

Prepared for



NAES Corporation
Sandy Creek Energy Station
2161 Rattlesnake Road
Riesel, TX 76682

**CLOSURE PLAN AND POST-CLOSURE PLAN
FOR SOLID WASTE DISPOSAL FACILITY
REGISTRATION NO. 88448**

SANDY CREEK ENERGY STATION
RIESEL, McLENNAN COUNTY, TEXAS

Prepared by

Geosyntec 

consultants

8217 Shoal Creek Blvd., Suite 200
Austin, Texas 78757

October 2016

TABLE OF CONTENTS

1.	INTRODUCTION	1
1.1	Purpose.....	1
1.2	Background.....	1
1.3	Organization of Plan	1
2.	LANDFILL CLOSURE.....	3
2.1	Overview.....	3
2.2	Largest Area Requiring Final Cover.....	3
2.3	Maximum Waste Inventory	3
2.4	Closure Activities	3
2.5	Certification of Closure Completion.....	4
2.6	Deed Notation	4
2.7	Amendment of Closure Plan.....	4
3.	FINAL COVER SYSTEM	6
3.1	Closure Performance Standard	6
3.2	Final Cover Grades	6
3.3	Stormwater Management.....	6
3.4	Final Cover System Configuration	6
3.5	Design and Installation of Final Cover System Components	8
3.5.1	Infiltration Layer	8
3.5.2	Geocomposite Drainage Layer.....	8
3.5.3	Erosion Layer	9
3.6	Final Cover Slope Stability.....	9
4.	CLOSURE SCHEDULE	10
5.	LANDFILL POST-CLOSURE.....	11
5.1	Introduction.....	11
5.2	Facility Contact.....	11
5.3	Post-Closure Overview	11
5.4	Post-Closure Maintenance Activities.....	11
5.5	Post-Closure Inspection Requirements and Frequencies.....	12
5.6	Notification of Completion of Post-Closure	13
5.7	Post-Closure Land Use	13
5.8	Amendment of Post-Closure Plan	14
6.	PROFESSIONAL ENGINEER CERTIFICATION	15

7. REFERENCES 16

DRAWINGS

Drawing 1 of 16 Site Layout (Geosyntec, 2014a)
Drawing 7 of 16 Subcell 2E Filling Plan (Geosyntec, 2014a)
Drawing 2 of 7 Final Cover Grading Plan (Geosyntec, 2014b)
Drawing 5 of 7 Final Cover System Details (Geosyntec, 2014b)

1. INTRODUCTION

1.1 Purpose

This document presents the Closure Plan and Post-Closure Plan for the Solid Waste Disposal Facility (Landfill) at the Sandy Creek Energy Station (SCES). The plans were prepared to comply with the United States Environmental Protection Agency's (USEPA's) requirements for written closure and post-closure plans (40 CFR §257.102(b) and 104(d)) for coal combustion residuals (CCR) landfills. The report was prepared by Geosyntec Consultants (Geosyntec) under the direction of Dr. Beth A. Gross, P.E., a qualified professional engineer.

1.2 Background

The SCES is a coal-fired power plant located in Riesel, McLennan County, Texas. CCR generated at the SCES are disposed in the Landfill, which is located on the southwest corner of the property east of a drainage easement maintained by the Texas Department of Transportation (TxDOT) (Drawing 1 of 16). At final buildout, the Landfill will occupy approximately 65 acres and will consist of four cells, Cells 1 to 4 (Drawing 1 of 16). Cells 1 and 2 were constructed with a 3-foot thick compacted clay liner with a hydraulic conductivity less than 1×10^{-7} cm/s and a leachate collection system and are currently being filled to interim grades with CCR.

Run-off from active areas of the Landfill and leachate collected in the leachate collection system are conveyed to the Leachate Evaporation Pond (Drawing 1 of 16); this pond will continue to be used for leachate management after the Landfill is closed. Stormwater run-off from areas of the Landfill with intermediate soil or final cover can be conveyed to the Stormwater Pond; this pond will continue to be used for management of stormwater from the final cover system after the Landfill is closed.

1.3 Organization of Plan

The remainder of this Plan is organized as follows:

- Section 2 presents a narrative description of the Landfill closure process, including estimates of the maximum inventory of CCR in the Landfill that could ever be on site and the largest area of the Landfill that would require final cover system at any time during the active life of the Landfill (40 CFR §257.102(b)(1)(iv) and (v));
- Section 3 describes the design and installation procedures for a final cover system for the Landfill that meets the closure performance standard (40 CFR §257.102(b)(1)(iii) and (d));
- Section 4 presents a schedule for completing closure activities (40 CFR §257.102(b)(1)(vi));

- Section 5 presents a narrative description of the Landfill post-closure process (40 CFR §257.104(d));
- Section 6 presents a certification by a qualified professional engineer that this Closure and Post-Closure Plan meets the requirements of 40 CFR §257.102(b); and
- Section 7 provides a list of references cited in the Plans.

