.00	15.00	
11	2	300.00	15.00	
12	2	300.00	15.00	
13	2	300.00	15.00	
14	2	300.00	15.00	
15	2	300.00	15.00	

16	2	300.00	15.00
17	2	300.00	15.00
18	2	300.00	15.00
19	2	300.00	15.00
20	2	300.00	15.00
21	2	300.00	15.00
22	2	300.00	15.00
23	2	300.00	15.00
24	2	300.00	15.00
25	2	300.00	15.00
26	2	300.00	15.00
27	2	300.00	15.00
28	2	300.00	15.00
29	2	300.00	15.00
30	2	300.00	15.00
31	2	300.00	15.00
32	2	300.00	15.00
33	2	300.00	15.00
34	2	300.00	15.00
35	2	300.00	15.00
36	2	300.00	15.00
37	2	300.00	15.00
38	2	300.00	15.00
39	2	300.00	15.00
40	2	300.00	15.00
41	2	300.00	15.00
42	2	300.00	15.00
43	2	300.00	15.00
44	2	300.00	15.00
45	2	300.00	15.00
46	2	300.00	15.00
47	2	300.00	15.00
48	2	300.00	15.00
49	2	300.00	15.00
50	2	300.00	15.00
51	2	300.00	15.00
52	2	300.00	15.00
53	2	300.00	15.00
54	2	300.00	15.00
55	2	300.00	15.00
56	2	300.00	15.00
57	2	300.00	15.00
58	2	300.00	15.00
59	2	300.00	15.00
60	2	300.00	15.00
61	2	300.00	15.00
62	2	300.00	15.00
63	2	300.00	15.00
64	2	300.00	15.00
65	2	300.00	15.00

66	2	300.00	15.00
67	2	300.00	15.00
68	2	300.00	15.00
69	2	300.00	15.00
70	2	300.00	15.00
71	2	300.00	15.00
72	2	300.00	15.00
73	2	300.00	15.00
74	2	300.00	15.00
75	2	300.00	15.00
76	2	300.00	15.00
77	2	300.00	15.00
78	2	300.00	15.00
79	2	300.00	15.00
80	2	300.00	15.00
81	2	300.00	15.00
82	2	300.00	15.00
83	2	300.00	15.00
84	2	300.00	15.00
85	2	300.00	15.00
86	2	300.00	15.00
87	2	300.00	15.00
88	2	300.00	15.00
89	2	300.00	15.00
90	2	300.00	15.00
91	2	300.00	15.00
92	2	300.00	15.00
93	2	300.00	15.00
94	2	300.00	15.00
95	2	300.00	15.00
96	2	300.00	15.00
97	2	300.00	15.00
98	2	300.00	15.00
99	2	300.00	15.00
100	2	300.00	15.00
101	2	300.00	15.00
102	2	300.00	15.00
103	2	300.00	15.00
104	2	300.00	15.00
105	2	300.00	15.00
106	2	300.00	15.00
107	2	300.00	15.00
108	2	300.00	15.00
109	2	300.00	15.00
110	2	300.00	15.00
111	2	300.00	15.00
112	2	300.00	15.00
113	2	300.00	15.00
114	2	300.00	15.00
115	2	300.00	15.00

116	2	300.00	15.00
117	2	300.00	15.00
118	2	300.00	15.00
119	2	300.00	15.00
120	2	300.00	15.00
121	2	300.00	15.00
122	2	300.00	15.00
123	2	300.00	15.00
124	2	300.00	15.00
125	2	300.00	15.00
126	2	300.00	15.00
127	2	300.00	15.00
128	2	300.00	15.00
129	2	300.00	15.00
130	2	300.00	15.00
131	2	300.00	15.00
132	2	300.00	15.00
133	2	300.00	15.00
134	2	300.00	15.00
135	2	300.00	15.00
136	2	300.00	15.00
137	2	300.00	15.00
138	2	300.00	15.00
139	2	300.00	15.00
140	2	300.00	15.00
141	2	300.00	15.00
142	2	300.00	15.00
143	2	300.00	15.00
144	2	300.00	15.00
145	2	300.00	15.00
146	2	300.00	15.00
147	2	300.00	15.00
148	2	300.00	15.00
149	2	300.00	15.00
150	2	300.00	15.00
151	2	300.00	15.00
152	2	300.00	15.00

SOIL OPTIONS: A = ANISOTROPIC, C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C),
F = FIBER-REINFORCED SOIL (FRS), N = NONLINEAR UNDRAINED SHEAR STRENGTH,
R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH
NOTE: Phi and C in Table 4 are modified values based on specified
Soil Options (if any).

TABLE 3 - Effective and Base Shear Stress Data on the 152 Slices

Slice Alpha X-Coord. Base Effective Available
Mobilized

No.	(deg)	Slice Cntr (ft)	Leng. (ft)	Normal Stress (psf)	Shear Strength (psf)	Shear Stress * (psf)
1	-22.03	229.97	5.00	121.92	332.67	216.60
2	-21.51	234.62	5.00	192.75	351.65	228.96
3	-20.99	239.28	5.00	262.53	370.34	241.13
4	-20.47	243.95	5.00	331.27	388.76	253.12
5	-19.95	248.64	5.00	398.96	406.90	264.93
6	-19.43	253.35	5.00	465.62	424.76	276.56
7	-18.91	258.07	5.00	531.25	442.35	288.01
8	-18.39	262.81	5.00	595.84	459.65	299.28
9	-17.87	267.56	5.00	659.40	476.69	310.37
10	-17.35	272.33	5.00	721.93	493.44	321.28
11	-16.83	277.11	5.00	783.42	509.92	332.01
12	-16.31	281.90	5.00	843.90	526.12	342.56
13	-15.79	286.71	5.00	903.34	542.05	352.93
14	-15.27	291.52	5.00	961.76	557.70	363.12
15	-14.75	296.35	5.00	1019.16	573.08	373.14
16	-14.23	301.19	5.00	1075.53	588.19	382.97
17	-13.71	306.05	5.00	1130.89	603.02	392.63
18	-13.19	310.91	5.00	1185.22	617.58	402.11
19	-12.67	315.78	5.00	1238.53	631.86	411.41
20	-12.15	320.67	5.00	1290.83	645.88	420.53
21	-11.63	325.56	5.00	1342.11	659.62	429.48
22	-11.11	330.46	5.00	1392.37	673.08	438.25
23	-10.59	335.37	5.00	1441.62	686.28	446.84

24	-10.07	340.29	5.00	1489.85	699.20	455.25
25	-9.55	345.22	5.00	1537.06	711.85	463.49
26	-9.03	350.15	5.00	1583.27	724.24	471.55
27	-8.51	355.09	5.00	1628.46	736.34	479.44
28	-7.99	360.04	5.00	1672.64	748.18	487.14
29	-7.47	364.99	5.00	1715.81	759.75	494.67
30	-6.95	369.96	5.00	1757.97	771.05	502.03
31	-6.43	374.92	5.00	1799.12	782.07	509.21
32	-5.91	379.89	5.00	1839.26	792.83	516.21
33	-5.39	384.87	5.00	1878.40	803.32	523.04
34	-4.87	389.85	5.00	1916.53	813.53	529.69
35	-4.35	394.83	5.00	1953.65	823.48	536.17
36	-3.83	399.82	5.00	1989.77	833.16	542.47
37	-3.31	404.81	5.00	2024.88	842.56	548.59
38	-2.79	409.80	5.00	2058.99	851.70	554.55
39	-2.27	414.80	5.00	2092.09	860.57	560.32
40	-1.75	419.79	5.00	2124.20	869.18	565.92
41	-1.23	424.79	5.00	2155.31	877.51	571.35
42	-0.71	429.79	5.00	2185.41	885.58	576.60
43	-0.19	434.79	5.00	2214.52	893.38	581.68
44	0.33	439.79	5.00	2242.63	900.91	586.58
45	0.85	444.79	5.00	2269.74	908.18	591.31
46	1.37	449.79	5.00	2295.86	915.17	595.87
47	1.89	454.79	5.00	2320.98	921.91	600.25
48	2.41	459.78	5.00	2345.11	928.37	604.46

49	2.93	464.78	5.00	2368.26	934.57	608.50
50	3.45	469.77	5.00	2390.41	940.51	612.37
51	3.97	474.76	5.00	2411.57	946.18	616.06
52	4.49	479.75	5.00	2431.74	951.58	619.58
53	5.01	484.73	5.00	2450.93	956.72	622.92
54	5.53	489.71	5.00	2469.13	961.60	626.10
55	6.05	494.68	5.00	2486.35	966.22	629.10
56	6.57	499.65	5.00	2502.59	970.57	631.94
57	7.09	504.62	5.00	2517.85	974.66	634.60
58	7.61	509.58	5.00	2532.13	978.48	637.09
59	8.13	514.53	5.00	2545.44	982.05	639.41
60	8.65	519.47	5.00	2557.77	985.35	641.57
61	9.17	524.41	5.00	2569.13	988.40	643.55
62	9.69	529.35	5.00	2579.53	991.18	645.36
63	10.21	534.27	5.00	2588.95	993.71	647.00
64	10.73	539.19	5.00	2597.40	995.97	648.48
65	11.25	544.10	5.00	2604.90	997.98	649.79
66	11.77	549.00	5.00	2611.43	999.73	650.93
67	12.29	553.89	5.00	2617.00	1001.22	651.90
68	12.81	558.77	5.00	2621.62	1002.46	652.70
69	13.33	563.64	5.00	2625.28	1003.44	653.34
70	13.85	568.50	5.00	2627.99	1004.17	653.82
71	14.37	573.35	5.00	2629.75	1004.64	654.12
72	14.89	578.18	5.00	2630.57	1004.86	654.26
73	15.41	583.01	5.00	2630.44	1004.82	654.24

74	15.93	587.82	5.00	2629.37	1004.54	654.06
75	16.45	592.63	5.00	2627.36	1004.00	653.71
76	16.97	597.41	5.00	2624.42	1003.21	653.19
77	17.49	602.19	5.00	2620.55	1002.17	652.52
78	18.01	606.95	5.00	2615.75	1000.89	651.68
79	18.53	611.70	5.00	2610.02	999.35	650.68
80	19.05	616.43	5.00	2603.38	997.57	649.52
81	19.57	621.15	5.00	2595.81	995.55	648.20
82	20.09	625.85	5.00	2587.33	993.27	646.72
83	20.61	630.54	5.00	2577.94	990.76	645.08
84	21.13	635.21	5.00	2567.64	988.00	643.29
85	21.65	639.87	5.00	2556.44	985.00	641.33
86	22.17	644.51	5.00	2544.34	981.75	639.22
87	22.69	649.13	5.00	2531.35	978.27	636.95
88	23.21	653.73	5.00	2517.46	974.55	634.53
89	23.73	658.32	5.00	2502.68	970.59	631.95
90	24.25	662.89	5.00	2487.03	966.40	629.22
91	24.77	667.44	5.00	2470.49	961.97	626.34
92	25.29	671.97	5.00	2453.08	957.30	623.30
93	25.81	676.48	5.00	2434.80	952.40	620.11
94	26.33	680.97	5.00	2415.66	947.27	616.77
95	26.85	685.44	5.00	2395.66	941.91	613.28
96	27.37	689.89	5.00	2374.80	936.33	609.64
97	27.89	694.32	5.00	2353.09	930.51	605.86
98	28.41	698.73	5.00	2330.54	924.47	601.92

99	28.93	703.12	5.00	2307.15	918.20	597.84
100	29.45	707.48	5.00	2282.93	911.71	593.61
101	29.97	711.82	5.00	2257.87	905.00	589.24
102	30.49	716.14	5.00	2232.00	898.06	584.73
103	31.01	720.44	5.00	2205.31	890.91	580.07
104	31.53	724.72	5.00	2177.80	883.54	575.27
105	32.05	728.97	5.00	2149.50	875.96	570.34
106	32.57	733.19	5.00	2120.39	868.16	565.26
107	33.09	737.39	5.00	2090.49	860.14	560.04
108	33.61	741.57	5.00	2059.80	851.92	554.69
109	34.13	745.72	5.00	2028.34	843.49	549.20
110	34.65	749.85	5.00	1996.10	834.85	543.57
111	35.17	753.95	5.00	1963.09	826.01	537.82
112	35.69	758.02	5.00	1929.33	816.96	531.93
113	36.21	762.07	5.00	1894.81	807.71	525.90
114	36.73	766.09	5.00	1859.55	798.27	519.75
115	37.25	770.08	5.00	1823.55	788.62	513.47
116	37.77	774.05	5.00	1786.83	778.78	507.06
117	38.29	777.99	5.00	1749.38	768.74	500.53
118	38.81	781.90	5.00	1711.21	758.52	493.87
119	39.33	785.78	5.00	1672.34	748.10	487.09
120	39.85	789.63	5.00	1632.78	737.50	480.19
121	40.37	793.45	5.00	1592.52	726.71	473.17
122	40.89	797.25	5.00	1551.59	715.75	466.02
123	41.41	801.01	5.00	1509.98	704.60	458.76

124	41.93	804.75	5.00	1467.71	693.27	451.39
125	42.45	808.45	5.00	1424.78	681.77	443.90
126	42.97	812.13	5.00	1381.22	670.10	436.30
127	43.49	815.77	5.00	1337.02	658.25	428.59
128	44.01	819.38	5.00	1292.19	646.24	420.77
129	44.53	822.09	2.55	1256.40	636.65	414.53
130	44.53	823.87	2.45	1231.68	630.03	410.21
131	45.05	826.51	5.00	1180.66	616.36	401.31
132	45.57	830.03	5.00	1114.06	598.51	389.69
133	46.09	833.51	5.00	1047.17	580.59	378.02
134	46.61	836.96	5.00	980.00	562.59	366.30
135	47.13	840.38	5.00	912.58	544.52	354.54
136	47.65	843.76	5.00	844.91	526.39	342.73
137	48.17	847.12	5.00	777.01	508.20	330.89
138	48.69	850.43	5.00	708.89	489.95	319.00
139	49.21	853.72	5.00	640.57	471.64	307.09
140	49.73	856.97	5.00	572.07	453.29	295.14
141	50.25	860.18	5.00	503.40	434.89	283.15
142	50.77	863.36	5.00	434.57	416.44	271.15
143	51.29	866.50	5.00	365.61	397.97	259.12
144	51.81	869.61	5.00	296.53	379.46	247.06
145	52.33	872.69	5.00	227.35	360.92	235.00
146	52.85	875.72	5.00	158.09	342.36	222.91
147	53.37	878.72	5.00	88.76	323.78	210.82
148	53.89	881.69	5.00	19.39	305.20	198.71

149	54.41	884.62	5.00	169.41	45.39	29.56
150	54.93	887.51	5.00	103.42	27.71	18.04
151	55.45	890.36	5.00	37.51	10.05	6.54
152	55.97	891.88	0.35	2.31	0.62	0.40

Table 4 - Base Force Data on the 152 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force * (lbs)
1	-22.03	229.97	5.00	609.61	1663.35	1083.01
2	-21.51	234.62	5.00	963.74	1758.23	1144.79
3	-20.99	239.28	5.00	1312.64	1851.72	1205.66
4	-20.47	243.95	5.00	1656.33	1943.81	1265.62
5	-19.95	248.64	5.00	1994.82	2034.51	1324.67
6	-19.43	253.35	5.00	2328.12	2123.82	1382.82
7	-18.91	258.07	5.00	2656.24	2211.74	1440.07
8	-18.39	262.81	5.00	2979.20	2298.27	1496.41
9	-17.87	267.56	5.00	3296.99	2383.43	1551.85
10	-17.35	272.33	5.00	3609.63	2467.20	1606.40
11	-16.83	277.11	5.00	3917.12	2549.59	1660.04
12	-16.31	281.90	5.00	4219.48	2630.61	1712.79
13	-15.79	286.71	5.00	4516.71	2710.25	1764.65
14	-15.27	291.52	5.00	4808.81	2788.52	1815.61
15	-14.75	296.35	5.00	5095.79	2865.41	1865.68

16	-14.23	301.19	5.00	5377.67	2940.94	1914.85
17	-13.71	306.05	5.00	5654.43	3015.10	1963.14
18	-13.19	310.91	5.00	5926.10	3087.89	2010.53
19	-12.67	315.78	5.00	6192.67	3159.32	2057.04
20	-12.15	320.67	5.00	6454.15	3229.38	2102.66
21	-11.63	325.56	5.00	6710.54	3298.08	2147.39
22	-11.11	330.46	5.00	6961.84	3365.42	2191.23
23	-10.59	335.37	5.00	7208.08	3431.40	2234.19
24	-10.07	340.29	5.00	7449.23	3496.02	2276.26
25	-9.55	345.22	5.00	7685.32	3559.27	2317.45
26	-9.03	350.15	5.00	7916.34	3621.18	2357.75
27	-8.51	355.09	5.00	8142.30	3681.72	2397.18
28	-7.99	360.04	5.00	8363.20	3740.91	2435.71
29	-7.47	364.99	5.00	8579.05	3798.75	2473.37
30	-6.95	369.96	5.00	8789.85	3855.23	2510.15
31	-6.43	374.92	5.00	8995.60	3910.36	2546.04
32	-5.91	379.89	5.00	9196.32	3964.15	2581.06
33	-5.39	384.87	5.00	9391.99	4016.58	2615.20
34	-4.87	389.85	5.00	9582.63	4067.66	2648.46
35	-4.35	394.83	5.00	9768.24	4117.39	2680.84
36	-3.83	399.82	5.00	9948.83	4165.78	2712.35
37	-3.31	404.81	5.00	10124.39	4212.82	2742.97
38	-2.79	409.80	5.00	10294.94	4258.52	2772.73
39	-2.27	414.80	5.00	10460.47	4302.87	2801.61
40	-1.75	419.79	5.00	10621.00	4345.89	2829.61

41	-1.23	424.79	5.00	10776.53	4387.56	2856.75
42	-0.71	429.79	5.00	10927.05	4427.90	2883.01
43	-0.19	434.79	5.00	11072.59	4466.89	2908.40
44	0.33	439.79	5.00	11213.14	4504.55	2932.92
45	0.85	444.79	5.00	11348.70	4540.88	2956.57
46	1.37	449.79	5.00	11479.30	4575.87	2979.35
47	1.89	454.79	5.00	11604.92	4609.53	3001.27
48	2.41	459.78	5.00	11725.57	4641.86	3022.32
49	2.93	464.78	5.00	11841.28	4672.86	3042.51
50	3.45	469.77	5.00	11952.03	4702.54	3061.83
51	3.97	474.76	5.00	12057.83	4730.89	3080.29
52	4.49	479.75	5.00	12158.70	4757.91	3097.89
53	5.01	484.73	5.00	12254.64	4783.62	3114.62
54	5.53	489.71	5.00	12345.66	4808.01	3130.50
55	6.05	494.68	5.00	12431.76	4831.08	3145.52
56	6.57	499.65	5.00	12512.96	4852.84	3159.69
57	7.09	504.62	5.00	12589.26	4873.28	3173.00
58	7.61	509.58	5.00	12660.67	4892.42	3185.46
59	8.13	514.53	5.00	12727.21	4910.24	3197.07
60	8.65	519.47	5.00	12788.87	4926.77	3207.83
61	9.17	524.41	5.00	12845.67	4941.99	3217.74
62	9.69	529.35	5.00	12897.63	4955.91	3226.80
63	10.21	534.27	5.00	12944.74	4968.53	3235.02
64	10.73	539.19	5.00	12987.02	4979.86	3242.40
65	11.25	544.10	5.00	13024.49	4989.90	3248.93

66	11.77	549.00	5.00	13057.14	4998.65	3254.63
67	12.29	553.89	5.00	13085.01	5006.12	3259.49
68	12.81	558.77	5.00	13108.09	5012.30	3263.52
69	13.33	563.64	5.00	13126.40	5017.21	3266.71
70	13.85	568.50	5.00	13139.95	5020.84	3269.08
71	14.37	573.35	5.00	13148.75	5023.20	3270.61
72	14.89	578.18	5.00	13152.83	5024.29	3271.32
73	15.41	583.01	5.00	13152.19	5024.12	3271.21
74	15.93	587.82	5.00	13146.84	5022.69	3270.28
75	16.45	592.63	5.00	13136.81	5020.00	3268.53
76	16.97	597.41	5.00	13122.11	5016.06	3265.96
77	17.49	602.19	5.00	13102.75	5010.87	3262.59
78	18.01	606.95	5.00	13078.74	5004.44	3258.40
79	18.53	611.70	5.00	13050.12	4996.77	3253.40
80	19.05	616.43	5.00	13016.88	4987.86	3247.60
81	19.57	621.15	5.00	12979.05	4977.73	3241.01
82	20.09	625.85	5.00	12936.66	4966.37	3233.61
83	20.61	630.54	5.00	12889.70	4953.79	3225.42
84	21.13	635.21	5.00	12838.21	4939.99	3216.43
85	21.65	639.87	5.00	12782.21	4924.98	3206.66
86	22.17	644.51	5.00	12721.71	4908.77	3196.11
87	22.69	649.13	5.00	12656.73	4891.36	3184.77
88	23.21	653.73	5.00	12587.29	4872.75	3172.66
89	23.73	658.32	5.00	12513.42	4852.96	3159.77
90	24.25	662.89	5.00	12435.13	4831.98	3146.11

91	24.77	667.44	5.00	12352.46	4809.83	3131.69
92	25.29	671.97	5.00	12265.41	4786.51	3116.50
93	25.81	676.48	5.00	12174.02	4762.02	3100.56
94	26.33	680.97	5.00	12078.31	4736.37	3083.86
95	26.85	685.44	5.00	11978.29	4709.57	3066.41
96	27.37	689.89	5.00	11874.01	4681.63	3048.22
97	27.89	694.32	5.00	11765.47	4652.55	3029.28
98	28.41	698.73	5.00	11652.71	4622.34	3009.61
99	28.93	703.12	5.00	11535.76	4591.00	2989.21
100	29.45	707.48	5.00	11414.64	4558.54	2968.07
101	29.97	711.82	5.00	11289.37	4524.98	2946.22
102	30.49	716.14	5.00	11160.00	4490.31	2923.65
103	31.01	720.44	5.00	11026.54	4454.55	2900.37
104	31.53	724.72	5.00	10889.02	4417.70	2876.37
105	32.05	728.97	5.00	10747.48	4379.78	2851.68
106	32.57	733.19	5.00	10601.94	4340.78	2826.29
107	33.09	737.39	5.00	10452.44	4300.72	2800.21
108	33.61	741.57	5.00	10299.01	4259.61	2773.44
109	34.13	745.72	5.00	10141.68	4217.46	2745.99
110	34.65	749.85	5.00	9980.49	4174.26	2717.87
111	35.17	753.95	5.00	9815.46	4130.05	2689.08
112	35.69	758.02	5.00	9646.65	4084.81	2659.63
113	36.21	762.07	5.00	9474.07	4038.57	2629.52
114	36.73	766.09	5.00	9297.76	3991.33	2598.76
115	37.25	770.08	5.00	9117.77	3943.10	2567.36

116	37.77	774.05	5.00	8934.14	3893.89	2535.32
117	38.29	777.99	5.00	8746.89	3843.72	2502.65
118	38.81	781.90	5.00	8556.07	3792.59	2469.36
119	39.33	785.78	5.00	8361.72	3740.52	2435.46
120	39.85	789.63	5.00	8163.89	3687.51	2400.94
121	40.37	793.45	5.00	7962.61	3633.57	2365.83
122	40.89	797.25	5.00	7757.93	3578.73	2330.12
123	41.41	801.01	5.00	7549.89	3522.99	2293.82
124	41.93	804.75	5.00	7338.54	3466.36	2256.95
125	42.45	808.45	5.00	7123.92	3408.85	2219.51
126	42.97	812.13	5.00	6906.08	3350.48	2181.50
127	43.49	815.77	5.00	6685.08	3291.26	2142.94
128	44.01	819.38	5.00	6460.95	3231.21	2103.84
129	44.53	822.09	2.55	3207.95	1625.55	1058.40
130	44.53	823.87	2.45	3013.58	1541.50	1003.67
131	45.05	826.51	5.00	5903.31	3081.79	2006.56
132	45.57	830.03	5.00	5570.28	2992.55	1948.46
133	46.09	833.51	5.00	5235.83	2902.94	1890.11
134	46.61	836.96	5.00	4900.00	2812.95	1831.52
135	47.13	840.38	5.00	4562.88	2722.62	1772.70
136	47.65	843.76	5.00	4224.53	2631.96	1713.67
137	48.17	847.12	5.00	3885.03	2540.99	1654.44
138	48.69	850.43	5.00	3544.45	2449.73	1595.02
139	49.21	853.72	5.00	3202.86	2358.20	1535.43
140	49.73	856.97	5.00	2860.35	2266.43	1475.68

141	50.25	860.18	5.00	2517.00	2174.43	1415.77
142	50.77	863.36	5.00	2172.87	2082.22	1355.74
143	51.29	866.50	5.00	1828.07	1989.83	1295.58
144	51.81	869.61	5.00	1482.67	1897.28	1235.32
145	52.33	872.69	5.00	1136.77	1804.60	1174.98
146	52.85	875.72	5.00	790.45	1711.80	1114.56
147	53.37	878.72	5.00	443.81	1618.92	1054.08
148	53.89	881.69	5.00	96.94	1525.98	993.57
149	54.41	884.62	5.00	847.04	226.96	147.78
150	54.93	887.51	5.00	517.09	138.55	90.21
151	55.45	890.36	5.00	187.53	50.25	32.72
152	55.97	891.88	0.35	0.81	0.22	0.14

Sum of the Resisting Forces = 519998.36 (lbs)

Average Available Shear Strength = 693.01(psf)

Sum of the Driving Forces = 338571.74 (lbs)

Average Mobilized Shear Stress = 451.22(psf)

Total length of the failure surface = 750.35(ft)

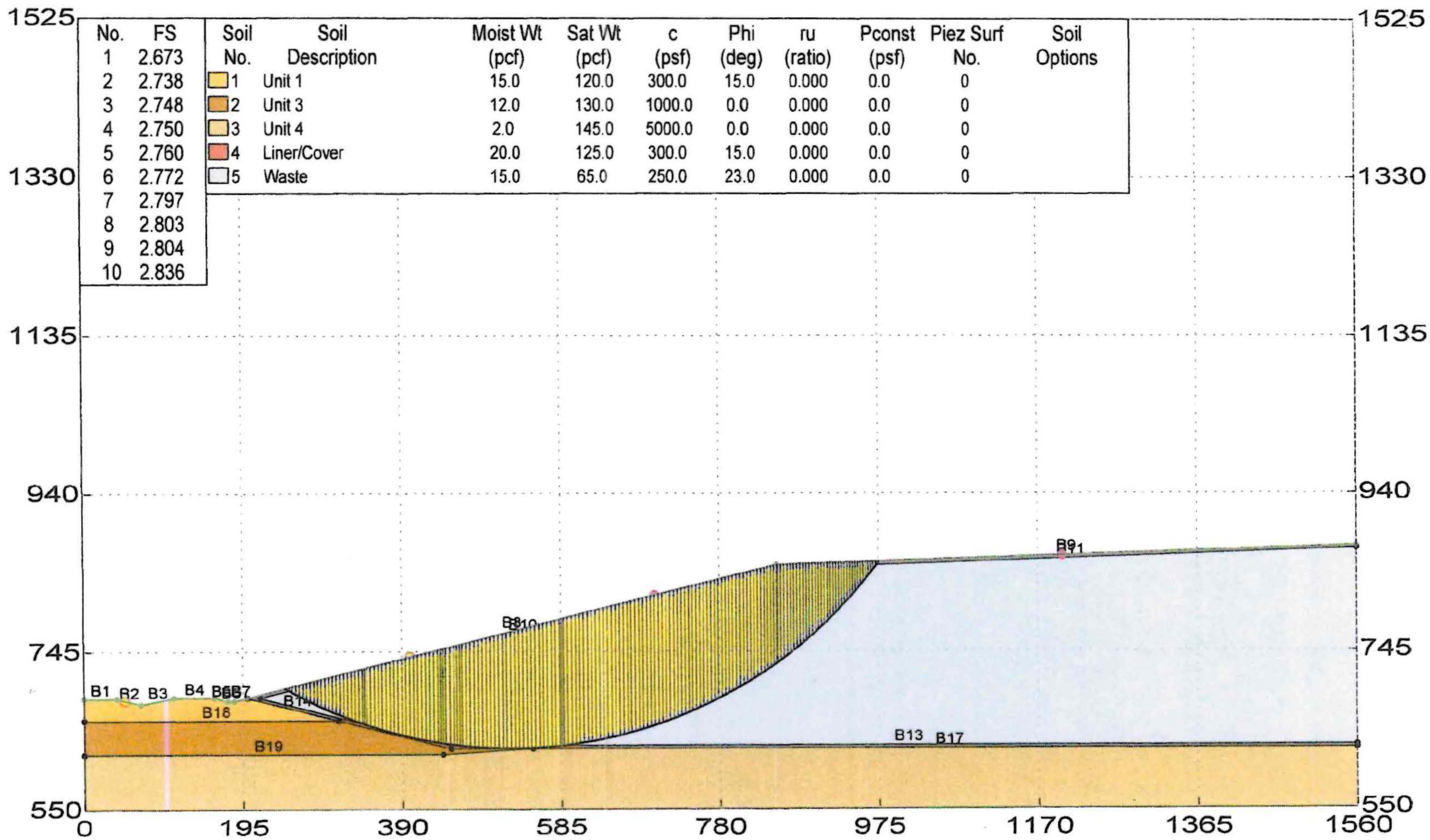
Factor of Safety Balance Check: FS = 1.53586

**** END OF GEOSTASE OUTPUT ****

Chisholm Trail Disposal Landfill
Final Waste Slope

BME

\Final Waste Slope.gsd



No.	FS
1	2.673
2	2.738
3	2.748
4	2.750
5	2.760
6	2.772
7	2.797
8	2.803
9	2.804
10	2.836

Soil No.	Soil Description	Moist Wt (pcf)	Sat Wt (pcf)	c (psf)	Phi (deg)	ru (ratio)	Pconst (psf)	Piez Surf No.	Soil Options
1	Unit 1	15.0	120.0	300.0	15.0	0.000	0.0	0	
2	Unit 3	12.0	130.0	1000.0	0.0	0.000	0.0	0	
3	Unit 4	2.0	145.0	5000.0	0.0	0.000	0.0	0	
4	Liner/Cover	20.0	125.0	300.0	15.0	0.000	0.0	0	
5	Waste	15.0	65.0	250.0	23.0	0.000	0.0	0	

GEOSTASE FS = 2.673

Simplified Janbu Method

GEOSTASE
Slope Stability Analysis

*** GEOSTASE(R) ***

****
SLOPE STABILITY ANALYSIS SOFTWARE
Simplified Bishop, Simplified Janbu, or General Equilibrium (GE)
Options.
(Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)
Including Pier/Pile, Planar Reinf, Nail, Tieback, Line Loads
Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads
Nonlinear Undrained Shear Strength, Curved Strength Envelope,
Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown
2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.
****

Analysis Date: 11/ 4/ 2024
Analysis Time:
Analysis By: BME

Input File Name: O:\Green Group\Wise County\Solid Waste\Type IV\P\Stability\Final Waste Slope.gsd

Output File Name: O:\Green Group\Wise County\Solid Waste\Type IV\P\Stability\Final Waste Slope.OUT

Unit System: English

PROJECT: Chisholm Trail Disposal Landfill

DESCRIPTION: Final Waste Slope

BOUNDARY DATA

9 Surface Boundaries

20 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	687.000	40.000	687.000	1
2	40.000	687.000	70.000	680.000	1
3	70.000	680.000	110.000	688.000	1
4	110.000	688.000	160.000	688.000	1
5	160.000	688.000	176.000	684.000	1
6	176.000	684.000	184.000	684.000	1
7	184.000	684.000	200.000	688.000	1
8	200.000	688.000	850.000	852.000	4
9	850.000	852.000	1560.000	875.000	4
10	216.000	688.000	850.000	847.000	5
11	850.000	847.000	1560.000	872.000	5
12	216.000	688.000	450.000	629.000	4
13	450.000	629.000	1560.000	629.000	4
14	200.000	688.000	312.000	660.000	1
15	312.000	660.000	450.000	625.000	2
16	450.000	625.000	550.000	625.000	2
17	550.000	625.000	1560.000	625.000	3
18	0.000	660.000	312.000	660.000	2
19	0.000	618.000	440.000	618.000	3
20	440.000	618.000	550.000	625.000	3

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 550.000(ft)

MOHR-COULOMB SOIL PARAMETERS

5 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	Pressure Constant (psf)	Water Surface No.	Water Option
1 Unit 1	15.0	120.0	300.00	15.00	0.000	0.0	0	0
2 Unit 3	12.0	130.0	1000.00	0.00	0.000	0.0	0	0
3 Unit 4	2.0	145.0	5000.00	0.00	0.000	0.0	0	0
4 Liner/Cover	20.0	125.0	300.00	15.00	0.000	0.0	0	

```
    0
  5 Waste                  15.0      65.0      250.00     23.00     0.000       0.0       0
    0
```

TRIAL FAILURE SURFACE DATA

Circular Trial Failure Surfaces Have Been Generated Using A Random Procedure.

1000 Trial Surfaces Have Been Generated.

1000 Surfaces Generated at Increments of 4.2042(in) Equally Spaced Within the Start Range

Along The Specified Surface Between X = 50.00(ft)
and X = 400.00(ft)

Each Surface Enters within a Range Between X = 700.00(ft)
and X =1200.00(ft)

Unless XCLUDE Lines Were Specified, The Minimum Elevation
To Which A Surface Extends Is Y = 550.00(ft)

Specified Maximum Radius = 5000.000(ft)

10.000(ft) Line Segments Were Used For Each Trial Failure Surface.

The Simplified Janbu Method Was Selected for FS Analysis.

Total Number of Trial Surfaces Attempted = 1000

Number of Trial Surfaces With Valid FS = 1000

Statistical Data On All Valid FS Values:
FS Max = 9.646 FS Min = 2.673 FS Ave = 5.496
Standard Deviation = 2.079 Coefficient of Variation = 37.83 %

Critical Surface is Sequence Number 562 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

BACK-CALCULATED CIRCULAR SURFACE PARAMETERS:

Circle Center At X = 524.671708(ft) ; Y = 1182.164010(ft); and Radius = 556.850628(ft)

Circular Trial Failure Surface Generated With 83 Coordinate Points

Point No.	X-Coord. (ft)	Y-Coord. (ft)
1	246.547	699.744
2	255.254	694.827
3	264.049	690.068
4	272.928	685.467
5	281.888	681.027
6	290.926	676.748
7	300.040	672.632
8	309.226	668.680
9	318.482	664.894
10	327.804	661.275
11	337.189	657.824
12	346.635	654.541
13	356.139	651.429
14	365.696	648.489
15	375.306	645.720
16	384.963	643.124
17	394.665	640.702
18	404.409	638.455
19	414.192	636.383
20	424.011	634.487
21	433.862	632.768
22	443.742	631.226
23	453.649	629.861
24	463.578	628.675
25	473.527	627.667
26	483.493	626.838
27	493.472	626.188
28	503.461	625.718
29	513.456	625.426
30	523.456	625.315
31	533.456	625.383
32	543.453	625.630
33	553.443	626.057
34	563.425	626.664
35	573.394	627.449
36	583.348	628.413
37	593.282	629.556
38	603.194	630.877
39	613.081	632.376
40	622.940	634.053

41	632.767	635.906
42	642.559	637.935
43	652.313	640.140
44	662.025	642.519
45	671.694	645.073
46	681.315	647.799
47	690.885	650.698
48	700.402	653.769
49	709.863	657.010
50	719.263	660.420
51	728.601	663.999
52	737.873	667.744
53	747.076	671.656
54	756.208	675.732
55	765.265	679.971
56	774.244	684.373
57	783.143	688.935
58	791.958	693.656
59	800.687	698.534
60	809.328	703.569
61	817.876	708.757
62	826.330	714.099
63	834.687	719.591
64	842.943	725.233
65	851.097	731.022
66	859.146	736.957
67	867.087	743.035
68	874.917	749.254
69	882.635	755.614
70	890.237	762.111
71	897.721	768.743
72	905.085	775.509
73	912.326	782.405
74	919.442	789.431
75	926.431	796.583
76	933.290	803.860
77	940.017	811.259
78	946.611	818.777
79	953.068	826.413
80	959.388	834.163
81	965.567	842.026
82	971.604	849.998
83	976.042	856.083

Factor Of Safety For The Critical or Specified Surface = 2.673

Table 1 - Geometry Data on the 170 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length (ft)
1	2.50	1.02	247.80	699.04	700.06	-29.45	14.16	2.88
2	2.50	3.07	250.30	697.62	700.69	-29.45	14.16	2.88
3	3.70	5.60	253.40	695.87	701.47	-29.45	14.16	4.25
4	4.40	8.86	257.45	693.64	702.50	-28.42	14.16	5.00
5	4.40	12.35	261.85	691.26	703.61	-28.42	14.16	5.00
6	4.44	15.80	266.27	688.92	704.72	-27.39	14.16	5.00
7	4.44	19.22	270.71	686.62	705.84	-27.39	14.16	5.00
8	4.48	22.61	275.17	684.36	706.97	-26.36	14.16	5.00
9	4.48	25.96	279.65	682.14	708.10	-26.36	14.16	5.00
10	4.52	29.27	284.15	679.96	709.23	-25.33	14.16	5.00
11	4.52	32.55	288.67	677.82	710.37	-25.33	14.16	5.00
12	4.56	35.80	293.20	675.72	711.52	-24.31	14.16	5.00
13	4.56	39.01	297.76	673.66	712.67	-24.31	14.16	5.00
14	4.59	42.18	302.34	671.64	713.82	-23.28	14.16	5.00
15	4.59	45.31	306.93	669.67	714.98	-23.28	14.16	5.00
16	4.63	48.41	311.54	667.73	716.14	-22.25	14.16	5.00
17	4.63	51.47	316.17	665.84	717.31	-22.25	14.16	5.00
18	4.66	54.49	320.81	663.99	718.48	-21.22	14.16	5.00
19	4.66	57.48	325.47	662.18	719.66	-21.22	14.16	5.00
20	4.69	60.43	330.15	660.41	720.84	-20.19	14.16	5.00
21	4.69	63.34	334.84	658.69	722.02	-20.19	14.16	5.00
22	3.98	65.99	339.18	657.13	723.12	-19.16	14.16	

4.22

23	2.73	68.00	342.54	655.96	723.96	-19.16	14.16	2.89
24	2.73	69.64	345.27	655.02	724.65	-19.16	14.16	2.89
25	4.75	71.83	349.01	653.76	725.60	-18.13	14.16	5.00
26	4.75	74.59	353.76	652.21	726.80	-18.13	14.16	5.00
27	4.78	77.30	358.53	650.69	728.00	-17.10	14.16	5.00
28	4.78	79.98	363.31	649.22	729.20	-17.10	14.16	5.00
29	4.80	82.62	368.10	647.80	730.41	-16.07	14.16	5.00
30	4.80	85.21	372.90	646.41	731.62	-16.07	14.16	5.00
31	4.83	87.77	377.72	645.07	732.84	-15.04	14.16	5.00
32	4.83	90.29	382.55	643.77	734.06	-15.04	14.16	5.00
33	4.85	92.76	387.39	642.52	735.28	-14.02	14.16	5.00
34	4.85	95.20	392.24	641.31	736.50	-14.02	14.16	5.00
35	4.87	97.59	397.10	640.14	737.73	-12.99	14.16	5.00
36	4.87	99.94	401.97	639.02	738.96	-12.99	14.16	5.00
37	4.89	102.25	406.86	637.94	740.19	-11.96	14.16	5.00
38	4.89	104.52	411.75	636.90	741.43	-11.96	14.16	5.00
39	4.91	106.75	416.65	635.91	742.66	-10.93	14.16	5.00
40	4.91	108.94	421.56	634.96	743.90	-10.93	14.16	5.00
41	4.93	111.08	426.47	634.06	745.14	-9.90	14.16	5.00
42	4.93	113.19	431.40	633.20	746.38	-9.90	14.16	5.00
43	3.14	114.88	435.43	632.52	747.40	-8.87	14.16	3.17
44	3.37	116.21	438.68	632.02	748.22	-8.87	14.16	3.41
45	3.37	117.58	442.06	631.49	749.07	-8.87	14.16	3.41
46	4.95	119.24	446.22	630.88	750.12	-7.84	14.16	5.00
47	4.95	121.17	451.17	630.20	751.37	-7.84	14.16	

								5.00
48	3.60	122.81	455.45	629.65	752.45	-6.81	14.16	3.63
49	3.60	124.15	459.06	629.22	753.36	-6.81	14.16	3.63
50	2.72	125.32	462.22	628.84	754.16	-6.81	14.16	2.74
51	4.97	126.71	466.07	628.42	755.13	-5.78	14.16	5.00
52	4.97	128.47	471.04	627.92	756.39	-5.78	14.16	5.00
53	4.98	130.18	476.02	627.46	757.64	-4.76	14.16	5.00
54	4.98	131.85	481.00	627.05	758.90	-4.76	14.16	5.00
55	4.99	133.48	485.99	626.68	760.16	-3.73	14.16	5.00
56	4.99	135.07	490.98	626.35	761.42	-3.73	14.16	5.00
57	4.99	136.60	495.97	626.07	762.68	-2.70	14.16	5.00
58	4.99	138.10	500.96	625.84	763.94	-2.70	14.16	5.00
59	5.00	139.55	505.96	625.64	765.20	-1.67	14.16	5.00
60	5.00	140.96	510.96	625.50	766.46	-1.67	14.16	5.00
61	5.00	142.32	515.96	625.40	767.72	-0.64	14.16	5.00
62	5.00	143.64	520.96	625.34	768.98	-0.64	14.16	5.00
63	5.00	144.91	525.96	625.33	770.24	0.39	14.16	5.00
64	5.00	146.14	530.96	625.37	771.50	0.39	14.16	5.00
65	5.00	147.32	535.95	625.44	772.76	1.42	14.16	5.00
66	5.00	148.46	540.95	625.57	774.03	1.42	14.16	5.00
67	5.00	149.55	545.95	625.74	775.29	2.45	14.16	5.00
68	5.00	150.60	550.95	625.95	776.55	2.45	14.16	5.00
69	4.99	151.60	555.94	626.21	777.81	3.48	14.16	5.00
70	4.99	152.55	560.93	626.51	779.07	3.48	14.16	5.00
71	4.98	153.46	565.92	626.86	780.32	4.51	14.16	5.00
72	4.98	154.33	570.90	627.25	781.58	4.51	14.16	

5.00							
73	4.98	155.15	575.88	627.69	782.84	5.53	14.16
5.00							
74	4.98	155.92	580.86	628.17	784.09	5.53	14.16
5.00							
75	2.55	156.48	584.62	628.56	785.04	6.56	14.16
2.57							
76	2.55	156.83	587.17	628.85	785.69	6.56	14.16
2.57							
77	4.84	157.34	590.86	629.28	786.62	6.56	14.16
4.87							
78	4.96	157.97	595.76	629.89	787.85	7.59	14.16
5.00							
79	4.96	158.56	600.72	630.55	789.10	7.59	14.16
5.00							
80	4.94	159.10	605.67	631.25	790.35	8.62	14.16
5.00							
81	4.94	159.60	610.61	632.00	791.60	8.62	14.16
5.00							
82	4.93	160.05	615.55	632.80	792.85	9.65	14.16
5.00							
83	4.93	160.46	620.48	633.63	794.09	9.65	14.16
5.00							
84	4.91	160.81	625.40	634.52	795.33	10.68	14.16
5.00							
85	4.91	161.13	630.31	635.44	796.57	10.68	14.16
5.00							
86	4.90	161.39	635.21	636.41	797.81	11.71	14.16
5.00							
87	4.90	161.62	640.11	637.43	799.04	11.71	14.16
5.00							
88	4.88	161.79	645.00	638.49	800.28	12.74	14.16
5.00							
89	4.88	161.92	649.87	639.59	801.51	12.74	14.16
5.00							
90	4.86	162.00	654.74	640.73	802.73	13.77	14.16
5.00							
91	4.86	162.04	659.60	641.92	803.96	13.77	14.16
5.00							
92	4.83	162.02	664.44	643.16	805.18	14.79	14.16
5.00							
93	4.83	161.97	669.28	644.43	806.40	14.79	14.16
5.00							
94	4.81	161.86	674.10	645.75	807.62	15.82	14.16
5.00							
95	4.81	161.71	678.91	647.12	808.83	15.82	14.16
5.00							
96	4.79	161.52	683.71	648.52	810.04	16.85	14.16
5.00							
97	4.79	161.28	688.49	649.97	811.25	16.85	14.16

5.00	98	4.76	160.99	693.26	651.47	812.45	17.88	14.16
5.00	99	4.76	160.65	698.02	653.00	813.66	17.88	14.16
5.00	100	4.73	160.27	702.77	654.58	814.85	18.91	14.16
5.00	101	4.73	159.85	707.50	656.20	816.05	18.91	14.16
5.00	102	4.70	159.37	712.21	657.86	817.24	19.94	14.16
5.00	103	4.70	158.85	716.91	659.57	818.42	19.94	14.16
5.00	104	4.67	158.29	721.60	661.31	819.60	20.97	14.16
5.00	105	4.67	157.68	726.27	663.10	820.78	20.97	14.16
5.00	106	4.64	157.02	730.92	664.93	821.95	22.00	14.16
5.00	107	4.64	156.32	735.55	666.81	823.12	22.00	14.16
5.00	108	4.60	155.57	740.17	668.72	824.29	23.03	14.16
5.00	109	4.60	154.77	744.78	670.68	825.45	23.03	14.16
5.00	110	4.57	153.93	749.36	672.67	826.61	24.05	14.16
5.00	111	4.57	153.05	753.92	674.71	827.76	24.05	14.16
5.00	112	4.53	152.12	758.47	676.79	828.91	25.08	14.16
5.00	113	4.53	151.14	763.00	678.91	830.05	25.08	14.16
5.00	114	4.49	150.12	767.51	681.07	831.19	26.11	14.16
5.00	115	4.49	149.05	772.00	683.27	832.32	26.11	14.16
5.00	116	4.45	147.93	776.47	685.51	833.45	27.14	14.16
5.00	117	4.45	146.78	780.92	687.79	834.57	27.14	14.16
5.00	118	4.41	145.57	785.35	690.11	835.69	28.17	14.16
5.00	119	4.41	144.32	789.75	692.48	836.80	28.17	14.16
5.00	120	4.36	143.03	794.14	694.88	837.91	29.20	14.16
5.00	121	4.36	141.69	798.51	697.31	839.01	29.20	14.16
5.00	122	4.32	140.31	802.85	699.79	840.10	30.23	14.16