2. LANDFILL CLOSURE

2.1 Overview

The Landfill will be closed in accordance with recognized and generally accepted good engineering practices as described in this Closure Plan. Closure of the Landfill will be accomplished by leaving CCR in place and constructing a final cover system over the CCR. Closure of the Landfill will also include installing associated stormwater management features and establishing vegetation on the final cover. When no longer needed for management of CCR, contact water, and leachate, facility equipment will be cleaned and decontaminated and ancillary components will be removed.

2.2 Largest Area Requiring Final Cover

The largest area that of the Landfill that would ever require a final cover during the active life of the Landfill is approximately 24 acres. This area represents the Landfill as it currently exists with only Cells 1 and 2 constructed (Drawings 1 of 16 and 7 of 16). It is anticipated that the Landfill will undergo partial closure, in 10 to 15 acre increments, as additional cells are constructed through a phased installation of a final cover system as sections of the landfill are brought to their final design top of waste grades. Therefore, the current scenario of a 24-acre active area is a temporary condition that is not expected to exist after Cell 3 is constructed.

2.3 Maximum Waste Inventory

The Landfill is designed to be developed with four cells (Drawing 1 of 16) with a maximum waste inventory of approximately 8,470,000 cubic yards. If the Landfill is closed prematurely as Cells 1 and 2 only, the maximum inventory of CCR requiring a final cover in these cells is approximately 1,740,000 cubic yards.

2.4 Closure Activities

The closure activities for the Landfill, organized in general accordance with the sequence in which they will occur during a closure event, are summarized below.

- **Notification of Intent to Close.** In accordance with 40 CFR §257.102(g), no later than the date of closure initiation, a notice of intent to close the Landfill or portion thereof will be prepared and placed in the facility's Operating Record. The notification will include a certification by a qualified professional engineer that the design of the final cover system meets the requirements of 40 CFR §257.102(d)(3).
- **Construct Final Cover System and Install Stormwater Management Features.** After the final cover system subgrade has been graded and surveyed, the final cover system components will be constructed and the stormwater management features will be

installed. The design and installation of the final cover system is described in Section 3 of this Closure Plan.

- Equipment Cleaning and Decontamination. During final facility closure, facility equipment that contacted waste during active operations or closure activities will be cleaned prior to moving the equipment from the facility or placing it into service for post-closure activities.

2.5 Certification of Closure Completion

In accordance with 40 CFR §257.102(f)(3), upon completion of closure of the Landfill or portion thereof, a certification from a qualified professional engineer must be obtained to confirm that closure has been completed in accordance with the Closure Plan and the requirements of 40 CFR §257.102(d).

In accordance with 40 CFR §257.102(h), within 30 days of completion of closure of the Landfill or portion thereof, a notification of closure will be prepared and placed in the facility's Operating Record. The notification will include the professional engineer certification of closure.

2.6 Deed Notation

In accordance with 40 CFR §257.102(i), following closure of the Landfill, a notation will be recorded on the facility deed indicating that: (i) the property has been used for CCR disposal; and (ii) the use of the property is restricted under the post-closure care requirements as provided by 40 CFR §257.104(d)(1)(iii).

In accordance with 40 CFR §257.102(i)(3), within 30 days of recording the deed notation, a notification stating that the notation has been recorded in the McLennan County Deed Records will be placed in the facility's Operating Record.

2.7 Amendment of Closure Plan

In accordance with 40 CFR §257.102(b)(3), this Closure Plan may be amended at any time. Any amendment of the Closure Plan requires a written certification by a qualified professional engineer that the amendment meets the requirements of 40 CFR §257.102(b).

When conditions occur that necessitate a change to the Closure Plan, it must be amended within the following timeframes:

- at least 60 days prior to changing the operation of the Landfill in a manner that would substantially affect the activities described in this Closure Plan;

- within 60 days after an unanticipated event requires the need to revise the activities described in this Closure Plan, if closure activities have not yet been initiated for the Landfill; and
- within 30 days after an unanticipated event requires the need to revise the activities described in this Closure Plan, if closure activities are underway.

3. FINAL COVER SYSTEM

3.1 Closure Performance Standard

The Landfill will be closed in a manner that meets the performance standard of 40 CFR §257.102(d). As such, it will be closed with a final cover system designed to isolate CCR from surface water and the atmosphere, promote good surface drainage, minimize erosion, minimize water infiltration into the underlying CCR and thus leachate generation and potential release, provide for slope stability, and minimize the need for further maintenance.

3.2 Final Cover Grades

Consistent with the closure performance standard of 40 CFR §257.102(d), the final cover system of the CBL will be graded to promote run-off and minimize erosion. The final grades (top of final cover system) for the Landfill are shown on Drawing 2 of 7. The final cover system will have a maximum elevation of approximately 638 feet above mean sea level, minimum top deck slope of 3%, and maximum side slope of 3.5 horizontal: 1 vertical (Drawing 2 of 7). The side slopes will include diversion berms orientated approximately parallel to the slopes with a maximum vertical spacing of 74 feet. The maximum spacing of the diversion berms was selected to limit calculated annual soil loss to 3 tons/acre/year consistent with Texas Commission on Environmental Quality (TCEQ) guidance (TCEQ, 2007). The Landfill perimeter will include a perimeter berm consisting of compacted soil with exterior sideslopes of 3 horizontal: 1 vertical. Landfill sections along the perimeter berm are presented on Drawing 5 of 7.