5.00								
123	4.32	138.88	807.17	702.31	841.19	30.23	14.16	
5.00								
124	4.27	137.41	811.46	704.87	842.28	31.26	14.16	
5.00								
125	4.27	135.90	815.74	707.46	843.36	31.26	14.16	
5.00								
126	4.23	134.34	819.99	710.09	844.43	32.29	14.16	
5.00								
127	4.23	132.73	824.22	712.76	845.49	32.29	14.16	
5.00								
128	4.18	131.08	828.42	715.47	846.55	33.32	14.16	
5.00								
129	4.18	129.39	832.60	718.22	847.61	33.32	14.16	
5.00								
130	4.13	127.66	836.75	721.00	848.66	34.34	14.16	
5.00								
131	4.13	125.88	840.88	723.82	849.70	34.34	14.16	
5.00								
132	3.53	124.18	844.71	726.49	850.66	35.37	14.16	
4.33								
133	3.53	122.56	848.24	728.99	851.55	35.37	14.16	
4.33								
134	1.10	121.39	850.55	730.63	852.02	35.37	1.86	
1.35								
135	4.02	119.59	853.11	732.51	852.10	36.40	1.86	
5.00								
136	4.02	116.76	857.13	735.47	852.23	36.40	1.86	
5.00								
137	3.97	113.88	861.13	738.48	852.36	37.43	1.86	
5.00								
138	3.97	110.97	865.10	741.52	852.49	37.43	1.86	
5.00								
139	3.92	108.03	869.04	744.59	852.62	38.46	1.86	
5.00								
140	3.92	105.04	872.96	747.70	852.74	38.46	1.86	
5.00								
141	3.86	102.03	876.85	750.84	852.87	39.49	1.86	
5.00								
142	3.86	98.97	880.71	754.02	852.99	39.49	1.86	
5.00								
143	3.80	95.88	884.54	757.24	853.12	40.52	1.86	
5.00								
144	3.80	92.76	888.34	760.49	853.24	40.52	1.86	
5.00								
145	3.74	89.60	892.11	763.77	853.36	41.55	1.86	
5.00								
146	3.74	86.40	895.85	767.08	853.49	41.55	1.86	
5.00								
147	3.68	83.17	899.56	770.43	853.61	42.58	1.86	

								5.00
148	3.68	79.91	903.24	773.82	853.72	42.58	1.86	5.00
149	3.62	76.61	906.89	777.23	853.84	43.60	1.86	5.00
150	3.62	73.28	910.52	780.68	853.96	43.60	1.86	5.00
151	3.56	69.91	914.10	784.16	854.08	44.63	1.86	5.00
152	3.56	66.52	917.66	787.67	854.19	44.63	1.86	5.00
153	3.49	63.09	921.19	791.22	854.31	45.66	1.86	5.00
154	3.49	59.62	924.68	794.80	854.42	45.66	1.86	5.00
155	3.43	56.13	928.15	798.40	854.53	46.69	1.86	5.00
156	3.43	52.60	931.58	802.04	854.64	46.69	1.86	5.00
157	3.36	49.04	934.97	805.71	854.75	47.72	1.86	5.00
158	3.36	45.45	938.34	809.41	854.86	47.72	1.86	5.00
159	3.30	41.83	941.67	813.14	854.97	48.75	1.86	5.00
160	3.30	38.18	944.96	816.90	855.08	48.75	1.86	5.00
161	3.23	34.50	948.23	820.69	855.18	49.78	1.86	5.00
162	3.23	30.78	951.45	824.50	855.29	49.78	1.86	5.00
163	3.16	27.04	954.65	828.35	855.39	50.81	1.86	5.00
164	3.16	23.27	957.81	832.23	855.49	50.81	1.86	5.00
165	3.09	19.46	960.93	836.13	855.59	51.84	1.86	5.00
166	3.09	15.63	964.02	840.06	855.69	51.84	1.86	5.00
167	3.02	11.77	967.08	844.02	855.79	52.87	1.86	5.00
168	3.02	7.89	970.09	848.00	855.89	52.87	1.86	5.00
169	0.96	5.30	972.08	850.66	855.95	53.89	1.86	1.63
170	3.48	2.33	974.30	853.70	856.03	53.89	1.86	5.90

Table 2 - Force Data On The 170 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force Top (lbs)	Ualpha Force Bot (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Distributed Load (lbs)
1	51.2	0.0	0.0	0.0	0.0	0.0
2	153.6	0.0	0.0	0.0	0.0	0.0
3	386.7	0.0	0.0	0.0	0.0	0.0
4	674.4	0.0	0.0	0.0	0.0	0.0
5	904.7	0.0	0.0	0.0	0.0	0.0
6	1143.6	0.0	0.0	0.0	0.0	0.0
7	1371.5	0.0	0.0	0.0	0.0	0.0
8	1611.7	0.0	0.0	0.0	0.0	0.0
9	1837.0	0.0	0.0	0.0	0.0	0.0
10	2078.0	0.0	0.0	0.0	0.0	0.0
11	2300.4	0.0	0.0	0.0	0.0	0.0
12	2541.5	0.0	0.0	0.0	0.0	0.0
13	2760.9	0.0	0.0	0.0	0.0	0.0
14	3001.5	0.0	0.0	0.0	0.0	0.0
15	3217.6	0.0	0.0	0.0	0.0	0.0
16	3457.2	0.0	0.0	0.0	0.0	0.0
17	3669.8	0.0	0.0	0.0	0.0	0.0
18	3907.7	0.0	0.0	0.0	0.0	0.0
19	4116.6	0.0	0.0	0.0	0.0	0.0
20	4352.3	0.0	0.0	0.0	0.0	0.0
21	4557.3	0.0	0.0	0.0	0.0	0.0
22	4027.5	0.0	0.0	0.0	0.0	0.0
23	2845.1	0.0	0.0	0.0	0.0	0.0
24	2915.8	0.0	0.0	0.0	0.0	0.0
25	5237.3	0.0	0.0	0.0	0.0	0.0
26	5442.3	0.0	0.0	0.0	0.0	0.0
27	5675.7	0.0	0.0	0.0	0.0	0.0
28	5874.1	0.0	0.0	0.0	0.0	0.0
29	6101.1	0.0	0.0	0.0	0.0	0.0
30	6292.5	0.0	0.0	0.0	0.0	0.0
31	6512.4	0.0	0.0	0.0	0.0	0.0
32	6696.8	0.0	0.0	0.0	0.0	0.0
33	6909.2	0.0	0.0	0.0	0.0	0.0
34	7086.3	0.0	0.0	0.0	0.0	0.0
35	7290.6	0.0	0.0	0.0	0.0	0.0
36	7460.2	0.0	0.0	0.0	0.0	0.0
37	7656.0	0.0	0.0	0.0	0.0	0.0
38	7817.9	0.0	0.0	0.0	0.0	0.0
39	8004.6	0.0	0.0	0.0	0.0	0.0
40	8158.7	0.0	0.0	0.0	0.0	0.0
41	8336.1	0.0	0.0	0.0	0.0	0.0
42	8482.2	0.0	0.0	0.0	0.0	0.0
43	5474.1	0.0	0.0	0.0	0.0	0.0

44	5952.1	0.0	0.0	0.0	0.0	0.0
45	6021.9	0.0	0.0	0.0	0.0	0.0
46	8967.9	0.0	0.0	0.0	0.0	0.0
47	9111.6	0.0	0.0	0.0	0.0	0.0
48	6718.4	0.0	0.0	0.0	0.0	0.0
49	6791.0	0.0	0.0	0.0	0.0	0.0
50	5177.5	0.0	0.0	0.0	0.0	0.0
51	9578.9	0.0	0.0	0.0	0.0	0.0
52	9722.9	0.0	0.0	0.0	0.0	0.0
53	9878.8	0.0	0.0	0.0	0.0	0.0
54	10014.3	0.0	0.0	0.0	0.0	0.0
55	10158.9	0.0	0.0	0.0	0.0	0.0
56	10285.7	0.0	0.0	0.0	0.0	0.0
57	10418.6	0.0	0.0	0.0	0.0	0.0
58	10536.7	0.0	0.0	0.0	0.0	0.0
59	10657.6	0.0	0.0	0.0	0.0	0.0
60	10766.9	0.0	0.0	0.0	0.0	0.0
61	10875.7	0.0	0.0	0.0	0.0	0.0
62	10976.0	0.0	0.0	0.0	0.0	0.0
63	11072.4	0.0	0.0	0.0	0.0	0.0
64	11163.8	0.0	0.0	0.0	0.0	0.0
65	11247.5	0.0	0.0	0.0	0.0	0.0
66	11329.8	0.0	0.0	0.0	0.0	0.0
67	11400.8	0.0	0.0	0.0	0.0	0.0
68	11474.1	0.0	0.0	0.0	0.0	0.0
69	11532.2	0.0	0.0	0.0	0.0	0.0
70	11596.4	0.0	0.0	0.0	0.0	0.0
71	11641.4	0.0	0.0	0.0	0.0	0.0
72	11696.5	0.0	0.0	0.0	0.0	0.0
73	11728.5	0.0	0.0	0.0	0.0	0.0
74	11774.4	0.0	0.0	0.0	0.0	0.0
75	6048.4	0.0	0.0	0.0	0.0	0.0
76	6058.1	0.0	0.0	0.0	0.0	0.0
77	11523.7	0.0	0.0	0.0	0.0	0.0
78	11858.0	0.0	0.0	0.0	0.0	0.0
79	11902.0	0.0	0.0	0.0	0.0	0.0
80	11912.1	0.0	0.0	0.0	0.0	0.0
81	11949.2	0.0	0.0	0.0	0.0	0.0
82	11948.4	0.0	0.0	0.0	0.0	0.0
83	11978.5	0.0	0.0	0.0	0.0	0.0
84	11966.7	0.0	0.0	0.0	0.0	0.0
85	11990.0	0.0	0.0	0.0	0.0	0.0
86	11967.2	0.0	0.0	0.0	0.0	0.0
87	11983.6	0.0	0.0	0.0	0.0	0.0
88	11950.0	0.0	0.0	0.0	0.0	0.0
89	11959.6	0.0	0.0	0.0	0.0	0.0
90	11915.2	0.0	0.0	0.0	0.0	0.0
91	11918.0	0.0	0.0	0.0	0.0	0.0
92	11863.0	0.0	0.0	0.0	0.0	0.0
93	11859.1	0.0	0.0	0.0	0.0	0.0

94	11793.7	0.0	0.0	0.0	0.0	0.0
95	11783.0	0.0	0.0	0.0	0.0	0.0
96	11707.3	0.0	0.0	0.0	0.0	0.0
97	11690.1	0.0	0.0	0.0	0.0	0.0
98	11604.2	0.0	0.0	0.0	0.0	0.0
99	11580.5	0.0	0.0	0.0	0.0	0.0
100	11484.7	0.0	0.0	0.0	0.0	0.0
101	11454.5	0.0	0.0	0.0	0.0	0.0
102	11349.0	0.0	0.0	0.0	0.0	0.0
103	11312.6	0.0	0.0	0.0	0.0	0.0
104	11197.7	0.0	0.0	0.0	0.0	0.0
105	11155.0	0.0	0.0	0.0	0.0	0.0
106	11030.9	0.0	0.0	0.0	0.0	0.0
107	10982.2	0.0	0.0	0.0	0.0	0.0
108	10849.2	0.0	0.0	0.0	0.0	0.0
109	10794.5	0.0	0.0	0.0	0.0	0.0
110	10653.0	0.0	0.0	0.0	0.0	0.0
111	10592.5	0.0	0.0	0.0	0.0	0.0
112	10442.7	0.0	0.0	0.0	0.0	0.0
113	10376.5	0.0	0.0	0.0	0.0	0.0
114	10218.9	0.0	0.0	0.0	0.0	0.0
115	10147.1	0.0	0.0	0.0	0.0	0.0
116	9982.0	0.0	0.0	0.0	0.0	0.0
117	9904.9	0.0	0.0	0.0	0.0	0.0
118	9732.7	0.0	0.0	0.0	0.0	0.0
119	9650.3	0.0	0.0	0.0	0.0	0.0
120	9471.4	0.0	0.0	0.0	0.0	0.0
121	9384.0	0.0	0.0	0.0	0.0	0.0
122	9198.8	0.0	0.0	0.0	0.0	0.0
123	9106.5	0.0	0.0	0.0	0.0	0.0
124	8915.5	0.0	0.0	0.0	0.0	0.0
125	8818.4	0.0	0.0	0.0	0.0	0.0
126	8622.1	0.0	0.0	0.0	0.0	0.0
127	8520.5	0.0	0.0	0.0	0.0	0.0
128	8319.3	0.0	0.0	0.0	0.0	0.0
129	8213.4	0.0	0.0	0.0	0.0	0.0
130	8007.8	0.0	0.0	0.0	0.0	0.0
131	7897.7	0.0	0.0	0.0	0.0	0.0
132	6660.3	0.0	0.0	0.0	0.0	0.0
133	6574.9	0.0	0.0	0.0	0.0	0.0
134	2025.2	0.0	0.0	0.0	0.0	0.0
135	7319.8	0.0	0.0	0.0	0.0	0.0
136	7148.3	0.0	0.0	0.0	0.0	0.0
137	6881.2	0.0	0.0	0.0	0.0	0.0
138	6707.6	0.0	0.0	0.0	0.0	0.0
139	6441.1	0.0	0.0	0.0	0.0	0.0
140	6265.7	0.0	0.0	0.0	0.0	0.0
141	6000.3	0.0	0.0	0.0	0.0	0.0
142	5823.3	0.0	0.0	0.0	0.0	0.0
143	5559.8	0.0	0.0	0.0	0.0	0.0

144	5381.4	0.0	0.0	0.0	0.0	0.0
145	5120.4	0.0	0.0	0.0	0.0	0.0
146	4940.9	0.0	0.0	0.0	0.0	0.0
147	4682.9	0.0	0.0	0.0	0.0	0.0
148	4502.5	0.0	0.0	0.0	0.0	0.0
149	4248.2	0.0	0.0	0.0	0.0	0.0
150	4067.1	0.0	0.0	0.0	0.0	0.0
151	3817.2	0.0	0.0	0.0	0.0	0.0
152	3635.6	0.0	0.0	0.0	0.0	0.0
153	3390.6	0.0	0.0	0.0	0.0	0.0
154	3208.9	0.0	0.0	0.0	0.0	0.0
155	2969.5	0.0	0.0	0.0	0.0	0.0
156	2787.9	0.0	0.0	0.0	0.0	0.0
157	2554.6	0.0	0.0	0.0	0.0	0.0
158	2373.3	0.0	0.0	0.0	0.0	0.0
159	2146.8	0.0	0.0	0.0	0.0	0.0
160	1966.0	0.0	0.0	0.0	0.0	0.0
161	1746.9	0.0	0.0	0.0	0.0	0.0
162	1566.9	0.0	0.0	0.0	0.0	0.0
163	1355.9	0.0	0.0	0.0	0.0	0.0
164	1176.9	0.0	0.0	0.0	0.0	0.0
165	974.5	0.0	0.0	0.0	0.0	0.0
166	796.8	0.0	0.0	0.0	0.0	0.0
167	603.6	0.0	0.0	0.0	0.0	0.0
168	427.4	0.0	0.0	0.0	0.0	0.0
169	98.8	0.0	0.0	0.0	0.0	0.0
170	161.9	0.0	0.0	0.0	0.0	0.0

TOTAL WEIGHT OF SLIDING MASS = 1245267.79(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 1245267.79(lbs)

TOTAL AREA OF SLIDING MASS = 81755.08(ft2)

TABLE 2A - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 170 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	4	300.00	15.00	
2	4	300.00	15.00	
3	5	250.00	23.00	
4	5	250.00	23.00	
5	5	250.00	23.00	
6	5	250.00	23.00	
7	5	250.00	23.00	
8	5	250.00	23.00	
9	5	250.00	23.00	
10	5	250.00	23.00	
11	5	250.00	23.00	

12	5	250.00	23.00
13	5	250.00	23.00
14	5	250.00	23.00
15	5	250.00	23.00
16	5	250.00	23.00
17	5	250.00	23.00
18	5	250.00	23.00
19	5	250.00	23.00
20	5	250.00	23.00
21	5	250.00	23.00
22	5	250.00	23.00
23	4	300.00	15.00
24	4	300.00	15.00
25	4	300.00	15.00
26	4	300.00	15.00
27	4	300.00	15.00
28	4	300.00	15.00
29	4	300.00	15.00
30	4	300.00	15.00
31	4	300.00	15.00
32	4	300.00	15.00
33	4	300.00	15.00
34	4	300.00	15.00
35	4	300.00	15.00
36	4	300.00	15.00
37	4	300.00	15.00
38	4	300.00	15.00
39	4	300.00	15.00
40	4	300.00	15.00
41	4	300.00	15.00
42	4	300.00	15.00
43	4	300.00	15.00
44	5	250.00	23.00
45	5	250.00	23.00
46	5	250.00	23.00
47	5	250.00	23.00
48	5	250.00	23.00
49	5	250.00	23.00
50	4	300.00	15.00
51	4	300.00	15.00
52	4	300.00	15.00
53	4	300.00	15.00
54	4	300.00	15.00
55	4	300.00	15.00
56	4	300.00	15.00
57	4	300.00	15.00
58	4	300.00	15.00
59	4	300.00	15.00
60	4	300.00	15.00
61	4	300.00	15.00

62	4	300.00	15.00
63	4	300.00	15.00
64	4	300.00	15.00
65	4	300.00	15.00
66	4	300.00	15.00
67	4	300.00	15.00
68	4	300.00	15.00
69	4	300.00	15.00
70	4	300.00	15.00
71	4	300.00	15.00
72	4	300.00	15.00
73	4	300.00	15.00
74	4	300.00	15.00
75	4	300.00	15.00
76	4	300.00	15.00
77	5	250.00	23.00
78	5	250.00	23.00
79	5	250.00	23.00
80	5	250.00	23.00
81	5	250.00	23.00
82	5	250.00	23.00
83	5	250.00	23.00
84	5	250.00	23.00
85	5	250.00	23.00
86	5	250.00	23.00
87	5	250.00	23.00
88	5	250.00	23.00
89	5	250.00	23.00
90	5	250.00	23.00
91	5	250.00	23.00
92	5	250.00	23.00
93	5	250.00	23.00
94	5	250.00	23.00
95	5	250.00	23.00
96	5	250.00	23.00
97	5	250.00	23.00
98	5	250.00	23.00
99	5	250.00	23.00
100	5	250.00	23.00
101	5	250.00	23.00
102	5	250.00	23.00
103	5	250.00	23.00
104	5	250.00	23.00
105	5	250.00	23.00
106	5	250.00	23.00
107	5	250.00	23.00
108	5	250.00	23.00
109	5	250.00	23.00
110	5	250.00	23.00
111	5	250.00	23.00

112	5	250.00	23.00
113	5	250.00	23.00
114	5	250.00	23.00
115	5	250.00	23.00
116	5	250.00	23.00
117	5	250.00	23.00
118	5	250.00	23.00
119	5	250.00	23.00
120	5	250.00	23.00
121	5	250.00	23.00
122	5	250.00	23.00
123	5	250.00	23.00
124	5	250.00	23.00
125	5	250.00	23.00
126	5	250.00	23.00
127	5	250.00	23.00
128	5	250.00	23.00
129	5	250.00	23.00
130	5	250.00	23.00
131	5	250.00	23.00
132	5	250.00	23.00
133	5	250.00	23.00
134	5	250.00	23.00
135	5	250.00	23.00
136	5	250.00	23.00
137	5	250.00	23.00
138	5	250.00	23.00
139	5	250.00	23.00
140	5	250.00	23.00
141	5	250.00	23.00
142	5	250.00	23.00
143	5	250.00	23.00
144	5	250.00	23.00
145	5	250.00	23.00
146	5	250.00	23.00
147	5	250.00	23.00
148	5	250.00	23.00
149	5	250.00	23.00
150	5	250.00	23.00
151	5	250.00	23.00
152	5	250.00	23.00
153	5	250.00	23.00
154	5	250.00	23.00
155	5	250.00	23.00
156	5	250.00	23.00
157	5	250.00	23.00
158	5	250.00	23.00
159	5	250.00	23.00
160	5	250.00	23.00
161	5	250.00	23.00

162	5	250.00	23.00
163	5	250.00	23.00
164	5	250.00	23.00
165	5	250.00	23.00
166	5	250.00	23.00
167	5	250.00	23.00
168	5	250.00	23.00
169	5	250.00	23.00
170	4	300.00	15.00

SOIL OPTIONS: A = ANISOTROPIC, C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C),
F = FIBER-REINFORCED SOIL (FRS), N = NONLINEAR UNDRAINED SHEAR STRENGTH,
R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH
NOTE: Phi and C in Table 4 are modified values based on specified
Soil Options (if any).

TABLE 3 - Effective and Base Shear Stress Data on the 170 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Stress (psf)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-29.45	247.80	2.88	88.85	323.81	121.15
2	-29.45	250.30	2.88	132.21	335.43	125.49
3	-29.45	253.40	4.25	172.80	323.35	120.98
4	-28.42	257.45	5.00	223.17	344.73	128.97
5	-28.42	261.85	5.00	280.46	369.05	138.07
6	-27.39	266.27	5.00	333.51	391.57	146.50
7	-27.39	270.71	5.00	389.45	415.31	155.38
8	-26.36	275.17	5.00	440.80	437.11	163.54
9	-26.36	279.65	5.00	495.39	460.28	172.21
10	-25.33	284.15	5.00	545.07	481.37	180.10
11	-25.33	288.67	5.00	598.30	503.96	188.55
12	-24.31	293.20	5.00	646.33	524.35	196.18

13	-24.31	297.76	5.00	698.20	546.37	204.41
14	-23.28	302.34	5.00	744.58	566.06	211.78
15	-23.28	306.93	5.00	795.09	587.49	219.80
16	-22.25	311.54	5.00	839.85	606.50	226.91
17	-22.25	316.17	5.00	888.99	627.35	234.72
18	-21.22	320.81	5.00	932.15	645.67	241.57
19	-21.22	325.47	5.00	979.91	665.95	249.15
20	-20.19	330.15	5.00	1021.48	683.59	255.76
21	-20.19	334.84	5.00	1067.87	703.28	263.12
22	-19.16	339.18	4.22	1104.33	718.76	268.91
23	-19.16	342.54	2.89	1119.78	600.04	224.50
24	-19.16	345.27	2.89	1146.60	607.23	227.19
25	-18.13	349.01	5.00	1177.60	615.54	230.29
26	-18.13	353.76	5.00	1222.21	627.49	234.77
27	-17.10	358.53	5.00	1261.10	637.91	238.66
28	-17.10	363.31	5.00	1303.92	649.39	242.96
29	-16.07	368.10	5.00	1340.92	659.30	246.67
30	-16.07	372.90	5.00	1381.96	670.29	250.78
31	-15.04	377.72	5.00	1417.07	679.70	254.30
32	-15.04	382.55	5.00	1456.30	690.22	258.23
33	-14.02	387.39	5.00	1489.53	699.12	261.56
34	-14.02	392.24	5.00	1526.96	709.15	265.32
35	-12.99	397.10	5.00	1558.30	717.55	268.46
36	-12.99	401.97	5.00	1593.93	727.09	272.03
37	-11.96	406.86	5.00	1623.39	734.99	274.98

38	-11.96	411.75	5.00	1657.21	744.05	278.37
39	-10.93	416.65	5.00	1684.78	751.44	281.14
40	-10.93	421.56	5.00	1716.79	760.01	284.35
41	-9.90	426.47	5.00	1742.49	766.90	286.92
42	-9.90	431.40	5.00	1772.68	774.99	289.95
43	-8.87	435.43	3.17	1791.31	779.98	291.82
44	-8.87	438.68	3.41	1824.80	1024.58	383.33
45	-8.87	442.06	3.41	1846.01	1033.58	386.70
46	-7.84	446.22	5.00	1864.16	1041.29	389.58
47	-7.84	451.17	5.00	1893.83	1053.88	394.29
48	-6.81	455.45	3.63	1911.54	1061.40	397.11
49	-6.81	459.06	3.63	1932.06	1070.11	400.37
50	-6.81	462.22	2.74	1939.33	819.64	306.66
51	-5.78	466.07	5.00	1956.82	824.33	308.41
52	-5.78	471.04	5.00	1986.06	832.16	311.34
53	-4.76	476.02	5.00	2008.67	838.22	313.61
54	-4.76	481.00	5.00	2036.09	845.57	316.36
55	-3.73	485.99	5.00	2056.81	851.12	318.43
56	-3.73	490.98	5.00	2082.40	857.98	321.00
57	-2.70	495.97	5.00	2101.24	863.03	322.89
58	-2.70	500.96	5.00	2125.00	869.39	325.27
59	-1.67	505.96	5.00	2141.96	873.94	326.97
60	-1.67	510.96	5.00	2163.88	879.81	329.17
61	-0.64	515.96	5.00	2178.96	883.85	330.68
62	-0.64	520.96	5.00	2199.06	889.24	332.69

63	0.39	525.96	5.00	2212.25	892.77	334.02
64	0.39	530.96	5.00	2230.52	897.67	335.85
65	1.42	535.95	5.00	2241.84	900.70	336.98
66	1.42	540.95	5.00	2258.28	905.10	338.63
67	2.45	545.95	5.00	2267.73	907.64	339.58
68	2.45	550.95	5.00	2282.34	911.55	341.04
69	3.48	555.94	5.00	2289.92	913.58	341.80
70	3.48	560.93	5.00	2302.71	917.01	343.09
71	4.51	565.92	5.00	2308.43	918.54	343.66
72	4.51	570.90	5.00	2319.39	921.48	344.76
73	5.53	575.88	5.00	2323.25	922.51	345.14
74	5.53	580.86	5.00	2332.39	924.96	346.06
75	6.56	584.62	2.57	2332.62	925.02	346.08
76	6.56	587.17	2.57	2336.38	926.03	346.46
77	6.56	590.86	4.87	2329.81	1238.94	463.53
78	7.59	595.76	5.00	2330.77	1239.35	463.69
79	7.59	600.72	5.00	2339.47	1243.05	465.07
80	8.62	605.67	5.00	2339.16	1242.91	465.02
81	8.62	610.61	5.00	2346.48	1246.02	466.18
82	9.65	615.55	5.00	2344.76	1245.29	465.91
83	9.65	620.48	5.00	2350.72	1247.82	466.85
84	10.68	625.40	5.00	2347.58	1246.49	466.36
85	10.68	630.31	5.00	2352.18	1248.44	467.09
86	11.71	635.21	5.00	2347.66	1246.52	466.37
87	11.71	640.11	5.00	2350.90	1247.90	466.88

88	12.74	645.00	5.00	2344.99	1245.39	465.94
89	12.74	649.87	5.00	2346.88	1246.19	466.24
90	13.77	654.74	5.00	2339.59	1243.10	465.09
91	13.77	659.60	5.00	2340.14	1243.33	465.17
92	14.79	664.44	5.00	2331.48	1239.66	463.80
93	14.79	669.28	5.00	2330.70	1239.32	463.67
94	15.82	674.10	5.00	2320.68	1235.07	462.08
95	15.82	678.91	5.00	2318.57	1234.17	461.75
96	16.85	683.71	5.00	2307.21	1229.35	459.94
97	16.85	688.49	5.00	2303.78	1227.90	459.40
98	17.88	693.26	5.00	2291.08	1222.51	457.38
99	17.88	698.02	5.00	2286.34	1220.49	456.63
100	18.91	702.77	5.00	2272.32	1214.54	454.40
101	18.91	707.50	5.00	2266.28	1211.98	453.44
102	19.94	712.21	5.00	2250.95	1205.47	451.01
103	19.94	716.91	5.00	2243.62	1202.36	449.85
104	20.97	721.60	5.00	2226.99	1195.30	447.20
105	20.97	726.27	5.00	2218.38	1191.64	445.84
106	22.00	730.92	5.00	2200.46	1184.04	442.99
107	22.00	735.55	5.00	2190.58	1179.85	441.42
108	23.03	740.17	5.00	2171.39	1171.70	438.37
109	23.03	744.78	5.00	2160.25	1166.97	436.61
110	24.05	749.36	5.00	2139.80	1158.29	433.36
111	24.05	753.92	5.00	2127.42	1153.04	431.39
112	25.08	758.47	5.00	2105.73	1143.83	427.95

113	25.08	763.00	5.00	2092.12	1138.05	425.79
114	26.11	767.51	5.00	2069.20	1128.32	422.15
115	26.11	772.00	5.00	2054.37	1122.03	419.79
116	27.14	776.47	5.00	2030.24	1111.78	415.96
117	27.14	780.92	5.00	2014.20	1104.98	413.41
118	28.17	785.35	5.00	1988.87	1094.23	409.39
119	28.17	789.75	5.00	1971.65	1086.91	406.65
120	29.20	794.14	5.00	1945.15	1075.67	402.44
121	29.20	798.51	5.00	1926.74	1067.85	399.52
122	30.23	802.85	5.00	1899.08	1056.11	395.13
123	30.23	807.17	5.00	1879.52	1047.81	392.02
124	31.26	811.46	5.00	1850.72	1035.58	387.45
125	31.26	815.74	5.00	1830.01	1026.79	384.16
126	32.29	819.99	5.00	1800.10	1014.10	379.41
127	32.29	824.22	5.00	1778.25	1004.82	375.94
128	33.32	828.42	5.00	1747.25	991.66	371.02
129	33.32	832.60	5.00	1724.29	981.92	367.37
130	34.34	836.75	5.00	1692.21	968.30	362.28
131	34.34	840.88	5.00	1668.16	958.09	358.46
132	35.37	844.71	4.33	1636.72	944.75	353.46
133	35.37	848.24	4.33	1614.98	935.52	350.01
134	35.37	850.55	1.35	1599.09	928.77	347.49
135	36.40	853.11	5.00	1566.51	914.94	342.31
136	36.40	857.13	5.00	1528.36	898.75	336.25
137	37.43	861.13	5.00	1481.46	878.84	328.81

138	37.43	865.10	5.00	1442.48	862.30	322.62
139	38.46	869.04	5.00	1394.91	842.10	315.06
140	38.46	872.96	5.00	1355.13	825.22	308.74
141	39.49	876.85	5.00	1306.92	804.76	301.09
142	39.49	880.71	5.00	1266.36	787.54	294.65
143	40.52	884.54	5.00	1217.56	766.82	286.90
144	40.52	888.34	5.00	1176.23	749.28	280.33
145	41.55	892.11	5.00	1126.88	728.33	272.49
146	41.55	895.85	5.00	1084.82	710.48	265.82
147	42.58	899.56	5.00	1034.94	689.31	257.89
148	42.58	903.24	5.00	992.18	671.15	251.10
149	43.60	906.89	5.00	941.83	649.78	243.11
150	43.60	910.52	5.00	898.38	631.34	236.21
151	44.63	914.10	5.00	847.60	609.78	228.14
152	44.63	917.66	5.00	803.50	591.06	221.14
153	45.66	921.19	5.00	752.32	569.34	213.01
154	45.66	924.68	5.00	707.60	550.36	205.91
155	46.69	928.15	5.00	656.09	528.49	197.73
156	46.69	931.58	5.00	610.77	509.25	190.53
157	47.72	934.97	5.00	558.97	487.27	182.30
158	47.72	938.34	5.00	513.08	467.79	175.02
159	48.75	941.67	5.00	461.05	445.70	166.75
160	48.75	944.96	5.00	414.62	426.00	159.38
161	49.78	948.23	5.00	362.41	403.84	151.09
162	49.78	951.45	5.00	315.48	383.91	143.64

163	50.81	954.65	5.00	263.16	361.71	135.33
164	50.81	957.81	5.00	215.76	341.58	127.80
165	51.84	960.93	5.00	163.39	319.36	119.48
166	51.84	964.02	5.00	115.55	299.05	111.88
167	52.87	967.08	5.00	165.30	70.16	26.25
168	52.87	970.09	5.00	117.05	49.68	18.59
169	53.89	972.08	1.63	84.38	35.82	13.40
170	53.89	974.30	5.90	40.92	10.97	4.10

Table 4 - Base Force Data on the 170 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force * (lbs)
1	-29.45	247.80	2.88	255.48	931.08	348.35
2	-29.45	250.30	2.88	380.17	964.49	360.85
3	-29.45	253.40	4.25	734.28	1373.98	514.06
4	-28.42	257.45	5.00	1115.83	1723.64	644.87
5	-28.42	261.85	5.00	1402.30	1845.24	690.37
6	-27.39	266.27	5.00	1667.53	1957.83	732.49
7	-27.39	270.71	5.00	1947.25	2076.56	776.91
8	-26.36	275.17	5.00	2204.01	2185.55	817.69
9	-26.36	279.65	5.00	2476.96	2301.41	861.04
10	-25.33	284.15	5.00	2725.35	2406.84	900.48
11	-25.33	288.67	5.00	2991.51	2519.82	942.75

12	-24.31	293.20	5.00	3231.63	2621.74	980.89
13	-24.31	297.76	5.00	3490.98	2731.83	1022.07
14	-23.28	302.34	5.00	3722.91	2830.28	1058.91
15	-23.28	306.93	5.00	3975.44	2937.47	1099.01
16	-22.25	311.54	5.00	4199.27	3032.48	1134.56
17	-22.25	316.17	5.00	4444.95	3136.77	1173.58
18	-21.22	320.81	5.00	4660.75	3228.37	1207.85
19	-21.22	325.47	5.00	4899.57	3329.74	1245.77
20	-20.19	330.15	5.00	5107.39	3417.96	1278.78
21	-20.19	334.84	5.00	5339.34	3516.41	1315.61
22	-19.16	339.18	4.22	4657.73	3031.52	1134.20
23	-19.16	342.54	2.89	3237.44	1734.81	649.05
24	-19.16	345.27	2.89	3315.00	1755.59	656.83
25	-18.13	349.01	5.00	5887.99	3077.68	1151.47
26	-18.13	353.76	5.00	6111.05	3137.45	1173.83
27	-17.10	358.53	5.00	6305.49	3189.55	1193.32
28	-17.10	363.31	5.00	6519.62	3246.93	1214.79
29	-16.07	368.10	5.00	6704.61	3296.49	1233.33
30	-16.07	372.90	5.00	6909.78	3351.47	1253.90
31	-15.04	377.72	5.00	7085.33	3398.51	1271.50
32	-15.04	382.55	5.00	7281.52	3451.08	1291.17
33	-14.02	387.39	5.00	7447.63	3495.59	1307.82
34	-14.02	392.24	5.00	7634.82	3545.74	1326.59
35	-12.99	397.10	5.00	7791.51	3587.73	1342.30
36	-12.99	401.97	5.00	7969.66	3635.46	1360.16

37	-11.96	406.86	5.00	8116.94	3674.93	1374.92
38	-11.96	411.75	5.00	8286.04	3720.24	1391.87
39	-10.93	416.65	5.00	8423.91	3757.18	1405.69
40	-10.93	421.56	5.00	8583.95	3800.06	1421.74
41	-9.90	426.47	5.00	8712.43	3834.49	1434.62
42	-9.90	431.40	5.00	8863.38	3874.93	1449.75
43	-8.87	435.43	3.17	5684.92	2475.35	926.12
44	-8.87	438.68	3.41	6228.40	3497.10	1308.39
45	-8.87	442.06	3.41	6300.79	3527.83	1319.88
46	-7.84	446.22	5.00	9320.81	5206.45	1947.92
47	-7.84	451.17	5.00	9469.14	5269.41	1971.47
48	-6.81	455.45	3.63	6938.40	3852.61	1441.40
49	-6.81	459.06	3.63	7012.87	3884.22	1453.23
50	-6.81	462.22	2.74	5314.76	2246.24	840.40
51	-5.78	466.07	5.00	9784.10	4121.64	1542.05
52	-5.78	471.04	5.00	9930.30	4160.82	1556.71
53	-4.76	476.02	5.00	10043.37	4191.11	1568.04
54	-4.76	481.00	5.00	10180.44	4227.84	1581.78
55	-3.73	485.99	5.00	10284.07	4255.61	1592.17
56	-3.73	490.98	5.00	10412.01	4289.89	1605.00
57	-2.70	495.97	5.00	10506.21	4315.13	1614.44
58	-2.70	500.96	5.00	10625.00	4346.96	1626.35
59	-1.67	505.96	5.00	10709.78	4369.68	1634.85
60	-1.67	510.96	5.00	10819.42	4399.06	1645.84
61	-0.64	515.96	5.00	10894.79	4419.25	1653.40

62	-0.64	520.96	5.00	10995.29	4446.18	1663.47
63	0.39	525.96	5.00	11061.26	4463.86	1670.09
64	0.39	530.96	5.00	11152.60	4488.33	1679.24
65	1.42	535.95	5.00	11209.20	4503.50	1684.92
66	1.42	540.95	5.00	11291.40	4525.52	1693.16
67	2.45	545.95	5.00	11338.64	4538.18	1697.89
68	2.45	550.95	5.00	11411.70	4557.76	1705.22
69	3.48	555.94	5.00	11449.61	4567.91	1709.02
70	3.48	560.93	5.00	11513.53	4585.04	1715.43
71	4.51	565.92	5.00	11542.13	4592.70	1718.29
72	4.51	570.90	5.00	11596.93	4607.39	1723.79
73	5.53	575.88	5.00	11616.24	4612.56	1725.72
74	5.53	580.86	5.00	11661.95	4624.81	1730.30
75	6.56	584.62	2.57	5986.17	2373.88	888.15
76	6.56	587.17	2.57	5995.82	2376.46	889.12
77	6.56	590.86	4.87	11340.14	6030.46	2256.21
78	7.59	595.76	5.00	11653.86	6196.77	2318.43
79	7.59	600.72	5.00	11697.37	6215.24	2325.34
80	8.62	605.67	5.00	11695.78	6214.56	2325.09
81	8.62	610.61	5.00	11732.42	6230.12	2330.91
82	9.65	615.55	5.00	11723.78	6226.45	2329.53
83	9.65	620.48	5.00	11753.58	6239.10	2334.27
84	10.68	625.40	5.00	11737.92	6232.45	2331.78
85	10.68	630.31	5.00	11760.91	6242.21	2335.43
86	11.71	635.21	5.00	11738.28	6232.60	2331.84

87	11.71	640.11	5.00	11754.49	6239.48	2334.41
88	12.74	645.00	5.00	11724.93	6226.94	2329.72
89	12.74	649.87	5.00	11734.38	6230.95	2331.22
90	13.77	654.74	5.00	11697.94	6215.48	2325.43
91	13.77	659.60	5.00	11700.69	6216.65	2325.87
92	14.79	664.44	5.00	11657.41	6198.28	2318.99
93	14.79	669.28	5.00	11653.48	6196.61	2318.37
94	15.82	674.10	5.00	11603.41	6175.36	2310.42
95	15.82	678.91	5.00	11592.85	6170.87	2308.74
96	16.85	683.71	5.00	11536.05	6146.76	2299.72
97	16.85	688.49	5.00	11518.89	6139.48	2297.00
98	17.88	693.26	5.00	11455.41	6112.53	2286.91
99	17.88	698.02	5.00	11431.71	6102.47	2283.15
100	18.91	702.77	5.00	11361.61	6072.72	2272.02
101	18.91	707.50	5.00	11331.40	6059.90	2267.22
102	19.94	712.21	5.00	11254.74	6027.35	2255.05
103	19.94	716.91	5.00	11218.09	6011.80	2249.23
104	20.97	721.60	5.00	11134.93	5976.50	2236.02
105	20.97	726.27	5.00	11091.88	5958.22	2229.18
106	22.00	730.92	5.00	11002.29	5920.19	2214.95
107	22.00	735.55	5.00	10952.90	5899.23	2207.11
108	23.03	740.17	5.00	10856.94	5858.50	2191.87
109	23.03	744.78	5.00	10801.27	5834.87	2183.03
110	24.05	749.36	5.00	10699.02	5791.46	2166.79
111	24.05	753.92	5.00	10637.12	5765.19	2156.96

112	25.08	758.47	5.00	10528.66	5719.15	2139.74
113	25.08	763.00	5.00	10460.60	5690.26	2128.93
114	26.11	767.51	5.00	10346.00	5641.61	2110.73
115	26.11	772.00	5.00	10271.84	5610.14	2098.95
116	27.14	776.47	5.00	10151.18	5558.92	2079.79
117	27.14	780.92	5.00	10071.00	5524.89	2067.05
118	28.17	785.35	5.00	9944.37	5471.14	2046.94
119	28.17	789.75	5.00	9858.24	5434.57	2033.27
120	29.20	794.14	5.00	9725.73	5378.33	2012.22
121	29.20	798.51	5.00	9633.71	5339.27	1997.61
122	30.23	802.85	5.00	9495.41	5280.56	1975.64
123	30.23	807.17	5.00	9397.58	5239.04	1960.11
124	31.26	811.46	5.00	9253.60	5177.92	1937.24
125	31.26	815.74	5.00	9150.04	5133.96	1920.80
126	32.29	819.99	5.00	9000.48	5070.48	1897.04
127	32.29	824.22	5.00	8891.27	5024.12	1879.70
128	33.32	828.42	5.00	8736.23	4958.31	1855.08
129	33.32	832.60	5.00	8621.46	4909.59	1836.85
130	34.34	836.75	5.00	8461.05	4841.50	1811.38
131	34.34	840.88	5.00	8340.81	4790.47	1792.28
132	35.37	844.71	4.33	7082.39	4088.09	1529.50
133	35.37	848.24	4.33	6988.30	4048.15	1514.56
134	35.37	850.55	1.35	2151.80	1249.79	467.59
135	36.40	853.11	5.00	7832.54	4574.71	1711.56
136	36.40	857.13	5.00	7641.82	4493.76	1681.27

137	37.43	861.13	5.00	7407.28	4394.21	1644.03
138	37.43	865.10	5.00	7212.41	4311.49	1613.08
139	38.46	869.04	5.00	6974.55	4210.52	1575.30
140	38.46	872.96	5.00	6775.64	4126.09	1543.71
141	39.49	876.85	5.00	6534.62	4023.78	1505.44
142	39.49	880.71	5.00	6331.79	3937.68	1473.23
143	40.52	884.54	5.00	6087.79	3834.12	1434.48
144	40.52	888.34	5.00	5881.17	3746.41	1401.66
145	41.55	892.11	5.00	5634.39	3641.66	1362.47
146	41.55	895.85	5.00	5424.10	3552.39	1329.08
147	42.58	899.56	5.00	5174.72	3446.54	1289.47
148	42.58	903.24	5.00	4960.89	3355.77	1255.51
149	43.60	906.89	5.00	4709.13	3248.91	1215.53
150	43.60	910.52	5.00	4491.90	3156.70	1181.03
151	44.63	914.10	5.00	4237.98	3048.91	1140.71
152	44.63	917.66	5.00	4017.48	2955.32	1105.69
153	45.66	921.19	5.00	3761.62	2846.71	1065.06
154	45.66	924.68	5.00	3537.99	2751.79	1029.54
155	46.69	928.15	5.00	3280.44	2642.46	988.64
156	46.69	931.58	5.00	3053.83	2546.27	952.65
157	47.72	934.97	5.00	2794.84	2436.34	911.52
158	47.72	938.34	5.00	2565.39	2338.94	875.08
159	48.75	941.67	5.00	2305.23	2228.51	833.77
160	48.75	944.96	5.00	2073.11	2129.98	796.90
161	49.78	948.23	5.00	1812.07	2019.18	755.45

162	49.78	951.45	5.00	1577.42	1919.57	718.18
163	50.81	954.65	5.00	1315.82	1808.53	676.64
164	50.81	957.81	5.00	1078.80	1707.92	638.99
165	51.84	960.93	5.00	816.96	1596.78	597.41
166	51.84	964.02	5.00	577.74	1495.23	559.42
167	52.87	967.08	5.00	826.49	350.82	131.26
168	52.87	970.09	5.00	585.24	248.42	92.94
169	53.89	972.08	1.63	137.65	58.43	21.86
170	53.89	974.30	5.90	241.48	64.70	24.21

Sum of the Resisting Forces = 631519.98 (lbs)

Average Available Shear Strength = 772.47(psf)

Sum of the Driving Forces = 236273.88 (lbs)

Average Mobilized Shear Stress = 289.01(psf)

Total length of the failure surface = 817.53(ft)

Factor of Safety Balance Check: FS = 2.67283

**** END OF GEOSTASE OUTPUT ****

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

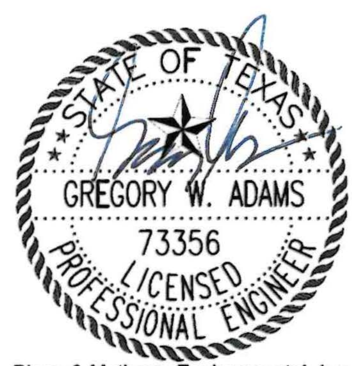
TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D6
CONTAMINATED WATER MANAGEMENT PLAN

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete



Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
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Texas Board of Professional Engineers and Land Surveyors
Firm Registration No. F-256 And No. 10194895

Texas Board of Professional Geoscientists
Firm Registration No. 50222

GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
9/23/2025

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

CONTENTS

1 INTRODUCTION

30 TAC §§330.65(c), 330.177, 330.207 330.227, 330.331(d), 330.337

This Contaminated Water Management Plan has been prepared for the Chisholm Trail Disposal Landfill consistent with 30 TAC §§330.65(c), 330.177, 330.207, 330.227, 330.331(d), and 330.337. This plan provides the details of the collection, storage, treatment, and disposal of contaminated water from site operations. Since the Chisholm Trail Disposal Landfill is operated as a Type IV landfill, a leachate collection system is not required. Contaminated water is defined in §330.3(36) as leachate, gas condensate, or water that has come into contact with waste.

2 CONTAMINATED WATER GENERATION

Surface water that comes into contact with waste is considered to be contaminated water. Best management practices will be used to limit contaminated water generation. Temporary diversion berms will be constructed around areas of exposed waste to limit the amount of surface water that comes into contact with waste. Design calculations and typical details for temporary diversion berms are presented in Appendix D6A. Weekly cover and intermediate cover will be placed over filled areas to limit the area of exposed waste. Procedures for verifying the adequacy of weekly and intermediate cover placement are provided in Part IV.