3.3 Stormwater Management

The stormwater management system for the Landfill is designed to divert surface water run-off from a 100-year, 24-hour storm event (rainfall depth of 9.5 inches) as recommended by TCEQ (2015). It is also designed to control run-off from that design storm. Designing the stormwater management system on the final cover system to accommodate run-off from a 100-year, 24-hour storm event reduces the potential for overtopping of the stormwater features during intense precipitation events and, hence, meets the final cover system performance goal of minimizing the need for further final cover maintenance. The stormwater management features will include top deck diversion berms, side slope diversion berms, downchutes, an access road channel, and a perimeter channel (Drawing 2 of 7). Except for one top deck diversion berm which routes water to the access road channel, the diversion berms direct water from the top deck and side slopes to the downchutes. Flow in the perimeter channel is conveyed to the Stormwater Pond.

3.4 Final Cover System Configuration

In accordance with 40 CFR § 257.102 (d)(3)(i), the final cover system must consist of at least two components: (i) a low-permeability infiltration layer (i.e., barrier layer) that minimizes infiltration of liquids into the closed CCR unit, and (ii) an overlying erosion layer (i.e.,

vegetative support layer) that is capable of sustaining native plant growth. The permeability of the infiltration layer for a final cover system must be less than or equal to the permeability of the liner or no greater than 1×10^{-5} cm/sec, whichever is less, and the thickness of this layer must be at least 18 inches (40 CFR § 257.102 (d)(3)(i)(A) and (B)). The thickness of the erosion layer must be at least 6 inches (40 CFR § 257.102 (d)(3)(i)(C)).

The final cover system recommended in TCEQ Technical Guideline No. 3 (2015) for Class 2 monofills of consistent, well characterized waste consists of a 3-foot thick compacted clay layer with a hydraulic conductivity no greater than 1×10^{-7} cm/sec and an overlying 18-inch thick uncompacted topsoil layer. Further, TCEQ recommends a drainage layer beneath the topsoil to reduce infiltration through the cover and increase slope stability.

Two options are proposed for the final cover system. Either of these options may be implemented as the Landfill is incrementally closed. The Option 1 final cover system (Drawing 5 of 7) meets the requirements of 40 CFR § 257.102 (d)(3)(i) and the recommended erosion layer thickness of TCEQ (2015) and consists of the following components, from top to bottom (40 CFR §257.102(d)(3)(i)):

- 18-inch thick vegetative support layer (erosion layer);
- double-sided geocomposite drainage layer (required on side slopes only; if included on top deck, single-sided geocomposite may be used); and
- composite cap (infiltration layer) with a 40-mil thick textured linear low density polyethylene (LLDPE) geomembrane upper component and 18-inch thick compacted clay lower component with a hydraulic conductivity no greater 1×10^{-5} cm/s; CCR may be used to construct the barrier below the geomembrane component for the final cover system if such barrier meets the hydraulic conductivity and maximum particle size criteria of the compacted clay layer.

The Option 2 final cover system meets both the requirements of 40 CFR § 257.102 (d)(3)(i) and the recommendations of TCEQ (2015) and consists of, from top to bottom:

- 18-inch thick vegetative support layer (erosion layer); and
- 3-foot thick compacted clay layer (infiltration layer) with a hydraulic conductivity no greater 1×10^{-7} cm/s.

The slope stability calculations presented subsequently in Section 3.6 demonstrate that an internal drainage layer is not needed to provide slope stability of the Option 2 final cover system.

3.5 Design and Installation of Final Cover System Components

3.5.1 Infiltration Layer

The final cover system infiltration layer will be a composite cap or a compacted clay layer. The infiltration layer is designed with a low hydraulic conductivity to minimize water infiltration into the underlying CCR.

- Compacted Clay. The compacted clay component of the final cover system will meet the following material specifications:
 - maximum particle size of 2 in.;
 - no more than 10% retained on the No. 4 sieve;
 - no less than 30% passing the No. 200 sieve;
 - minimum liquid limit of 30;
 - minimum plasticity index of 15; and
 - maximum hydraulic conductivity of 1×10^{-5} cm/s when the compacted clay layer is a component of a composite infiltration layer and 1×10^{-7} cm/s when the compacted clay layer is the infiltration layer.

The compacted clay will be placed in 9-inch thick (maximum) loose lifts to allow adequate compaction to be achieved throughout the overall layer thickness. The clay will be compacted to at least 95% of its Standard Proctor maximum dry density at a moisture content from 0 to 4 percentage points wet of the optimum to form a low hydraulic conductivity layer. Prior to installation of an overlying geomembrane, the surface of the compacted clay layer will be inspected and verified to be smooth and free of particles greater than ½ inch in diameter, sticks, roots, sharp objects, and other deleterious objects that could damage the geomembrane.

- Geomembrane. The textured LLDPE geomembrane will be placed in direct contact with the underlying compacted clay layer so that a compression seal (composite barrier) forms between the two layers from the overburden load. After geomembrane panels are deployed, they will be welded together to create a continuous sheet.

3.5.2 Geocomposite Drainage Layer

A geocomposite drainage layer will be installed between the erosion layer and the infiltration layer on landfill side slopes when a composite infiltration layer is used. The purpose of the geocomposite drainage layer is to reduce the head of water on the infiltration layer, thereby

reducing the potential for leakage into the infiltration layer and enhancing the slope stability of the final cover system side slopes. The geocomposite will consist of a high density polyethylene (HDPE) geonet with a nonwoven geotextile bonded to its top and bottom surfaces (i.e., double-sided geocomposite). Water collected in the drainage layer will be conveyed to the edges of the final cover system where it will exit into the stormwater management system.

3.5.3 Erosion Layer

The final cover system erosion layer will be a vegetative support layer. The vegetative support layer will be placed on top of the geocomposite drainage layer, vegetated, and maintained to prevent erosion.

3.6 Final Cover Slope Stability

An infinite slope stability analysis was conducted for the two final cover system options. Based on TCEQ (2015), the target factor of safety is 1.3 using peak strength and 1.0 using residual strength. For Option 1, the critical interface for slope stability is between the geomembrane and the underlying compacted clay layer. For Option 2, the critical interface is between the vegetative support layer (saturated) and the underlying compacted clay layer.

The factor of safety for stability of an infinite slope that may include a saturated zone that acts on a critical interface can be calculated using a simplified version of the Giroud et al. (1995) equation:

$$FS = \left(\frac{\gamma_{sat} - \gamma_w}{\gamma_{sat}} \right) \frac{\tan\phi}{\tan\beta} + \frac{c/\sin\beta}{\gamma_{sat}t}$$

where: γ_{sat} = saturated soil unit weight; γ_w = water unit weight = 0 if there is not a hydraulic head in the soil layer; ϕ = geosynthetic interface friction angle or soil internal friction angle; β = slope angle; c = geosynthetic interface adhesion (assumed to be 0) or soil cohesion; and t = soil thickness.

The input parameters used to evaluate the slope stability of the two final cover options on the Landfill side slopes were selected based on published interface shear strengths, data from Geosyntec's project database, and the final cover side slope inclination. For Option 1, the following input parameters were selected: $\gamma_{sat} = 105$ pcf, $\gamma_w = 0$ pcf, $\phi = 25^\circ$ (peak) and 19° (residual), $\beta = 15.9^\circ$, $c = 0$ psf, and $t = 1.5$ ft. With these parameters, the calculated FSs are 1.63 (peak) and 1.21 (residual), respectively. The following input parameters were selected for Option 2: $\gamma_{sat} = 105$ pcf, $\gamma_w = 62.4$ pcf; $\phi = 28^\circ$ (peak) and 20° (residual); $\beta = 18.4^\circ$; $c = 50$ psf; and $t = 1.5$ ft. With these parameters, the calculated the calculated FSs are 1.91 (peak) and 1.67 (residual), respectively.

The calculated FS values exceed the minimum slope stability factors of safety recommended by TCEQ (2015).

4. CLOSURE SCHEDULE

The anticipated schedule for implementing the closure activities for the Landfill is presented below. Based on the remaining airspace in the Landfill of approximately 8,320,000 cubic yards and an annual CCR disposal rate of 220,000 cubic yards, it is calculated that the Landfill will reach final grades in approximately 2054 and all closure activities will be completed by 2055, within 6 months after final receipt of CCR or removal of CCR from the Landfill.

Table 1. Closure Schedule

Task	Duration (days)	Time (calendar days)
Final receipt of waste for placement in the Landfill or removal of CCR from the Landfill for beneficial use.	30	-30 – 0
Initiate final closure of Landfill and place Notification of Intent to Close in the facility's Operating Record	0	0
Construct final cover system	150	0 – 150
Equipment cleaning and decontamination	5	115 – 120
Install stormwater management features on final cover system and hydroseed final cover system	45	135 – 180
Closure complete	0	180

In accordance with 40 CFR §257.102(f)(2), the timeframe for completing closure may be extended if it is not feasible to complete closure of the Landfill within the required timeframe due to factors beyond the facility's control (e.g., unusual amounts of precipitation). In that case, a demonstration of infeasibility that includes a narrative discussion providing the basis for additional time will be placed in the facility's Operating Record.

5. LANDFILL POST-CLOSURE

5.1 Introduction

After the Landfill is closed, the facility will enter a 30-year post-closure care period. This section presents the Post-Closure Plan for the facility, which describes how the Landfill will be maintained and monitored during the post-closure care period.