3 CONTAMINATED WATER COLLECTION AND CONTAINMENT

Temporary containment berms will be constructed around the active face to collect and contain surface water that has come into contact with waste. In addition to the planned containment berms around the active face, temporary containment berms will be constructed as needed to collect contaminated water. The design calculations and typical details for containment berms for a 25-year, 24-hour storm event are provided in Appendix D6A. The calculations show the dimensions for typical conditions, but additional storage capacity can be provided as site operating conditions dictate.

Contaminated water at the working face will remain within the active working face to evaporate or to be absorbed into the waste. Contaminated water will not be allowed to remain ponded, become stagnant, or cause nuisance conditions. Contaminated water may also be pumped into a transport truck for off-site treatment and disposal.

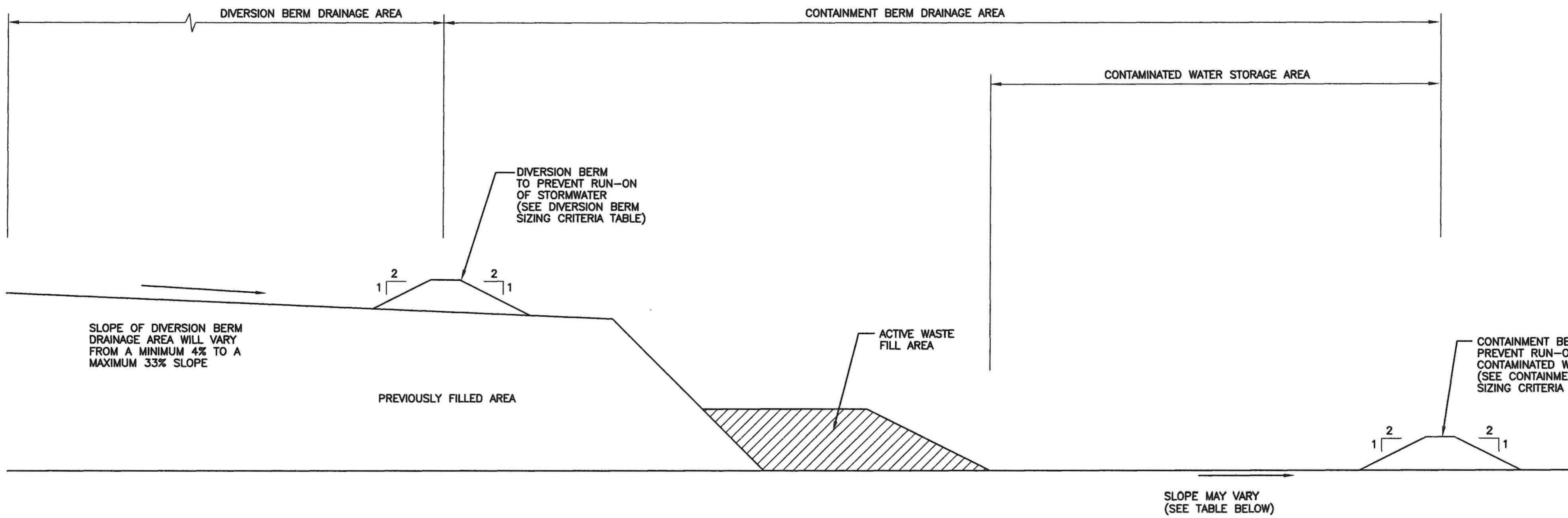
4 CONTAMINATED WATER DISPOSAL

30 TAC §330.207

Contaminated water will not be allowed to discharge into waters of the United States or be discharged offsite without prior written approval. Contaminated water will be transported to a publicly owned treatment works facility (POTW) for treatment and disposal in accordance with §330.207(f). Sampling and analysis will be conducted per the POTW's requirements. The results of any monitoring required by the disposal facility will be placed in the site operating record. The handling, storage, treatment, and disposal of contaminated water and leachate will be performed in accordance with §330.207.

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX D6A
CONTAINMENT/DIVERSION BERM DESIGN



DIVERSION BERM SIZING CRITERIA

DIVERSION BERM DRAINAGE AREA (ACRES)	3:1			25:1		
	FLOW RATE (CFS)	FLOW DEPTH (FT)	REQUIRED MINIMUM DIVERSION BERM HEIGHT (FT)	FLOW RATE (CFS)	FLOW DEPTH (FT)	REQUIRED MINIMUM DIVERSION BERM HEIGHT (FT)
0.5	1.9	0.9	1.9	1.9	0.5	1.5
1.0	3.8	1.1	2.1	3.8	0.6	1.6
1.5	5.8	1.3	2.3	5.8	0.7	1.7

NOTE: DIVERSION BERMS WILL BE SIZED TO DIVERT STORMWATER FROM THE 25 YEAR, 24 HOUR STORM EVENT WITH A FREEBOARD OF 1 FT.

CONTAINMENT BERM SIZING CRITERIA

CONTAINMENT BERM DRAINAGE AREA (ACRES)	CONTAINMENT WATER STORAGE AREA (ACRES)	FLOOR SLOPE OF CONTAMINATED WATER STORAGE AREA	REQUIRED MINIMUM HEIGHT OF CONTAINMENT BERM (FT)
0.5	0.35 0.25 0.20	1% 2% 4%	2.0 2.7 4.0
1.0	0.50 0.35 0.25	1% 2% 4%	2.7 3.5 4.9
1.5	0.60 0.40 0.30	1% 2% 4%	3.1 4.0 5.7

NOTE: CONTAINMENT BERMS WILL BE SIZED TO CONTAIN STORMWATER FROM THE 25 YEAR, 24 HOUR STORM EVENT. THE CRITERIA ARE BASED ON A MINIMUM DOWNSLOPE CONTAINMENT BERM LENGTH OF 100 FEET WITH A FREEBOARD OF 0.5 FT.

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

CONTAIMINATED WATER RUNON/RUNOFF DETAILS

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D6.1

Diversion Design

Required: Determine the necessary dimensions of the diversion berms.

Method:

1. Determine the flow using the Rational Method.
2. Calculate flow capacity using Manning's Method.

References:

1. Dodson's and Associates, Inc., *Hands-On HEC-1,* June 1997.
2. Ponce, Victor M., *Engineering Hydrology Principles and Practices,* 1989.
3. Texas Department of Transportation, Hydraulic Design Manual, Revised October 2011.
4. NOAA Atlas 14, Volume 11, Version 2 Rhome, Texas USA Point Precipitation Frequency Estimates

Solution: Diversion berms will be designed to pass the 25-year storm event. The Rational Method (Q=CiA) was used to determine the runoff.

25-Year Rainfall Depth (Pd) =	1.3	(Ref. 4, extrapolated for 10 min.)
Time of Concentration (tc) =	10.0 min	(conservative minimum value)
Rainfall Intensity (I) =	7.7 in/hr	(Ref. 3, I = Pd/tc)
Runoff Coefficient (C) =	0.5	
Time of Concentration (tc) =	10 min	
Running berm slope =	0.5 %	
Manning's n =	0.03	
Right side slope =	2 :1	

Drainage Area (ac)	0.5		1.0		1.5	
Peak Flow (cfs)	1.9		3.8		5.8	
Berm Evaluation						
Left Side Slope	3:1	25:1	3:1	25:1	3:1	25:1
Flow Depth (ft)	0.9	0.5	1.1	0.6	1.3	0.7
Flow Area (sf)	2.0	3.4	3.0	4.9	4.2	6.6
Wetted Perimeter (ft)	4.9	13.6	5.9	16.4	7.0	19.1
Velocity (fps)	2.0	1.4	2.2	1.6	2.5	1.7
Berm Capacity (cfs)	4.0	4.7	6.8	7.6	10.6	11.5

Containment Berm Design

Required: Size containment berms to contain contaminated water around the working face.

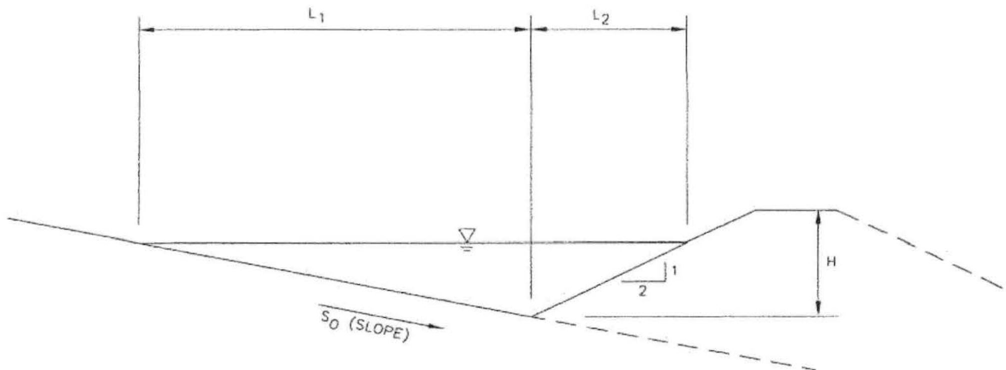
References:
1) Texas Department of Transportation, Hydraulic Design Manual, Revised October 2011.
2) NOAA Atlas 14, Volume 11, Version 2 Rhome, Texas USA Point Precipitation Frequency Estimates

Solution: Determine the storage volume required for the 25-year rainfall for Wise County.

$V_R = CAR$

where: V_R = required storage volume (cf)
C = runoff coeffecient = 0.5
A = drainage area (acres)
R = 25-year rainfall = 7.7 in

Size the storage area from the following figure:



$A_s = (L_1 + L_2)H/2$ Storage Area = $W(L_1 + L_2)$

where: A_s = cross section area (sf) W = storage width (ft)
$L_1 = H/S_o$
$L_2 = 2H$

Drainage area ac	Required Volume cf	W ft	Storage Area ac	S_o ft/ft	L_1 ft	L_2 ft	H ft	As sf	Vs cf
0.5	6,988	100	0.35	0.01	152	3.0	1.5	118.5	11,854
0.5	6,988	100	0.25	0.02	109	4.4	2.2	123.3	12,334
0.5	6,988	100	0.20	0.04	87	7.0	3.5	163.9	16,394
1	13,976	100	0.50	0.01	218	4.4	2.2	241.9	24,193
1	13,976	100	0.35	0.02	152	6.1	3.0	241.7	24,174
1	13,976	100	0.25	0.04	109	8.7	4.4	256.2	25,616
1.5	20,963	100	0.60	0.01	261	5.2	2.6	348.4	34,838
1.5	20,963	100	0.40	0.02	174	7.0	3.5	315.7	31,574
1.5	20,963	100	0.30	0.04	131	10.5	5.2	368.9	36,887

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D7
LINER QUALITY CONTROL PLAN

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

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GREGORY W. ADAMS
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5/23/2025

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CONTENTS

1 INTRODUCTION

30 TAC §330.339

1.1 Purpose

This Liner Quality Control Plan (LQCP) has been prepared in accordance with 30 TAC §330.339 to establish procedures for the design, construction, testing, and documentation of the liner system for the Chisholm Trail Dispsal Landfill.

1.2 Definitions

Specific terms and acronyms that are used in this LQCP are defined below.

ASTM – American Society for Testing and Material

BER – Ballast Evaluation Report

Construction Quality Assurance (CQA) – CQA is a planned system of activities that provides the owner and permitting agency assurance that the facility was constructed as specified in the design. CQA includes the observations, evaluations, and testing necessary to assess and document the quality of the constructed facility. CQA includes measures taken by the CQA organization to assess whether the work is in compliance with the plans, specifications, and permit requirements for a project.

Geotechnical Professional (GP) – The GP is the authorized representative of the operator who is responsible for all CQA activities for the project. The GP must be registered as a Professional Engineer in Texas. Experience and education should include geotechnical engineering, engineering geology, soil mechanics, geotechnical laboratory testing, construction quality assurance and quality control testing, and hydrogeology. The GP must also have competency and experience in certifying similar projects.

The GP may also be known in applicable regulations and guidelines as the CQA engineer, resident project representative, geotechnical quality control/quality assurance professional (GQCP), or professional of record (POR).

CQA Monitors – CQA monitors are representatives of the GP who work under the direct supervision of the GP. The CQA monitor is responsible for quality assurance monitoring and performing on-site tests and observations. The CQA monitor must be NICET-certified at Level 2 for soils and geosynthetics, an engineering technician with a minimum of four years directly related experience, or a graduate engineer or geologist with one year of directly related experience.

Quality Assurance – Quality assurance is a planned program that is designed to assure that the work meets the requirements of the plans, specifications, and permit for a project.

Quality assurance includes procedures, quality control activities, and documentation that are performed by the GP and CQA monitor.

Quality Control – Quality control includes the activities that implement the quality assurance program. The GP, CQA monitor, and contractor will perform quality control.

Seasonal High Water Table – The seasonal high water table is the highest measured water level within the construction area.

SLER – Soil Liner Evaluation Report

1.3 Sequence of Construction Activities

Generally construction of lined areas will proceed in the following sequence of activities:

- The area will be excavated to the proposed subgrade elevations.
- A temporary dewatering system, if required, will be installed as described in Section 3.3.
- The subgrade elevations will be verified.
- The compacted soil liner will be constructed, tested, and verified in accordance with Section 4.
- The protective cover will be constructed and verified in accordance with Section 5.
- The Soils and Liner Evaluation Report will be submitted to the TCEQ.

2 LINER SYSTEM

30 TAC §330.331

2.1 Type IV Liner System

The components of the Type IV liner system are listed from top to bottom in table below. Details of the Type IV liner system are provided in Attachment D3.

Components of the Type IV Liner System

Liner System Component	Description	Minimum Thickness
Protective Cover	General earthfill	12 inches
Compacted Soil Liner	Compacted soil with a coefficient of permeability less than or equal to 1×10^{-7} cm/sec	36 inches

2.2 Construction Monitoring

Continuous on-site monitoring is necessary to confirm that the components of the liner system are constructed in accordance with this LQCP. In accordance with 30 TAC §330.339(a)(2), the CQA monitor shall provide continuous on-site observation, field sampling, and testing as required during the following construction activities:

- Temporary dewatering system installation
- Subgrade preparation
- Compacted soil liner placement, processing, compaction, and testing
- Protective cover layer placement
- Any work that could damage the installed components of the liner system

The GP will document and certify that the liner system was constructed in accordance with this LQCP. The GP shall make sufficient site visits to observe critical construction activities and to verify that the construction and quality assurance activities are performed in accordance with this LQCP.

3 EARTHWORK

30 TAC §§330.337, 330.339

3.1 Materials

The following material classifications will be encountered in excavations or will be required for landfill construction.

General Fill

General fill consists of soil that is free from debris, rubbish, solid waste, organic matter, and particles larger than four inches in diameter.

Compacted Soil Liner

Compacted soil liner materials consist of soil that is free from debris, rubbish, solid waste, organic matter, and meets the requirements of Section 4.2.

Protective Cover

Protective cover materials consist of soil that is free from debris, rubbish, solid waste, organic matter, and meets the requirements of Section 5.2.

Weekly and Intermediate Cover

Daily and intermediate cover materials consist of soil that has not been previously mixed with solid waste.

Topsoil

Topsoil consists of soil that is capable of sustaining vegetation and is free of debris, rubbish, and solid waste.

Unsuitable Materials

Unsuitable materials consist of any material that is determined by the GP to not be suitable for use as classified above.

3.2 Construction Below Groundwater

3.2.1 Highest Measured Water Levels

Groundwater may be encountered in the excavation where Units I and III are exposed in the subgrade. The highest recorded groundwater elevations in these units are included in Appendix D7A.

The highest measured water elevations will be used as the design groundwater elevations. The most recent groundwater elevations must be reviewed before the construction of each cell and, if necessary, the highest measured water levels must be adjusted upward.

3.2.2 Temporary Dewatering

Areas where the liner is to be constructed below the highest groundwater elevations in Units I and III will be dewatered during and after construction by a temporary dewatering system. The temporary dewatering system will consist of a network of dewatering drains below the liner system. The dewatering drains in Unit I will consist of HDPE composite drains in sand-filled trenches or perforated pipes in porous media filled trenches. The dewatering drains in Unit III will consist of perforated pipes in porous media filled trenches with a geocomposite blanket on the slope. The trenches will gravity drain into open ditches and excavations beyond the lined areas or into closed sumps beneath the lined areas. Water in the open excavations and closed sumps will be pumped as needed into the perimeter drainage system. The temporary dewatering system will be operated until sufficient ballast has been placed to offset the potential hydrostatic forces.

The design procedures and typical details of the temporary dewatering system are provided in Appendix D7B. Design and installation of the temporary dewatering system will be documented in the SLER in accordance with Section 7.2. The facility will submit a BER to the TCEQ once it is determined that ballasting or dewatering is no longer necessary. If the TCEQ does not provide a response within 14 days of the date of receipt of the BER, the facility will discontinue dewatering or ballasting operations.

3.3 Excavation

A description of the materials that will be encountered in the excavations and the slope stability analyses are provided in Attachment D5. The slope stability analyses are only valid for the conditions that were analyzed. Any changes to the excavation plan, dewatering system, ballast system, liner system, final cover system, or landfill completion plan will necessitate that the slope stability analyses be revised to reflect the actual conditions. Temporary construction slopes shall not be steeper than the interim slopes and concentrated loadings such as heavy equipment and soil stockpiles should not be placed near the crest of slopes unless additional slope stability analyses are performed.

4 COMPACTED SOIL LINER

30 TAC §330.339

4.1 General

The compacted soil liner component of the Type IV liner system consists of a 36-inch-thick layer of compacted, relatively homogeneous, cohesive material. The CQA monitor shall provide continuous on-site observation during compacted soil liner placement, compaction, and testing in accordance with 30 TAC §330.339(a)(2). The GP shall make sufficient site visits during compacted soil liner construction to document the construction activities, testing, and thickness verification in the SLER, in accordance with Section 7.2.

4.2 Materials

Compacted soil liner material shall consist of soil that is free from debris, rubbish, frozen materials, foreign objects, and organic material. The required compacted soil liner material properties are summarized below.

Compacted Soil Liner Material Properties

Test	Standard	Required Property
Plasticity Index	ASTM D 4318	15 or greater
Liquid Limit	ASTM D 4318	30 or greater
Percent Passing No. 200 Mesh Sieve	ASTM D 1140	30 or greater
Percent Passing 1-inch Sieve	ASTM D 422 or Visual	100%
Coefficient of Permeability	ASTM D 5084 or COE EM 1110-2-1906 Appendix VII	1 x 10^{-7} cm/sec or less

Preconstruction testing procedures and frequencies for compacted soil liner materials are listed in Section 4.8.1.

4.3 Subgrade Preparation

Prior to placing soil liner material, the subgrade should be proof-rolled with heavy, rubber-tired construction equipment to detect soft areas. The GP or CQA monitor must observe the proof-rolling operation. Soft areas should be recompacted or undercut to firm material, then backfilled with compacted general fill. The GP will observe the subgrade for groundwater seepage and take appropriate actions when necessary.

Earthfill beneath the liner subgrade should be placed in maximum 9-inch loose lifts to produce compacted lift thickness of approximately 6 inches. If additional water is necessary to adjust the moisture content, it should be applied after initial processing, but prior to compaction. Water should be applied evenly across the lift and worked into the material. The earthfill shall be compacted with a pad/tamping-foot or prong-foot roller. The earthfill should be compacted to a minimum of 95 percent of the maximum dry density determined by standard Proctor (ASTM D 698) at a moisture content of 2 percent below to 3 percent above optimum moisture.

The subgrade elevations shall be verified in accordance with the requirements of Section 4.8.3 prior to the placement of compacted soil liner.

4.4 Placement and Processing

The compacted soil subgrade and surface of each lift should be roughened prior to placement of the next lift of compacted soil liner. The soil liner material should be placed in maximum 8-inch loose lifts to produce compacted lift thickness of approximately 6 inches. The material should be processed to generally achieve a maximum particle size of 1 inch or less before water is added.

If additional water is necessary to adjust the moisture content, it should be applied after initial processing, but prior to compaction. Water should be applied evenly across the lift and worked into the material. Water used for the soil liner compaction must not be contaminated by waste or any objectionable material.

4.5 Compaction

The soil liner shall be compacted with a pad/tamping-foot or prong-foot roller. A footed roller is necessary to bond the lifts, to distribute the water, and to blend the soil matrix through kneading action. Soil liner shall not be compacted with a bulldozer, rubber-tired roller, flat-wheel roller, scraper, truck, or any track equipment unless it is used to pull a footed roller. The compactor should weigh at least 40,000 pounds. The lift thickness shall be controlled to achieve penetration into the top of the previously compacted lift; therefore, the lift thickness should not be greater than the pad or prong length. Cleaning devices on the roller must be in place and maintained to prevent the prongs or pad feet from becoming clogged to the point that they cannot achieve full penetration.

The compactor should make approximately four passes across the area being compacted. A pass is defined as one pass of the compactor, front and rear drums. The material should be compacted to a minimum of 95 percent of the maximum dry density determined by standard Proctor (ASTM D 698) at a moisture content at or above optimum moisture. Areas with failing tests shall be reworked and recompacted, and then retested, and passing tests must be achieved before another lift is added.

After a lift is compacted, it must be watered to prevent drying and desiccation until the next lift can be placed. If desiccation occurs, the GP must determine if the lift can be rehydrated by surface application of water or if the lift must be scarified, watered, and recompacted. Following compaction and fine grading of the final lift, the surface of the compacted soil liner shall be smooth drum rolled.

4.6 Protection

The completed compacted soil liner must be protected from drying, desiccation, rutting, erosion, and ponded water until the protective cover is installed. Areas that undergo excessive desiccation or damage shall be reworked, recompacted, and retested as directed by the GP.

4.7 Tie in to Existing Liners

The edge of existing compacted soil liners shall be cut back on either a slope or steps to prevent the formation of a vertical joint. Details of the existing liner tie-in are shown in Attachment D3.

4.8 Testing and Verification

4.8.1 Preconstruction Testing

The minimum testing required for material proposed for use as compacted soil liner are listed below.

Compacted Soil Liner Material Preconstruction Tests

Test	Standard	Frequency
Unified Soil Classification	ASTM D 2487	1 per material type
Atterberg Limits	ASTM D 4318	1 per material type
Percent Passing No. 200 Mesh Sieve	ASTM D 1140	1 per material type
Percent Passing 1-inch Sieve	ASTM D 422 or Visual	1 per material type
Standard Proctor Test	ASTM D 698	1 per material type
Coefficient of Permeability	ASTM D 5084 or COE EM 1110-2-1906 Appendix VII	1 per material type

After the moisture density relationship has been determined for a material type, a soil sample should be remolded to about 95 percent of the maximum dry density at the optimum moisture content. This sample will be tested to determine if the soil can be compacted to achieve the required coefficient of permeability. Either falling head or constant head permeability tests may be performed to determine the coefficient of permeability. The permeant fluid for testing must be as required in ASTM D 5084. Distilled or deionized water shall not be used as the permeant fluid.

4.8.2 Construction Testing

All quality control testing will be performed during construction of the liner, except for testing which is required after individual lifts are constructed. The minimum testing required for material used as compacted soil liner is listed below.