5.2 Facility Contact

During the post-closure care period, the primary contact for the Landfill will be:

Ms. Kathy French
Sandy Creek Services
P.O. Box 370
Riesel, TX 76682
Phone: (636) 532-2200
Email: KFrench@LSPower.com

5.3 Post-Closure Overview

The post-closure activities for the Landfill will comply with requirements of 40 CFR §257.104 and will begin after closure is completed. Facility activities conducted during the post-closure care period will include:

- maintaining the integrity and effectiveness of the final cover system, including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events;
- preventing run-on and run-off from eroding or otherwise damaging the landfill final cover;
- maintaining the integrity and effectiveness of the leachate collection system; and
- maintaining the groundwater monitoring system and monitoring groundwater.

5.4 Post-Closure Maintenance Activities

During the post-closure care period, the facility will conduct regularly scheduled inspections of the Landfill (Section 5.5) and will perform maintenance as needed to mitigate potential performance issues identified during the inspections. The facility will also continue to conduct groundwater monitoring. Additional details of the maintenance activities are provided below.

- Final Cover System. The upper portion of the final cover system consists of a vegetative support layer, which is overlain in some locations by stormwater management features. A

vegetative cover will be established on the final cover system and maintained to reduce the potential for final cover system erosion. The vegetative cover will be mowed at least once a year to help maintain healthy vegetation, prevent brush and trees from being established, and allow for visual inspection of the final cover system. Areas of missing or deficient vegetation will be re-seeded. Erosion gullies in the vegetative support layer or areas that have standing water due to settlement or subsidence will be repaired by in-filling the gullies or depressions and re-seeding. If erosion or other final cover damage (e.g., burrowing animals) extends through the vegetative support layer, the affected area of the final cover system will be repaired to the same design specifications as the original cover. Stormwater management features on the final cover system or at the Landfill perimeter will be maintained as needed (e.g., remove sediment, vegetation, or other obstructions to restore the dimensions and surface of stormwater conveyances).

- Perimeter Berm. The vegetative cover on the perimeter berm will be mowed at least once a year to help maintain healthy vegetation, prevent brush and trees from being established, and allow for visual inspection. Areas of missing or deficient vegetation will be re-seeded. Erosion gullies will be repaired by in-filling the gullies and re-seeding.
- Leachate Collection System. The leachate collection system will be operated during the post-closure period until the Landfill stops generating leachate. Maintenance will consist of replacing features that are deteriorated or that will not function as intended, as identified during the routine inspections.
- Leachate Evaporation Pond. The pond will remain in operation during the post-closure care period to receive leachate collected from the Landfill. Maintenance will consist of replacing features that are deteriorated or that will not function as intended, as identified during the routine inspections.
- Groundwater Monitoring System. Groundwater monitoring (and associated sampling, analysis, and reporting) will be performed during the post-closure care period. Groundwater monitoring wells will be maintained by keeping the wells unobscured by vegetation and repairing/replacing monitoring well features (casing, bollards, locks, etc.) that are deteriorated or that will not function as intended, as identified during inspections during the monitoring events. Other possible maintenance may include well redevelopment or replacement, as needed.

5.5 Post-Closure Inspection Requirements and Frequencies

The post-closure care inspection requirements and frequencies are presented in Table 2.

Table 2. Post-Closure Inspection Requirements and Frequencies.

Component	Inspection Issue/Item	Inspection Frequency ⁽¹⁾
Final Cover System: Vegetative Cover	Erosion, damage or deterioration, inadequate vegetation, slope instability, standing water due to settlement or subsidence	Quarterly and after major storms
Final Cover System: Stormwater Management System	Erosion, siltation, damage or deterioration, standing water due to settlement or subsidence	Quarterly and after major storms
Landfill Perimeter Berm	Erosion, inadequate vegetation, surface sloughing, slope instability	Quarterly and after major storms
Leachate Collection System	Presence of leachate in sumps, proper functioning	Quarterly and after major storms
Leachate Evaporation Pond	Liquid level in pond, pond liner damage or deterioration, pond perimeter berm conditions (erosion, inadequate vegetation, surface sloughing, slope instability), proper functioning of leachate transmission system to pond	Monthly and after major storms for liquid level in pond; Quarterly and after major storms for other issues/items
Groundwater Monitoring Wells: Integrity Check	Well damage (well casing, base, bollards, etc.), missing or damaged locks, missing or obscured labels	Semi-Annually
Groundwater Monitoring: Sampling and Analysis	Sampling and analysis in accordance with Groundwater Sampling and Analysis Plan	Semi-Annually

Note: (1) The inspection frequencies for the final cover system, perimeter berm, and leachate collection system may be decreased from quarterly to semi-annual and then to annual if the results of the inspections indicate that a reduced inspection frequency is sufficient.