Compacted Soil Liner Material Construction Tests

Test	Standard	Frequency[1]
Field Density	ASTM D 2922	1/8,000 sf per 6-inch lift
Atterberg Limits	ASTM D 4318	1/100,000 sf per 6-inch lift
Percent Passing No. 200 Sieve	ASTM D 1140	1/100,000 sf per 6-inch lift
Percent Passing 1-inch Sieve	ASTM D 422 or Visual	1/100,000 sf per 6-inch lift
Standard Proctor Test	ASTM D 698	1 per material type
Coefficient of Permeability	ASTM D 5084 or COE EM 1110-2-1906 Appendix VII	1/100,000 sf per 6-inch lift
Moisture Content	ASTM D 2216	1/100,000 sf per 6-inch lift

[1] A minimum of one test must be performed for each lift regardless of surface area.

The Atterberg limits of the compacted soil liner must be compared to the Atterberg limits of the Proctor curve sample to assure that the Proctor curve represents the in-place material. Typically, a variance of more than 10 points between the liquid limit or plasticity index of the in-place soil and those of the Proctor curve sample will require that a new Proctor curve be developed. Permeability testing will be performed on undisturbed samples from the compacted soil liner as described in Section 4.8 and all test data will be reported.

4.8.3 Thickness Verification

The as-built thickness of the compacted soil liner shall be determined by standard survey methods. Prior to the placement of liner material, the subgrade elevations will be determined at a minimum rate of one survey point per 5,000 sf of lined area. After the compacted soil liner is completed, the top of the liner elevations will be determined at the same locations as the subgrade elevations.

5 PROTECTIVE COVER

30 TAC §330.339

5.1 General

The protective cover component of the Type IV liner system consists of a 12-inch-thick layer of soils placed over the compacted soil liner. The CQA monitor shall provide continuous on-site observation during protective cover placement to assure that protective cover placement does not damage compacted soil liner in accordance with 30 TAC §330.339(a)(2). The GP shall make sufficient site visits during protective cover placement to document the construction activities, testing, and thickness verification in the SLER in accordance with Section 7.2.

5.2 Materials

Protective cover material shall consist of soil that is free from debris, rubbish, frozen materials, foreign objects, and organic material, or any material that could damage the compacted soil liner.

5.3 Preparation

Prior to placing the protective cover material, the top of compacted soil liner elevations shall be verified in accordance with the requirements of Section 4.8 and all testing on the compacted soil liner shall be completed.

5.4 Placement

The protective cover shall be placed in a manner that minimizes the potential to damage the compacted soil liner. Hauling equipment shall be restricted to haul roads of sufficient thickness to protect the compacted soil liner. The protective cover shall be dumped from the haul road and spread by low ground pressure equipment. Any compacted soil liner that, in the opinion of the CQA monitor, has been damaged by the protective cover placement must be repaired and retested in accordance with Section 4.8.

5.5 Testing and Verification

5.5.1 Testing

If the protective cover is counted as ballast against hydrostatic forces, the field density of the in-place protective cover shall be determined at a rate of one test per 10,000 sf or will be estimated as 90% of the typical compacted density. The in-place field density will be determined for information only and there is no minimum compaction requirement for protective cover.

5.5.2 Thickness Verification

The as-built thickness of the protective cover shall be determined by standard survey methods. Prior to the placement of protective cover, the top of compacted soil liner elevations will be determined at a minimum rate of one survey point per 5,000 sf of lined area. After the protective cover is completed, the top of the protective cover elevations will be determined at the same locations as the top of compacted soil liner elevations.

6 BALLAST

30 TAC §330.337

6.1 General

The highest measured water levels are presented in Appendix D7A and represent the highest groundwater elevations that have been encountered at the site. The highest measured water levels will be used as the design groundwater elevations. The most recent groundwater elevations must be reviewed before the construction of each cell and, if necessary, the highest measured water levels must be adjusted upward. Lined areas will be dewatered during and after construction using a temporary dewatering system as described in Section 3.2.

Long-term hydrostatic uplift pressures will be resisted by the weight of the materials placed above the liner subgrade in accordance with §330.337. Ballast can include the weight of the compacted soil liner, protective cover, and compacted waste. The ballast will be documented in the BER in accordance with Section 7.3.

6.2 Ballast Geometry

For each new lined area, the GP will prepare calculations to determine the geometry of the ballast that is required to prevent hydrostatic uplift of the liner system with a minimum factor of safety of 1.5. Procedures for calculating the height of compacted waste or additional protective cover soil above the liner system needed to ballast hydrostatic pressure are provided in Appendix D7C along with example calculations.

6.3 Ballast Materials

Ballast will consist of compacted soil liner, protective cover, infiltration layer, erosion layer, and solid waste. If needed, solid waste ballast will consist of waste accepted at the site in accordance with Part IV – Site Operating Plan. Large, bulky items must be excluded from the initial five feet of waste ballast.

6.4 Ballast Placement

If solid waste ballast is required, landfill personnel will be on site full time during the placement of the first five feet of waste over the liner system. They will verify and document that the initial five feet of waste does not contain large, bulky items which could damage the liner system or which cannot be compacted to the required density. Waste ballast must be compacted to a density of not less than 1,200 lb/cy or 44 pcf. The site manager will document that the waste used for ballast has been compacted with multiple passes of a wheeled compactor that weighs in excess of 40,000 pounds. The form to be used by the landfill manager is included in Appendix D7D. This documentation will be placed in the site operating record and attached to the BER.

6.5 Testing and Verification

Where compacted soil liner and protective cover is used as ballast, it will be tested in accordance with Sections 4 and 5 and test results will be used to calculate the required ballast thickness. Where protective cover is not tested, the protective cover will be assumed to have a density of 90 percent of the maximum dry density of the material. If used, waste ballast compaction will be verified by the site manager and documented on the Waste-for-Ballast Placement Record. The GP will verify that the temporary dewatering system prevented uplift forces on the liner during construction of the liner. The verification will include observations of water levels in the dewatering sumps or survey data as deemed appropriate by the GP. The site manager will document that the dewatering system remained operational until ballast was placed. The documentation will be placed in the site operating record.

Once the calculated height of compacted waste has been achieved for each cell area, the temporary dewatering system no longer needs to remain operational. Before submittal of the BER, the GP will review compaction information and density of material used as ballast, and the thickness of all materials used in Ballast Calculations. A BER must be submitted to the TCEQ in accordance with Section 7.3 to document that adequate ballast height has been achieved and to request that the temporary dewatering system operations be discontinued.

7 DOCUMENTATION

30 TAC §330.341

7.1 Reports

Each report shall be submitted in triplicate to the Municipal Solid Waste Division and shall be prepared in accordance with the methods and procedures contained in this LQCP. The evaluated area should not be used for the receipt of solid waste until acceptance is received from the executive director. The executive director may respond to the permittee either verbally or in writing within 14 days from the date on which the SLER document is date-stamped by the Municipal Solid Waste Division. Verbal acceptance may be obtained from the executive director, which will be followed by written concurrence. If no response, either written or verbal, is received within 14 days, the SLER shall be considered accepted and the owner or operator may continue facility construction or operations. Each report must be signed and, where applicable, sealed by the individual performing the evaluation and countersigned by the site operator or his authorized representative.

Markers will be placed to identify all disposal areas for which a SLER has been submitted and accepted by the executive director. These markers shall be located so that they are not destroyed during operations.

The surface of a liner should be covered with a layer of solid waste within a period of six months to mitigate the effects of surface erosion and rutting due to traffic. Liner surfaces not covered with waste within six months shall be checked by the SLER evaluator, who shall then submit a letter report on his findings to the executive director. Any required repairs shall be performed properly. A new SLER shall be submitted on the new construction for all liners that need repair due to damage.

7.2 Soils and Liner Evaluation Report

After construction of the compacted soil liner, the GP will submit a SLER to the TCEQ on behalf of the owner. Preparation and submission of the SLER shall be in accordance with the TCEQ MSWR. The purpose of the SLER is to document that the construction methods and test procedures are consistent with this LQCP, the TCEQ MSWR, and the project specifications.

At a minimum, the SLER will contain the following:

- TCEQ SLER form
- A summary of all construction activities
- A summary of all laboratory and field test results
- Sampling and testing location drawings
- A description of significant construction problems and the resolution of these problems
- Record drawings

- A statement of compliance with the LQCP
- An updated seasonal high water table map
- A detailed description of the temporary dewatering system
- The seal and signature of the GP and assistant GP, if applicable, in accordance with the Texas Engineering Practice Act

7.3 Ballast Evaluation Report

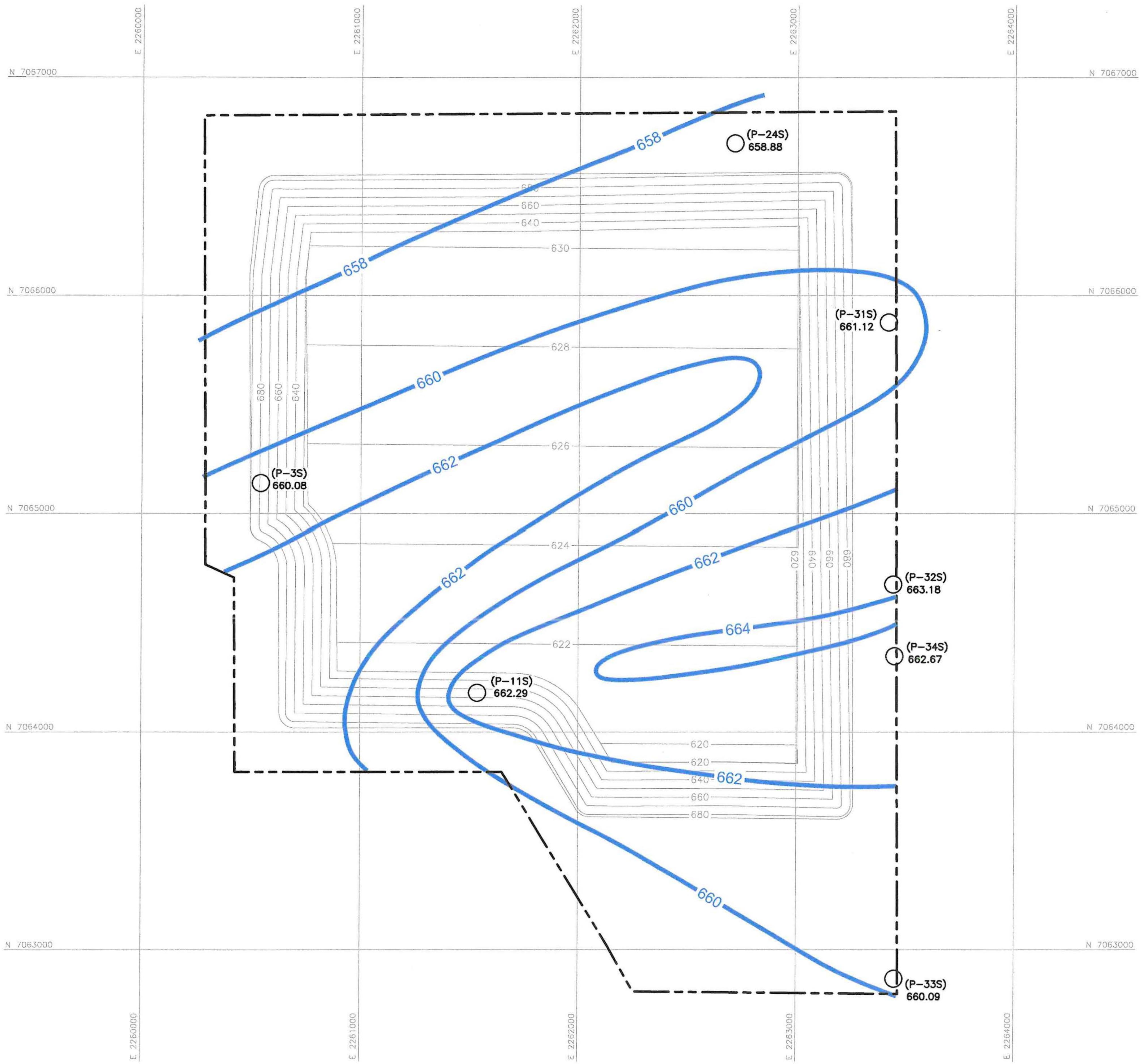
For areas where waste is used for ballast, a BER will be completed and submitted to the TCEQ. The purpose of the BER is to document that sufficient ballast has been placed to offset the potential long-term hydrostatic uplift forces that may exist below the liner system. The BER will provide documentation that the temporary groundwater control system is no longer required. The BER shall include the following information:

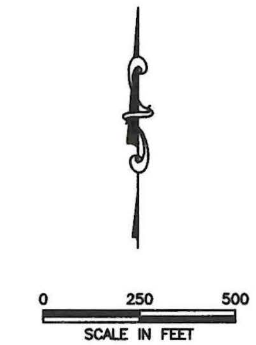
- Names and phone numbers of contact persons.
- Evaluation by the GP documenting that detrimental uplift has not occurred within the liner system. The evaluation shall include survey data as deemed pertinent by the GP.
- Certification from the owner of the type of waste placed in the lower five feet and documentation of the compaction from the Site Operating Record (see form in Appendix D7D).
- Survey of the top of waste to document that the required thickness has been placed.
- Documentation that any dewatering system used to lower the groundwater level during liner construction was in effect throughout the completion of the ballast placement.
- Documentation that the seasonal high water elevation has not increased from that presented in Appendix D7A, or that additional ballast has been provided to compensate for upward changes in the high water table during ballast placement.
- The signature and seal of the registered professional engineer performing the evaluation and the signature of the owner's authorized representative.

If adequate ballast is placed on a liner as part of the construction process it will be documented in the SLER. If it is documented in the SLER that adequate ballast is present to counteract any hydrostatic uplift, a separate BER will not be required or submitted for that particular liner installation.

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX D7A
HIGHEST MEASURED WATER LEVELS





LEGEND

— — —	PERMIT BOUNDARY
N 7062000	STATE PLANE COORDINATES
P-3S ○	PIEZOMETER LOCATION AND ID NUMBER
660	CONTOURS OF THE HIGHEST WATER LEVEL IN UNIT I
660.08	WATER LEVEL ELEVATION

NOTE(S):

1. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

UNIT I HIGHEST MEASURED WATER LEVELS

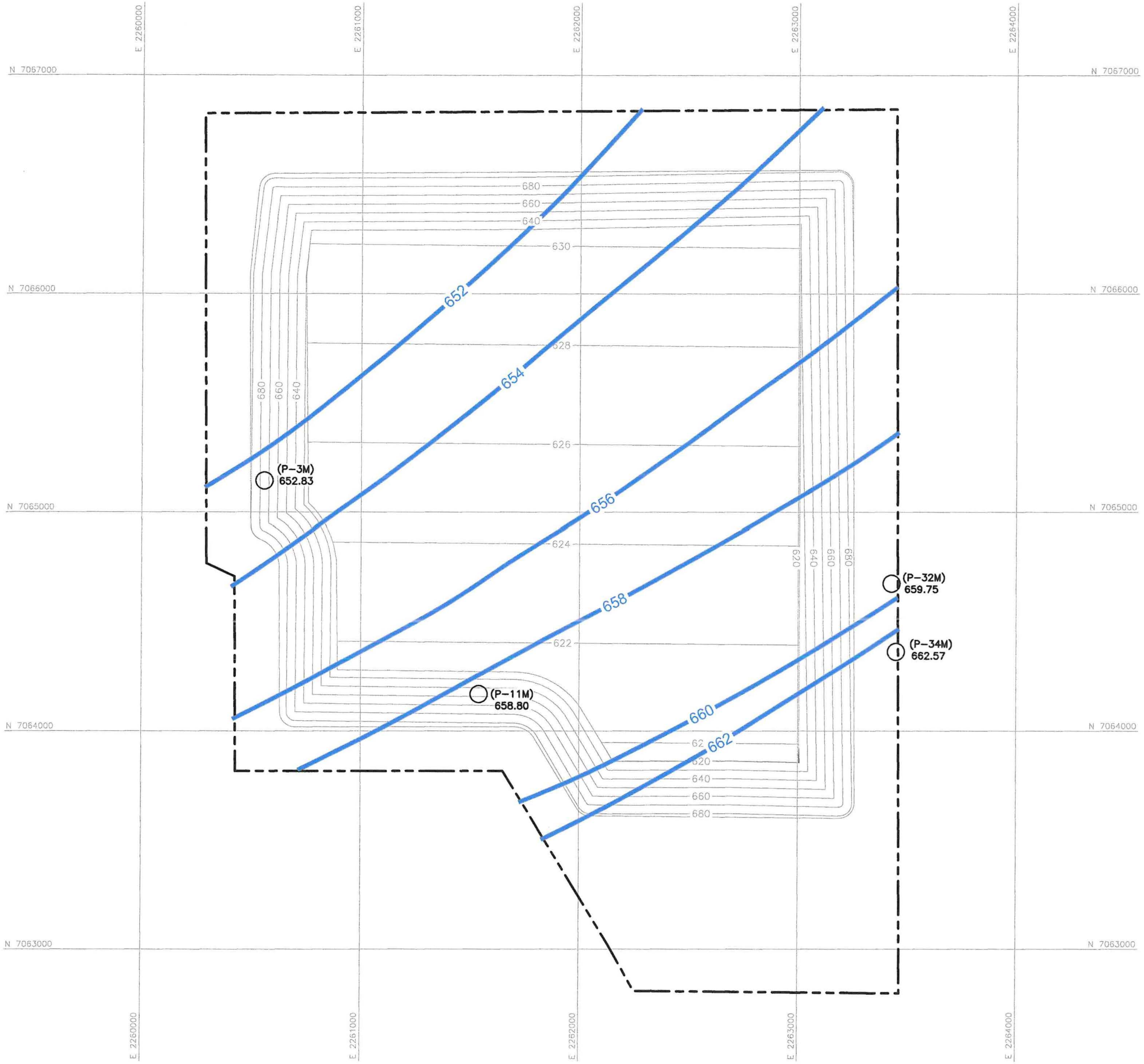
CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D7A.1

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D7A.1-Unit I_HMGWL.dwg Layout: LAYOUT 1 User: awhite



LEGEND

- PERMIT BOUNDARY
- N 7062000 — STATE PLANE COORDINATES
- P-3M ○ — PIEZOMETER LOCATION AND ID NUMBER
- 660 — CONTOURS OF THE HIGHEST WATER LEVEL IN UNIT III
- 652.83 — WATER LEVEL ELEVATION

NOTE(S):

1. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

UNIT III HIGHEST MEASURED WATER LEVELS

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

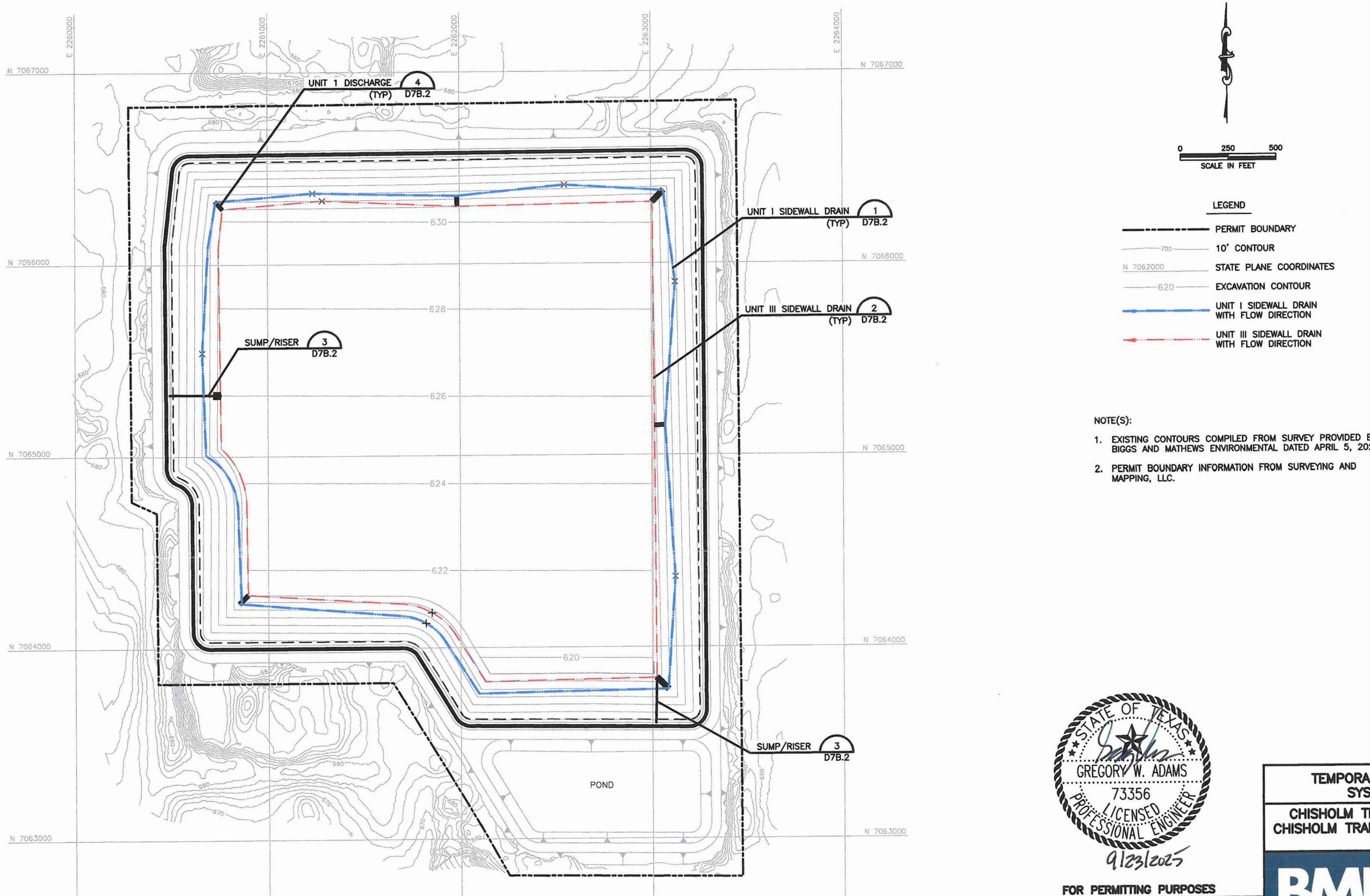
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D7A.2

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D7A.2-Unit III_HMGWL.dwg Layout: LAYOUT 1 User: awhite

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX D7B
TEMPORARY DEWATERING SYSTEM



O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D7B.1-TempDewateringSystemPlan.dwg Layout: D7B.1 User: awhite

NOTE(S):

1. EXISTING CONTOURS COMPILED FROM SURVEY PROVIDED BY BIGGS AND MATHEWS ENVIRONMENTAL DATED APRIL 5, 2024.
2. PERMIT BOUNDARY INFORMATION FROM SURVEYING AND MAPPING, LLC.