5.6 Notification of Completion of Post-Closure

In accordance with 40 CFR §257.104(e), no later than 60 days following the completion of the post-closure care period, a written notification by a qualified professional engineer verifying that post-closure care has been completed in accordance with this Post-Closure Plan will be placed in the facility's Operating Record.

5.7 Post-Closure Land Use

At this time there are no planned post-closure land uses for the Landfill other than open green space. In accordance with 40 CFR §257.104(d)(1)(iii), the post-closure use will not disturb the integrity of the final cover, liner, or any other components of the containment system or the function of the post-closure monitoring systems unless necessary to comply with the CCR regulations.

5.8 Amendment of Post-Closure Plan

In accordance with CFR §257.104(d)(3), this Post-Closure Plan may be amended at any time. Any amendment of the Post-Closure Plan requires a written certification by a qualified professional engineer that the amendment meets the requirements of CFR §257.104(d).

When conditions occur that necessitate a change to the Post-Closure Plan, it must be amended within the following timeframes:

- at least 60 days prior to changing the operation of the Landfill in a manner that would substantially affect the activities described in this Post-Closure Plan;
- within 60 days after an unanticipated event requires the need to revise the activities described in this Post-Closure Plan, if post-closure activities have not yet been initiated for the Landfill; and
- within 30 days after an unanticipated event requires the need to revise the activities described in this Post-Closure Plan, if post-closure activities are underway.

6. PROFESSIONAL ENGINEER CERTIFICATION

Based on the demonstrations and evaluations presented in this Closure Plan and Post-Closure Plan for the Solid Waste Disposal Facility (Landfill) at the Sandy Creek Energy Station, it is my professional opinion that the Plans meet the requirements of 40 CFR §257.102(b), including demonstrating that the final cover system meets the performance standard of 40 CFR §257.102(d).



GEOSYNTEC CONSULTANTS
F- 1182

Beth Ann Gross

Beth Ann Gross, Ph.D., P.E., D.GE

10/14/2016

Date

7. REFERENCES

Geosyntec Consultants (2014a). “Cell 2 Operations Plan, Solid Waste Disposal Facility, TCEQ Registration No. 88448, Sandy Creek Energy Station, Riesel, McLennan County, Texas” prepared for NAES Corporation.

Geosyntec Consultants (2014b). “Engineering Design Drawings, Solid Waste Disposal Facility Final Cover, Sandy Creek Energy Station, Riesel, Texas,” prepared for NAES Corporation.

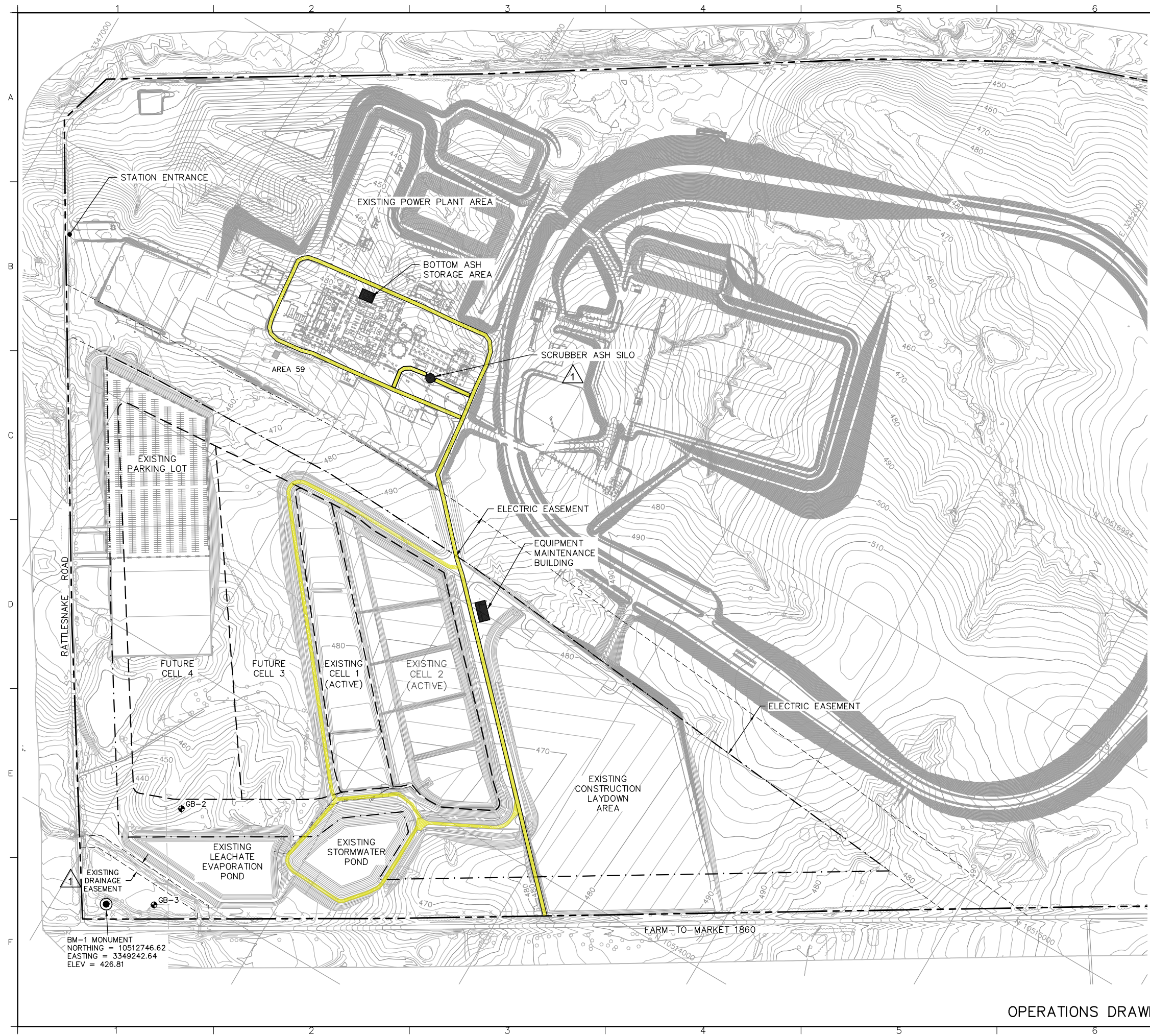
Giroud, J.P., Bachus, R.C., and Bonaparte, R. (1995). “Influence of Water Flow on the Stability of Geosynthetic-Soil Layered Systems on Slopes”, *Geosynthetics International*, Vol. 2, No. 6, pp. 1149-1180.