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
9/23/2025

FOR PERMITTING PURPOSES

REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

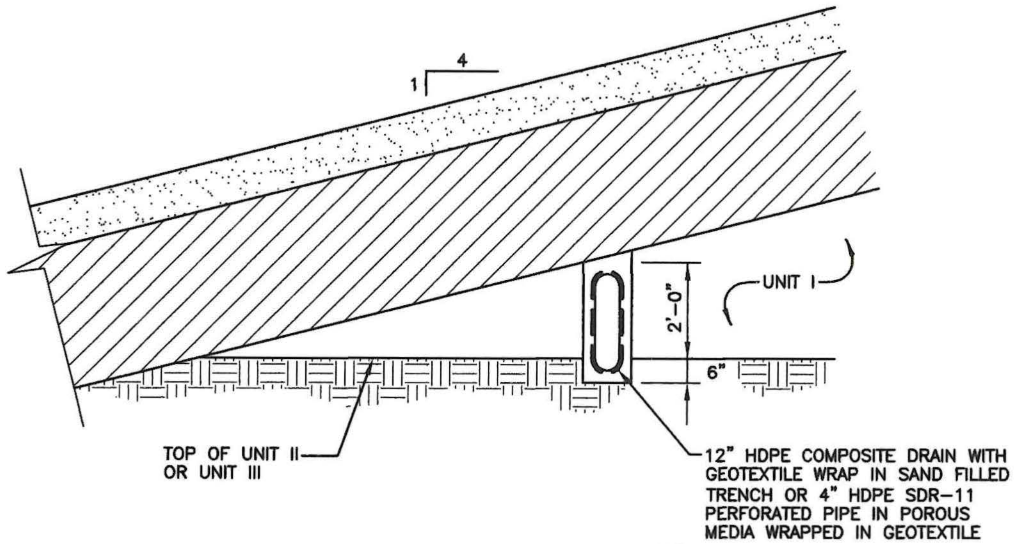
TEMPORARY DEWATERING SYSTEM PLAN

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME
BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

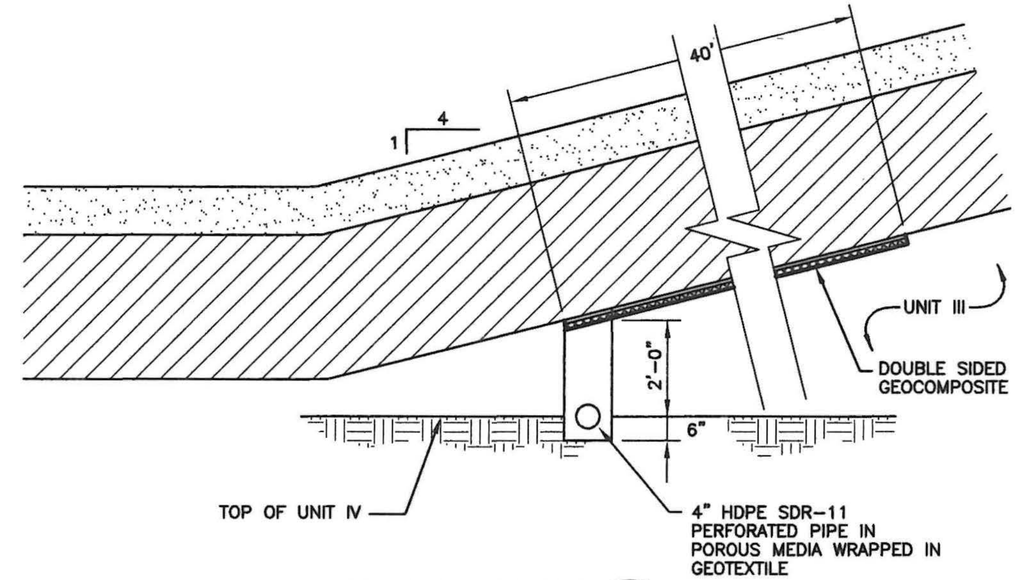
TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D7B.1



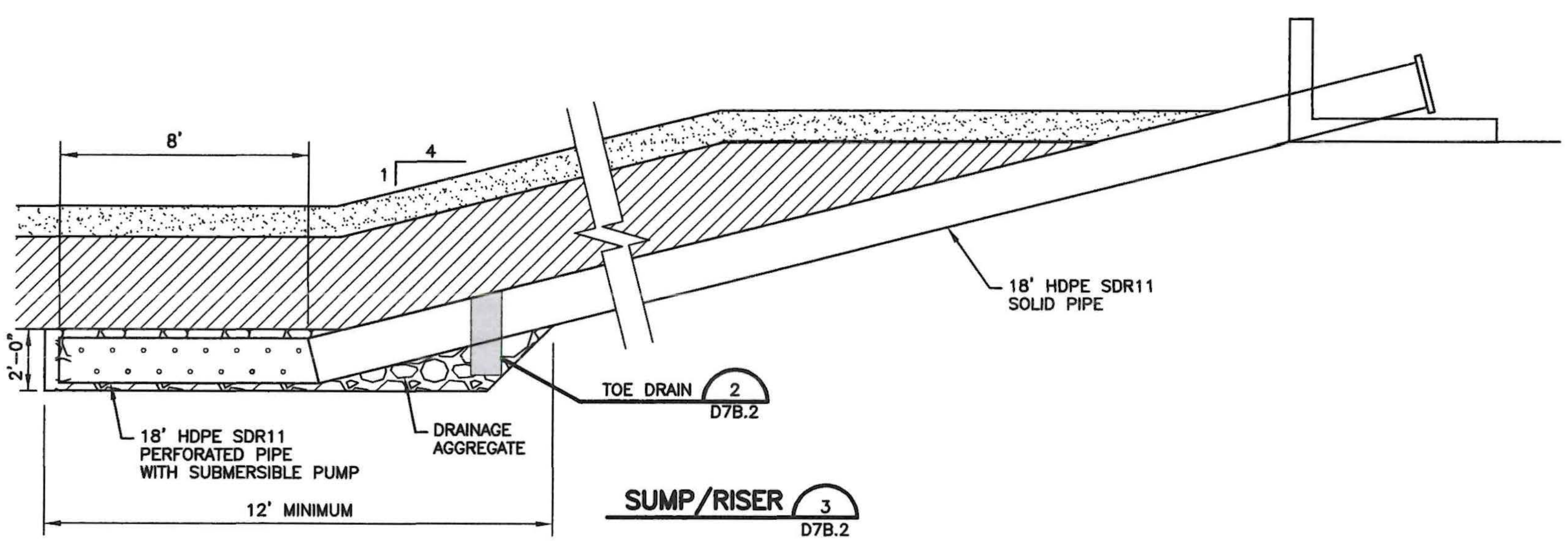
UNIT I SIDEWALL DRAIN (1 / D7B.2)

0 2 4
SCALE IN FEET



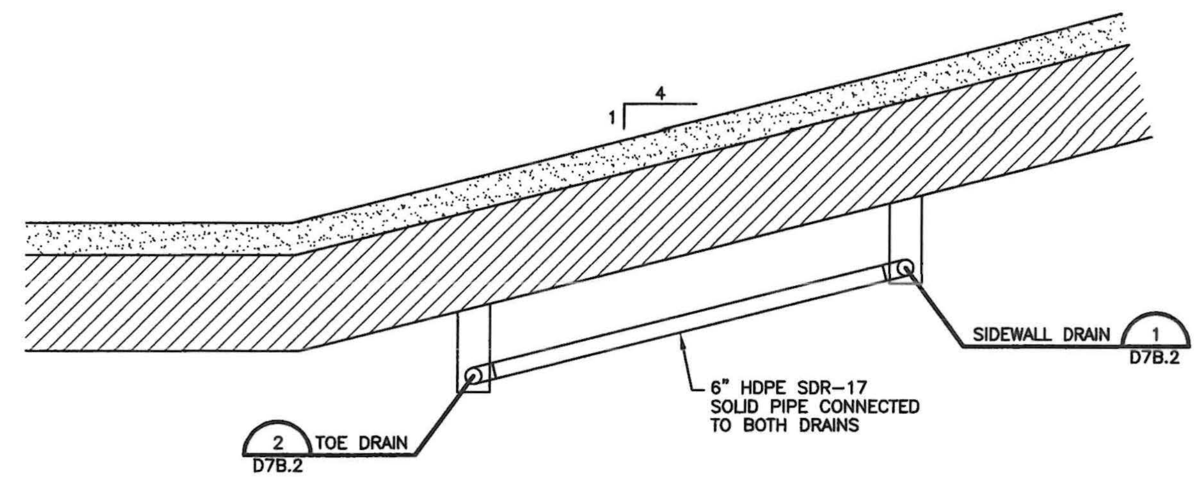
UNIT III TOE DRAIN (2 / D7B.2)

0 2 4
SCALE IN FEET



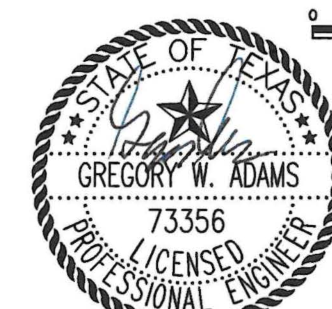
SUMP/RISER (3 / D7B.2)

0 3 6
SCALE IN FEET



UNIT I DISCHARGE PIPE (4 / D7B.2)

0 3 6
SCALE IN FEET



9/23/2025

FOR PERMITTING PURPOSES

REVISIONS			
REV	DATE	DESCRIPTION	DWN BY

TEMPORARY DEWATERING SYSTEM DETAILS

CHISHOLM TRAIL DISPOSAL, LLC
CHISHOLM TRAIL DISPOSAL LANDFILL

BME

BIGGS & MATHEWS ENVIRONMENTAL
1700 ROBERT ROAD, STE. 100
MANSFIELD, TEXAS 76063
817-563-1144

TBPE FIRM NO. F-256
TBPG FIRM NO. 50222

DRAWING
D7B.2

O:\Green Group\Wise County\Solid Waste\Type IV\P\Drawings\ATT D\D7B.2-TempDewateringSystemDetails.dwg Layout: Layout1 User: awhite

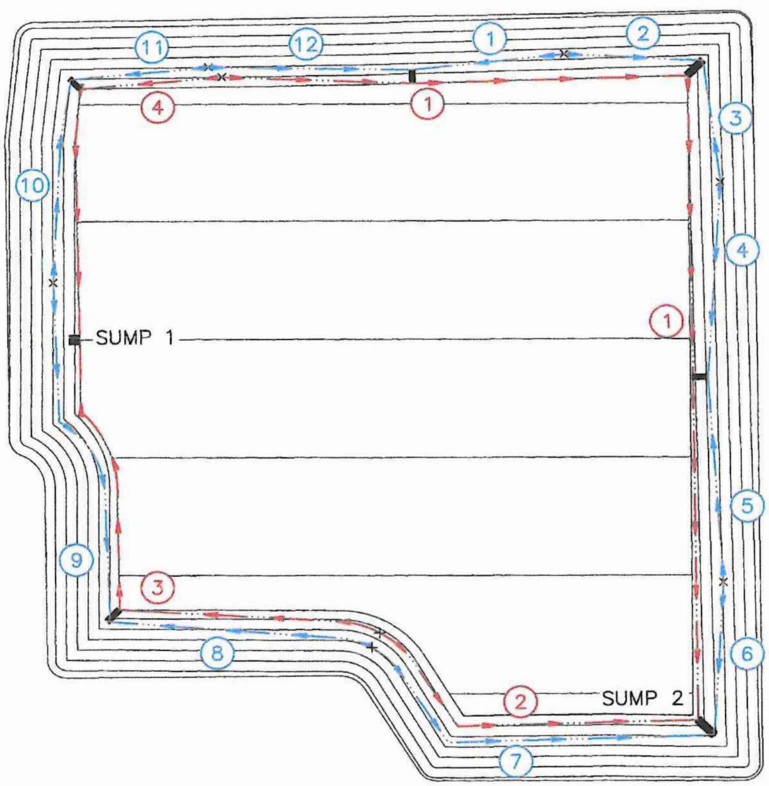
Chisholm Trail Disposal Landfill
Temporary Dewatering Unit I Inflow Rate

Required: Determine the inflow rate to the Unit I sideslope drains.

References: *Dewatering and Groundwater Control*, UFC 3-220-05, January 2004.

Assumptions: The temporary dewatering system will be designed for the highest recorded water levels in Unit I.
The boundary of the uppermost ground water bearing unit (GWBU) is at the top of Units II and III.

Solution: The sidewall drain consist of 12 segments located at the base of Unit I.



$Q = (kx/2L)(H^2 - h_o^2)$ (Reference Figure 4-1)

Q = design flowrate
k = hydraulic conductivity of GWBU = 2.54E-04 cm/sec
8.33E-06 fps

x = segment length
L = drawdown length from Reference Figure 4-2
H = origiinal height of water
h_o = height of water in drain

Chisholm Trail Disposal Landfill
Temporary Dewatering Unit I Inflow Rate

h_s = height of water above drain

Drain Segment	H (ft)	h_o (ft)	h_s (ft)	L (ft)	x (ft)	Q (cfs)	Q (gpm)
1	12.4	2.0	0.0	86.8	620.0	0.0045	2.0
2	10.7	2.0	0.0	74.9	500.0	0.0031	1.4
3	11.5	2.0	0.0	80.5	460.0	0.0031	1.4
4	14.7	2.0	0.0	102.9	760.0	0.0065	2.9
5	18.8	2.0	0.0	131.6	820.0	0.0091	4.1
6	15.4	2.0	0.0	107.8	600.0	0.0054	2.4
7	9.8	2.0	0.0	68.6	1,300.0	0.0073	3.3
8	16.6	2.0	0.0	116.2	1,100.0	0.0107	4.8
9	21.3	2.0	0.0	149.1	1,400.0	0.0176	7.9
10	12.8	2.0	0.0	89.6	780.0	0.0058	2.6
11	12.7	2.0	0.0	88.9	500.0	0.0037	1.7
12	12.8	2.0	0.0	89.6	780.0	0.0058	2.6

The peak flow for the sidewall drain = 7.9 gpm

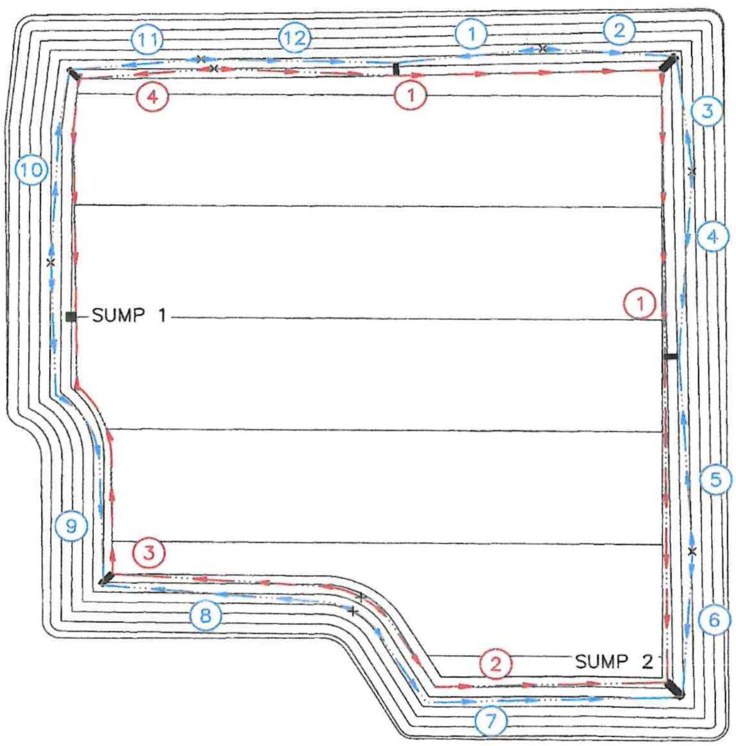
Chisholm Trail Disposal Landfill
Temporary Dewatering Unit III Inflow Rate

Required: Determine the inflow rate to the Unit III toe drains.

References: *Dewatering and Groundwater Control*, UFC 3-220-05, January 2004.

Assumptions: The temporary dewatering system will be designed for the highest recorded water levels in Unit III.
The boundary of the uppermost ground water bearing unit (GWBU) is at the top of Units II and III.

Solution: The toe drain consist of 4 segments located at the base of Unit III.



$Q = (kx/2L)(H^2 - h_o^2)$ (Reference Figure 4-1)

Q = design flowrate
k = hydraulic conductivity of GWBU = 2.05E-04 cm/sec
6.73E-06 fps

x = segment length
L = drawdown length from Reference Figure 4-2
H = origiinal height of water
h_o = height of water in drain
h_s = height of water above drain

Chisholm Trail Disposal Landfill
Temporary Dewatering Unit III Inflow Rate

Drain Segment	*H* (ft)	h_o (ft)	h_s (ft)	*L* (ft)	*x (ft)*	*Q (cfs)*	*Q (gpm)*
1	29.8	12.0	0.0	178.8	4,190.0	0.0586	26.3
2	36.6	12.0	0.0	219.6	1,280.0	0.0234	10.5
3	30.5	12.0	0.0	183.0	2,060.0	0.0298	13.4
4	22.4	12.0	0.0	134.4	1,550.0	0.0139	6.2

The total flow in each segment includes the flow from the Unit I Drains.

Unit I Drain	Unit III Drain 1	Unit III Drain 2	Unit III Drain 3	Unit III Drain 4
1	2.0			
2	1.4			
3	1.4			
4	2.9			
5	4.1			
6	2.4			
7		3.3		
8			4.8	
9			7.9	
10				2.6
11				1.7
12	2.6			
Total	16.8	3.3	12.7	4.3

Drain Segment	Unit III Q (gpm)	Unit I Q (gpm)	Total Q (gpm)
1	26.3	16.8	43.1
2	10.5	3.3	13.8
3	13.4	12.7	26.1
4	6.2	4.3	10.5

The peak flow for the toe drain = 43.1 gpm

Chisholm Trail Disposal Landfill
Temporary Dewatering System Trench Capacity

Required: Check the size of the sidewall and toe drains.

References: *AdvanEDGE Pipe (L-1074) Literature referencing KTC-97-5, SPR-92-143, "Performance and Cost Effectiveness of Pavement Edge Drains",* L. John Fleckenstein, Kentucky Transportation Center, 1997.

Solution: **Sidewall composite drain**

The peak flow rate for the sidewall drain =	7.9 gpm
Flow capacity of 12" ADS Composite Drain =	**39.0 gpm**

Toe pipe drain

The peak flow rate for the toe drain =	43.1 gpm

Use Manning's Equation to determine the flow capacity of the pipe drain.

$$Q = (1.486/n)AR^{2/3} S^{1/2}$$

n = Manning's number =	0.009
d = *pipe diameter* =	0.330 ft
A = cross section area of pipe =	0.086 sf
R = hydraulic radius of pipe =	0.083 ft
S = slope of pipe =	0.005 ft/ft
Solve for Q =	0.190 cfs

Flow capacity of 4" pipe = 85.1 gpm

Chisholm Trail Disposal Landfill
Temporary Dewatering System Sump Capacity

Required: Size the sump pumps for the dewatering system.

Solution: Add the peak flows into each sump.

Unit III Segment	Sump 1 Pump (gpm)	Sump 2 Pump (gpm)
1		43.1
2		13.8
3	26.1	
4	10.5	
Total	36.5	56.9

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX D7C
BALLAST CALCULATIONS

LINER BALLAST CALCULATIONS

The required ballast thickness shall be calculated by the GP and included in the SLER. The ballast calculation shall be based on the as-built conditions and the updated highest groundwater elevations. The required ballast thickness shall be calculated as follows:

A. Review and update, as necessary, the water level elevations (see Appendix D7A). Adjust the seasonal high water table upward, if necessary, across the area being lined using the highest measured water levels derived from the most recent piezometer water level readings. Determine the design water level for the area being analyzed. The lined area may be subdivided into more than one area as appropriate for changes in groundwater table elevations and/or subgrade elevations across the lined area.

B. Determine the hydrostatic uplift pressure on the base of the bottom and sidewall liner system including normal, vertical, and horizontal components of the uplift pressure as follows:

1. Bottom Liner: Determine the maximum hydrostatic uplift pressures acting normal to the base of the bottom liner system using the unit weight of water, γ_W, times the vertical distance from the excavation to the design water level, H.

$$P_N = \gamma_W H$$

2. Sidewall Liner: Determine the maximum hydrostatic uplift pressures acting normal, vertical, and horizontal to the base of the sidewall liner system using the following steps.

(a) Determine the maximum normal uplift pressure on the sidewall liner using the unit weight of water times the vertical distance from the base of the layer to the design water level, H.

$$P_N = \gamma_W H$$

(b) Determine the maximum vertical uplift pressure on the sidewall liner using the normal uplift pressure times the cosine of the slope angle.

$$P_V = P_N \cos \beta$$

(c) Determine the maximum horizontal uplift pressure on the sidewall liner using the normal uplift pressure times the sine of the slope angle.

$$P_H = P_N \sin \beta$$

C. Determine the resisting pressure against uplift of the bottom and sidewall liner system including normal, vertical, and horizontal components of the resisting pressures as follows:

1. Bottom Liner: Determine the normal resisting pressure at the liner using the unit weight of the protective cover times the thickness of the protective cover.

$$R_N = (\gamma_{pc} T_{pc})$$

Where: γ_{pc} = Wet unit weight of the protective cover
T_{pc} = Thickness of the protective cover

The unit weight of the protective cover shall be determined from field measured unit weights.

2. Sidewall Liner:

(a) Determine the vertical resisting pressure of the sidewall liner using the unit weight of the protective cover material times the vertical thickness of the protective cover layer. This is equal to the normal resisting pressure divided by the cosine of the slope angle.

$$R_v = R_N / \cos\beta$$

(b) Determine the horizontal resisting pressure of the sidewall liner using the coefficient of at-rest earth pressure of the liner system components times the vertical resisting pressure.

$$R_H = K_O R_V$$

The coefficient of at-rest earth pressure, K_O, is based on the assumed angle of internal friction, ϕ, of the material resisting hydrostatic pressures (compacted soil).

(c) Determine the normal resisting pressure of the sidewall liner system using the normal components of the horizontal and vertical resisting pressures calculated in steps (a) and (b) above.

$$R_N = R_H \sin \beta + R_V \cos \beta$$

D. Evaluate the factor of safety against uplift of the bottom and sidewall liner system due to hydrostatic pressures.

1. Bottom Liner: Determine the factor of safety against uplift of the bottom liner system due to hydrostatic forces acting normal to the base of the bottom liner system.

$$FS = R_N / P_N$$

If the factor of safety is greater than or equal to 1.2, the protective cover provides sufficient ballast to offset the hydrostatic uplift forces.

If the factor of safety is less than 1.2, additional ballast in the form of solid waste or additional soil will be necessary to offset the hydrostatic forces. See Step E for determining the geometry of solid waste or additional ballast.

2. Sidewall Liner:

Determine the factor of safety against uplift of the sidewall liner system due to hydrostatic pressures acting normal, vertical, and horizontal to the sidewall liner system.

$$FS_N = R_N / P_N$$

$$FS_V = R_V / P_V$$

$$FS_H = R_H / P_H$$

If the factors of safety are greater than or equal to 1.2, the protective cover provides sufficient ballast to offset the hydrostatic forces.

If the factor of safety is less than 1.2 for any of the components (normal, vertical, or horizontal), additional ballast in the form of solid waste or additional soil will be necessary to offset the hydrostatic forces. See Step E for determining the geometry of solid waste or additional soil ballast.

E. Use a factor of safety of 1.5 against uplift of the liner and ballast system for solid waste ballast and a factor of safety of 1.2 for soil ballast.