Texas Commission on Environmental Quality (2015). “Landfills,” Industrial Solid Waste Management Technical Guideline No. 3.

Texas Commission on Environmental Quality (2007). “Guidance for Addressing Erosional Stability During All Phases of Landfill Operation (Draft)”, 14 February.

DRAWINGS

DRAWING: Austin P:\CADD\Projects\Sandy Creek PP\OPERATIONS\CELL 2 OPERATIONS (TXL020807.01)\DRAWINGS\TXL020807-OP-00.dwg PLOTTED: Dec 12, 2014 - 1:44pm

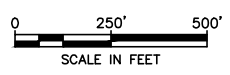


BM-1 MONUMENT
 NORTHING = 10512746.62
 EASTING = 3349242.64
 ELEV = 426.81



LEGEND

- 500 EXISTING GROUND ELEVATION (FT, MSL) (NOTES 1, 2)
- EXISTING SURFACE WATER LINE
- EXISTING SITE FENCE
- EXISTING TREE LINE
- EXISTING ROAD
- EXISTING BUILDING
- PROPERTY BOUNDARY
- DEED RECORDED LIMITS OF WASTE
- CELL BOUNDARY
- STATE PLANE COORDINATES
- EXISTING PIEZOMETER
- SWDF OPERATIONS ACCESS ROAD



NOTES:

1. THE EXISTING CONTOUR MAP SHOWN ON THIS DRAWING WAS COMPILED USING EXISTING TOPOGRAPHY DATED APRIL 2006 AND DESIGN GRADES DATED OCTOBER 2007 FROM BLACK & VEATCH CORPORATION; DESIGN GRADES DEVELOPED BY GEOSYNTEC CONSULTANTS, INC. FOR THE LEACHATE EVAPORATION POND AND CELL 2 DATED APRIL 2011 AND APRIL 2014, RESPECTIVELY; AND AREA 59 EXISTING TOPOGRAPHY SURVEY CONDUCTED BY WALKER PARTNERS DATED 9 MAY 2013.
2. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (FT, MSL) AS DEFINED BY THE USGS NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1988. STATE PLANE COORDINATE GRID CORRESPONDS TO TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD-83).

▲	9/24/2014	ADDED DRAINAGE EASEMENT AND SCRUBBER ASH SILO REFERENCE	JJV	MZI
○	6/10/2014	ISSUE FOR CONSTRUCTION	JJV	MZI
REV	DATE	DESCRIPTION	DRN	APP

NAES
 NAES CORPORATION
 2161 RATTLESNAKE ROAD
 RIESEL, TEXAS 76682
 PHONE: 254-896-4314

Geosyntec
 consultants
 GEOSYNTEC CONSULTANTS, INC.
 TEXAS ENG. FIRM REGISTRATION NO. 1182
 8217 SHOAL CREEK BLVD., SUITE 200
 AUSTIN, TEXAS 78757
 PHONE: 512.451.4003