Assume a unit weight of 44 pcf for solid waste and a unit weight of 100 pcf for soil if field measurements are not available, or if conditions indicate the field measurements are no longer applicable.

1. Bottom Liner

The factor of safety against uplift of the liner and ballast system is calculated as follows:

$$FS = (R_N + B_N) / P_N$$

Where R_N = Normal protective cover pressure
B_N = Normal ballast pressure
B_N = $H * \gamma$
FS = 1.5 for waste; 1.2 for soil

Solving the above equation for the height of ballast:

$$H = (FS\ P_N - R_N) / \gamma$$

2. Sidewall Liner

The factor of safety against uplift of the liner and ballast system is calculated as follows:

(a) $FS = (R_V + B_V) / P_V$

Where R_V = Vertical protective cover pressure
B_V = Vertical ballast pressure
B_V = $H * \gamma$
FS = 1.5 for waste; 1.2 for soil

Solving the above equation for the height of ballast:

$$H = (FS\ P_V - R_V) / \gamma$$

(b) $FS = (R_H + B_H) / P_H$

Where R_H = Horizontal protective cover pressure
B_H = Horizontal ballast pressure
$B_H = B_V * K_0$
$B_H = H * \gamma * 0.7$
FS = 1.5 for waste; 1.2 for soil

Solving the above equation for the height of ballast:

$$H = (FS\ P_H - R_H) / \gamma * k_0$$

Chisholm Trail Disposal Landfill
Example Unit I Ballast Calculation

Required: Example calculation to evaluate the long-term hydrostatic uplift pressures on the liner system and determine the ballast requirements.

Assumptions:
1) The design water elevations are shown on Drawing D7A.1.
2) All cells must be re-evaluated based on updated groundwater data prior to construction.
3) Uplift is evaluated at the bottom of the compacted soil liner.

Solution:

Calculations are shown for the sideslope of Sector 3 where the largest differential occurs between the base of the unit and the groundwater elevation.

The forces acting upon the liner system are:

P_N = normal pressure	R_N = normal resistance
P_V = vertical pressure	R_V = vertical resistance
P_H = horizontal pressure	R_H = horizontal resistance

1) Determine the uplift pressure upon the liner at the base of Unit I.

γ_w = unit weight of water =	62.4	pcf
Groundwater elevation =	662	ft-msl
Liner elevation =	640	ft-msl
H = design water level above liner =	22	ft
β = sidewall slope =	14.0	deg
$P_N = H\gamma_w$ =	1372.8	psf
$P_V = P_N \cos\beta$ =	1332.0	psf
$P_H = P_N \sin\beta$ =	332.1	psf

2) Determine the resistance pressure provided by the liner.

γ = density =	120.0	pcf
T_N = normal thickness =	4.0	ft
T_V = vertical thickness =	4.12	ft
ϕ = angle of internal friction =	15.0	deg
$R_V = R_N / \cos\beta$	512.1	psf
$R_H = k_o R_V$ =	256.1	psf (k_0 assumed as 0.5)
$R_N = R_H \sin\beta + R_V \cos\beta$ =	558.9	psf

3) Determine the factors of safety against uplift and evaluate the need for additional ballast.

$FS_N = R_N / P_N$ =	0.4
$FS_V = R_V / P_V$ =	0.4
$FS_H = R_H / P_H$ =	0.8

The factor of safety for the liner providing ballast against hydrostatic uplift is less than 1.2. Evaluate the height of waste ballast required to provide a factor of safety of at least 1.5.

γ_{sw} = unit weight of solid waste = 44.0 pcf

$FS = (R_v + B_v) / P_v$

For FS = 1.5 $H = (FS * P_v - R_v) / \gamma_{sw}$

H = 33.8 ft

$FS = (R_H + B_H) / P_H$

For FS = 1.5 $H = (FS*P_H - R_H) / (\gamma_{sw}*k_0)$

H = 11.0 ft

Using waste height calculated for vertical forces, check FS with normal forces:

Chisholm Trail Disposal Landfill
Example Unit I Ballast Calculation

For H_{sw} = 33.8 ft

$FS = ((R_v + B_v)cosB + (R_h + B_h)sinB) / P_n$

FS = 1.9 Factor of safety is greater than 1.5 so vertical forces control

The GP will evaluate the highest measured water levels to determine where the largest hydrostatic force is located and perform these calculations to determine how much ballast is required when preparing the Ballast Evaluation Report for submittal to the TCEQ prior to decommissioning any dewatering system.

Chisholm Trail Disposal Landfill
Example Unit III Ballast Calculation

Required: Example calculation to evaluate the long-term hydrostatic uplift pressures on the liner system and determine the ballast requirements.

Assumptions:
1) The design water elevations are shown on Drawing D7A.2.
2) All cells must be re-evaluated based on updated groundwater data prior to construction.
3) Uplift is evaluated at the bottom of the compacted soil liner.

Solution: Calculations are shown for the sideslope of Sector 4 where the largest differential occurs between the base of the unit and the groundwater elevation.

The forces acting upon the liner system are:

P_N = normal pressure	R_N = normal resistance
P_V = vertical pressure	R_V = vertical resistance
P_H = horizontal pressure	R_H = horizontal resistance

1) Determine the uplift pressure upon the liner at the base of Unit I.

γ_w = unit weight of water =	62.4	pcf
Groundwater elevation =	662	ft-msl
Liner elevation =	620	ft-msl
H = design water level above liner =	42	ft
β = sidewall slope =	14.0	deg
$P_N = H\gamma_w$ =	2620.8	psf
$P_V = P_N \cos\beta$ =	2543.0	psf
$P_H = P_N \sin\beta$ =	634.0	psf

2) Determine the resistance pressure provided by the liner.

γ = density =	120.0	pcf
T_N = normal thickness =	4.0	ft
T_V = vertical thickness =	4.12	ft
ϕ = angle of internal friction =	15.0	deg
$R_V = R_N / \cos\beta$	512.1	psf
$R_H = k_o R_V$ =	256.1	psf (k_0 assumed as 0.5)
$R_N = R_H \sin\beta + R_V \cos\beta$ =	558.9	psf

3) Determine the factors of safety against uplift and evaluate the need for additional ballast.

$FS_N = R_N / P_N$ =	0.2
$FS_V = R_V / P_V$ =	0.2
$FS_H = R_H / P_H$ =	0.4

The factor of safety for the liner providing ballast against hydrostatic uplift is less than 1.2. Evaluate the height of waste ballast required to provide a factor of safety of at least 1.5.

γ_{sw} = unit weight of solid waste = 44.0 pcf

$FS = (R_v + B_v) / P_v$

For FS = 1.5 $H = (FS * P_v - R_v) / \gamma_{sw}$

$H =$ 75.1 ft

$FS = (R_H + B_H) / P_H$

For FS = 1.5 $H = (FS * P_H - R_H) / (\gamma_{sw} * k_0)$

$H =$ 31.6 ft

Chisholm Trail Disposal Landfill
Example Unit III Ballast Calculation

Using waste height calculated for vertical forces, check FS with normal forces:

For H_{sw} = 75.1 ft

$FS = ((R_v + B_v)\cos B + (R_h + B_h)\sin B) / P_n$

FS = 1.8 Factor of safety is greater than 1.5 so vertical forces control

The GP will evaluate the highest measured water levels to determine where the largest hydrostatic force is located and perform these calculations to determine how much ballast is required when preparing the Ballast Evaluation Report for submittal to the TCEQ prior to decommissioning any dewatering system.

CHISHOLM TRAIL DISPOSAL LANDFILL

APPENDIX D7D
WASTE-FOR-BALLAST PLACEMENT RECORD

WASTE-FOR-BALLAST PLACEMENT RECORD

This form is to be completed by the landfill manager for all landfilled areas requiring waste-for-ballast. One form will be developed for each area as addressed in a Soil and Liner Evaluation Report (SLER). The Professional of Record (POR) may reference this form in order to certify that the placement of ballast is in compliance with the LQCP.

GENERAL INFORMATION

Area documented by this record (provide site grid coordinates of each corner):

____

____

____

____

SLER approval date for this area: ______________

Date of initial waste placement: ______________

Date of completion of first five feet of waste in place over entire area: ______________

Total required waste-for-ballast thickness for this area:
(Note: Calculations for determining the required thickness of waste-as-ballast will be included with the SLER for this area.) ______________

Date when minimum required thickness of waste was achieved: ______________

Actual waste-for-ballast thickness demonstrated by this record: ______________

WASTE EQUIPMENT USED

- ☐ 40,000-pound minimum gross weight wheeled compactor.
  Specify equipment used:____

FIRST LIFT CONSIDERATIONS

- ☐ No brush, large, bulky, elongated, or other waste items which could damage the underlying liner system have been placed within the first 5 feet of waste above the top of the protective cover.

- ☐ A 5-foot lift of loose waste (acceptable waste defined above) has been maintained between the waste compaction equipment and the top of the liner protective cover in all fill areas to allow uniform compaction of the waste material.

- ☐ Describe type(s) of waste placed in the first 5 feet of waste over the top of the liner protective cover.

  ____

  ____

WASTE COMPACTION METHODS FOR THE TOTAL WASTE-FOR-BALLAST THICKNESS

- ☐ Loose waste layer thickness was less than 2-feet-thick prior to compaction to allow uniform compaction of the acceptable waste material (i.e., no brush, large bulky items).
- ☐ Compaction was achieved over the entire area evaluated using a minimum of three passes of at least one track for each loose waste layer.
- ☐ The slope of the compacted waste layers was less than (flatter) 4 horizontal to 1 vertical.

SIGNATURE OF PERMITTEE

The waste overlying the area described in this record has been placed and compacted as described in this record and in accordance with the site Soils and Liner Quality Control Plan and Site Operating Plan.

____
Signature

____
Typed or Printed Name

____
Title

____
Date Signed

Chisholm Trail Disposal Landfill

291 P.R. 4674
Aurora, TX 76078
Phone: 770-720-2717

Note: This completed form will be placed in the Operating Record and will be available for TCEQ review.

CHISHOLM TRAIL DISPOSAL LANDFILL
WISE COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2421

TYPE IV PERMIT APPLICATION

PART III – SITE DEVELOPMENT PLAN
ATTACHMENT D8
FINAL COVER QUALITY CONTROL PLAN

Prepared for

Chisholm Trail Disposal, LLC

September 2025
Technically Complete

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256
9/23/2025

Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS
FIRM REGISTRATION NO. F-256 AND NO. 10194895

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

STATE OF TEXAS
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1 INTRODUCTION

30 TAC §330.457

1.1 Purpose

This Final Cover Quality Control Plan (FCQCP) has been prepared in accordance with 30 TAC §330.457. This FCQCP establishes the procedures for the design, construction, testing, and documentation of the final cover system for the CTD Landfill.

1.2 Definitions

Specific terms and acronyms that are used in this FCQCP are defined below.

ASTM – American Society for Testing and Material

Construction Quality Assurance (CQA) – CQA is a planned system of activities that provides the owner and permitting agency assurance that the facility was constructed as specified in the design. CQA includes the observations, evaluations, and testing necessary to assess and document the quality of the constructed facility. CQA includes measures taken by the CQA organization to assess whether the work is in compliance with the plans, specifications, and permit requirements for a project.

Geotechnical Professional (GP) – The GP is the authorized representative of the owner who is responsible for all CQA activities for the project. The GP must be registered as a Professional Engineer in Texas. Experience and education should include geotechnical engineering, engineering geology, soil mechanics, geotechnical laboratory testing, construction quality assurance and quality control testing, and hydrogeology. The GP must also have competency and experience in certifying similar projects.

The GP may also be known in applicable regulations and guidelines as the CQA engineer, resident project representative, geotechnical quality control/quality assurance professional (GQCP), or professional of record (POR).

CQA Monitors – CQA monitors are representatives of the GP who work under direct supervision of the GP. The CQA monitor is responsible for quality assurance monitoring and performing on-site tests and observations. The CQA monitor must be NICET-certified at Level 2 for soils, an engineering technician with a minimum of four years of directly related experience, or a graduate engineer or geologist with one year of directly related experience.

Owner's Representative – The owner's representative is an official representative of the owner responsible for planning, organizing, and controlling the design and construction activities.

Quality Assurance – Quality assurance is a planned program that is designed to assure that the work meets the requirements of the plans, specifications, and permit for a project. Quality assurance includes procedures, quality control activities, and documentation that are performed by the GP and CQA monitor.

Quality Control – Quality control includes the activities that implement the quality assurance program. The GP, CQA monitor, and contractor will perform quality control.

2 FINAL COVER SYSTEM

30 TAC §330.457

2.1 Final Cover System

The final cover system for the CTD Landfill will consist of an infiltration layer and an erosion control layer. The cover plan details are provided in Attachment D3. The components of the final cover system are listed from top to bottom in the table below.

Components of the Final Cover System

Cover System Component	Description	Minimum Thickness
Erosion Layer	Soil that is capable of sustaining native plant growth	12 inches
Infiltration Layer	Compacted soil with a maximum coefficient of permeability less than or equal to 1×10^{-7} cm/sec	18 inches

2.2 Construction Monitoring

Continuous on-site monitoring is necessary to assure that the components of the final cover system are constructed in accordance with this FCQCP. The CQA monitor shall provide continuous on-site observation during the following construction activities:

- Infiltration layer placement, processing, compaction, and testing
- Erosion layer placement
- Any work that could damage the installed components of the final cover system

The GP will document and certify that the final cover system was constructed in accordance with this FCQCP. The GP shall make sufficient site visits to observe critical construction activities and to verify that the construction and quality assurance activities are performed in accordance with this FCQCP.

3 INTERMEDIATE COVER AND GRADING

30 TAC §330.165(c)

3.1 General

The completion plan for the CTD Landfill is provided in Appendix H2, Drawing H2.1. The final lift of waste will be covered by at least 12 inches of intermediate cover that is placed in accordance with Part IV. Intermediate cover will consist of general fill that has not previously come into contact with waste.

3.2 Slopes

The slope stability analyses are provided in Attachment D5. The slope stability analyses are only valid for the conditions that were analyzed. Any changes to the final cover system or landfill completion plan will require that the slope stability analyses be revised to reflect the actual conditions. Temporary slopes shall not be steeper than the interim waste slopes and concentrated loadings, such as heavy equipment and soil stockpiles, and shall not be placed near the crest of slopes unless additional slope stability analyses are performed.

3.3 Testing and Verification

Intermediate cover placement and grading will be observed and documented by the landfill staff in accordance with Part IV.

4 INFILTRATION LAYER

30 TAC §330.457

4.1 General

The infiltration layer consists of an 18-inch-thick layer of compacted, relatively homogeneous, cohesive material. The CQA monitor shall provide continuous on-site observation during infiltration layer placement, processing, compaction, and testing. The GP shall make sufficient site visits during infiltration layer construction to document the construction activities, testing, and thickness verification in the Final Cover System Report, in accordance with Section 6.

4.2 Materials

Infiltration layer material shall consist of soil that is free from debris, rubbish, frozen materials, foreign objects, and organic material. The required infiltration layer material properties are summarized in the table below.

Infiltration Layer Material Properties

Test	Standard	Required Property
Plasticity Index	ASTM D 4318	15 or greater
Liquid Limit	ASTM D 4318	30 or greater
Percent Passing No. 200 Mesh Sieve	ASTM D 1140	30 or greater
Coefficient of Permeability	ASTM D 5084 or COE EM 1110-2-1906 Appendix VII	Less than or equal to 1×10^{-7} cm/sec

Preconstruction testing procedures and frequencies for infiltration layer materials are listed in Section 4.8.1.

4.3 Subgrade Preparation

Prior to placing infiltration layer material, the subgrade should be proof rolled with heavy, rubber-tired construction equipment to detect soft areas. The GP or CQA monitor must observe the proof-rolling operation. Soft areas should be compacted and then be proof rolled again.

The subgrade elevations shall be verified in accordance with the requirements of Section 4.8.3 prior to the placement of the infiltration layer.

4.4 Placement and Processing

The infiltration layer subgrade and surface of each lift should be roughened prior to placement of the next lift of the infiltration layer. The infiltration layer material should be placed in maximum 8-inch loose lifts to produce a compacted lift thickness of approximately six inches. The material should be processed to a maximum particle size of one inch or less before water is added.

If additional water is necessary to adjust the moisture content, it should be applied after initial processing but prior to compaction. Water should be applied evenly across the lift and worked into the material. Waste or any objectionable material must not contaminate compaction water.

4.5 Compaction

The infiltration layer shall be compacted with a pad/tamping-foot or prong-foot roller. A footed roller is necessary to bond the lifts, distribute the water, and blend the soil matrix through kneading action. The infiltration layer shall not be compacted with a bulldozer, rubber-tired roller, flat-wheel roller, scrapers, or any track equipment unless it is used to pull a footed roller. The compactor should weigh at least 40,000 pounds. The lift thickness shall be controlled to achieve total penetration into the top of the previously compacted lift; therefore, the lift thickness must not be greater than the pad or prong length. Cleaning devices on the roller must be in place and maintained to prevent the prongs or pad feet from becoming clogged to the point that they cannot achieve full penetration.

The compactor shall make at least four passes across the area being compacted. A pass is defined as one pass of the compactor, front and rear drums. The material should be compacted to a minimum of 95 percent of the maximum dry density determined by standard Proctor (ASTM D 698) at a moisture content at or above optimum moisture. Areas with failing tests shall be reworked, recompacted, and retested, and passing tests must be achieved before another lift is added.

After a lift is compacted, it must be watered to prevent drying and desiccation until the next lift can be placed. If desiccation occurs, the GP must determine if the lift can be rehydrated by surface application of water or if the lift must be scarified, watered, and recompacted. Following compaction and fine grading of the final lift, the surface of the infiltration layer shall be smooth drum rolled.

4.6 Protection

The completed infiltration layer must be protected from drying, desiccation, rutting, erosion, and ponded water until the erosion layer is installed. Areas that undergo excessive desiccation or damage shall be scarified, reworked, recompacted, and retested as directed by the GP.

4.7 Tie In to Existing Covers

The edge of existing infiltration layers shall be cut back on either a slope or step to prevent the formation of a vertical joint.

4.8 Testing and Verification

4.8.1 Preconstruction Testing

The table below lists the minimum testing required for material proposed for use as the infiltration layer.

Infiltration Layer Material Preconstruction Tests

Test	Standard	Frequency
Unified Soil Classification	ASTM D 2487	1 per material type
Atterberg Limits	ASTM D 4318	1 per material type
Percent Passing No. 200 Mesh Sieve	ASTM D 1140	1 per material type
Standard Proctor Test	ASTM D 698	1 per material type
Coefficient of Permeability	ASTM D 5084 or COE EM 1110-2-1906 Appendix VII	1 per material type

After the moisture density relationship has been determined for a material type, a soil sample should be remolded to about 95 percent of the maximum dry density at the optimum moisture content. This sample will be tested to determine if the soil can be compacted to achieve a suitable coefficient of permeability. Either falling head or constant head laboratory permeability tests may be performed to determine the coefficient of permeability. The permeant fluid for testing must be as required by ASTM D 5084. Distilled or deionized water shall not be used as the permeant fluid.

4.8.2 Construction Testing

The following table lists the minimum testing required for material used as the infiltration layer.

Infiltration Layer Material Construction Tests

Test	Standard	Frequency[1]
Field Density	ASTM D 2922	1/8,000 sf per 6-inch lift
Atterberg Limits	ASTM D 4318	1/100,000 sf per 6-inch lift
Percent Passing No. 200 Mesh Sieve	ASTM D 1140	1/100,000 sf per 6-inch lift
Standard Proctor Test	ASTM D 698	1 per material type
Coefficient of Permeability	ASTM D 5084 or COE EM 1110-2-1906 Appendix VII	1 per acre (evenly distributed through all lifts)

[1] A minimum of one test must be performed for each lift regardless of surface area.

The Atterberg limits of the in-place infiltration layer must be compared to the Atterberg limits of the Proctor curve sample to assure that the Proctor curve represents the in-place material. Any variance of more than 10 points between the liquid limit or plasticity index of the in-place soil and those of the Proctor curve sample will require that a new Proctor curve be developed. Permeability testing will be performed on undisturbed samples from the infiltration layer as described in Section 4.8.1 and all test data will be reported.

4.8.3 Thickness Verification

The as-built thickness of the infiltration layer shall be determined by standard survey methods. Prior to the placement of infiltration layer material, the subgrade elevations will be determined at a minimum rate of one survey point per 5,000 square feet of lined area. After the infiltration layer is completed, the top of infiltration layer elevations will be determined at the same locations as the subgrade elevations. Settlement plates may be utilized to verify infiltration layer thickness.

5 EROSION LAYER

30 TAC §330.457

5.1 General

The erosion layer consists of a 12-inch-thick layer of soil capable of sustaining native plant growth. The CQA monitor shall provide continuous on-site observation during erosion layer placement to assure that erosion layer placement does not damage the underlying infiltration layer. The GP shall make sufficient site visits during erosion layer placement to document the construction activities and thickness verification in the Final Cover Evaluation Report.

5.2 Materials

Erosion layer material shall consist of soil that is free from debris, rubbish, frozen materials, foreign objects, or any material that could damage the underlying infiltration layer. The required erosion layer material properties are summarized in the table below.

Erosion Layer Material Properties

Test	Standard	Required Property
Plasticity Index	ASTM D 4318	15 or greater
Liquid Limit	ASTM D 4318	30 or greater
Percent Passing No. 200 Mesh Sieve	ASTM D 1140	30 or greater

5.3 Preparation

Prior to placing the erosion layer material, the top of infiltration layer elevations shall be verified in accordance with the requirements of Section 4.8.3 and all testing on the underlying infiltration layer shall be completed.

5.4 Placement

The erosion layer shall be placed in a manner that minimizes the potential to damage the underlying infiltration layer. The erosion layer shall be dumped from the haul road and spread by low ground pressure equipment in a manner that prevents ruts in the infiltration layer.

The erosion layer will be vegetated following the application of final cover in order to minimize erosion.

5.5 Testing and Verification

5.5.1 Preconstruction Testing

The minimum testing required for material proposed for use as the infiltration layer is listed below.

Erosion Layer Material Preconstruction Tests

Test	Standard	Frequency
Plasticity Index	ASTM D 4318	1 per material type
Liquid Limit	ASTM D 4318	1 per material type
Percent Passing No. 200 Mesh Sieve	ASTM D 1140	1 per material type

5.5.2 Thickness Verification

The as-built thickness of the erosion layer shall be determined by standard survey methods. Prior to the placement of the erosion layer, the top of infiltration layer elevations will be determined at a minimum rate of one survey point per 5,000 square feet of lined area. After the erosion layer is completed, the top of the erosion layer elevations will be determined at the same locations as the top of infiltration layer elevations. Settlement plates may be utilized to verify erosion layer thickness.

6 DOCUMENTATION

After construction of the final cover system, the GP will submit a Final Cover Evaluation Report to the TCEQ on behalf of the owner. The purpose of the Final Cover Evaluation Report is to document that the construction methods and test procedures are consistent with this FCQCP.

At a minimum, the Final Cover Evaluation Report will contain the following:

- A summary of all construction activities
- A summary of all laboratory and field test results
- Sampling and testing location drawings
- A description of significant construction problems and the resolution of these problems
- Record drawings
- A statement of compliance with the FCQCP
- The seal and signature of the GP and assistant GP, if applicable, in accordance with the Texas Engineering Practice Act