TITLE: SITE LAYOUT

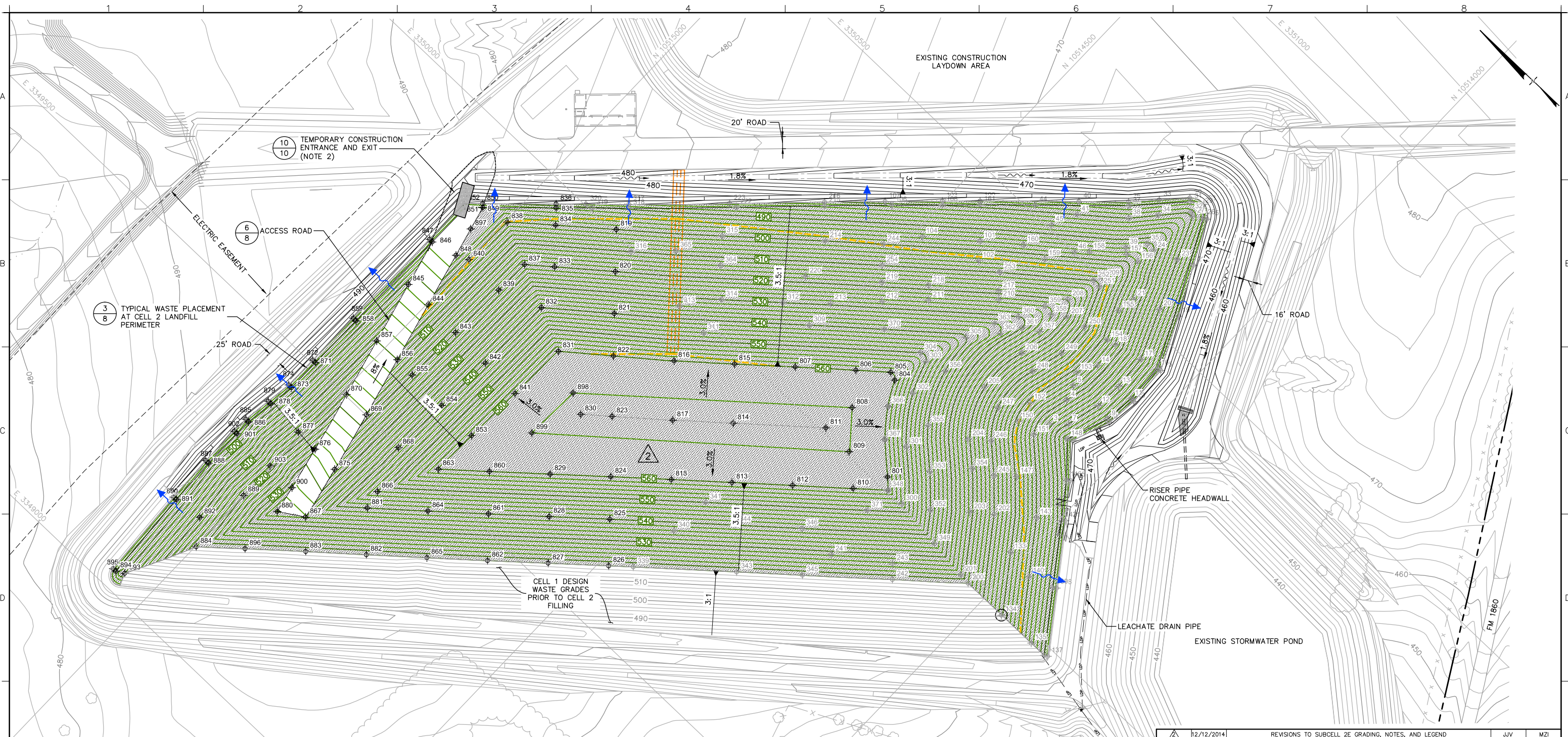
PROJECT: OPERATIONS PLAN – SOLID WASTE DISPOSAL FACILITY (CELL 2)

SITE: SANDY CREEK ENERGY STATION

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.		DESIGN BY: MZI	DATE: JUNE 2014
 SIGNATURE 6/10/2014 DATE		DRAWN BY: JJV/KH	PROJECT NO.: TXL0208.07.01
		CHECKED BY: MZI	FILE: TXL020807-OP-00
		REVIEWED BY: BG	DRAWING NO.: 1 OF 16
		APPROVED BY: MZI	

OPERATIONS DRAWING

DRAWING: Austin P:\CADD\Projects\Sandy Creek PP\OPERATIONS\CELL 2 OPERATIONS\TXL020807-OP-F05.dwg PLOTTED: Dec 12, 2014 - 1:49pm

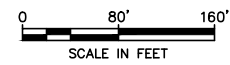


LEGEND

- 480 EXISTING GROUND ELEVATION (FT, MSL) (NOTE 1)
- EXISTING ROAD
- EXISTING BUILDING
- PROPERTY BOUNDARY
- STATE PLANE COORDINATES
N 10514500
E 3349500
- 10 CONSTRUCTION CONTROL POINT
- 550 PROPOSED TOP OF WASTE ELEVATION (FT, MSL)
- 460 EXISTING FINISHED GRADE ELEVATION (FT, MSL)
- INTERMEDIATE COVER AREA
- STORMWATER FLOW DIRECTION AFTER PLACING INTERMEDIATE COVER
- FUTURE SIDESLOPE DIVERSION BERM (NOTE 5)
- FUTURE DOWNCHUTE (NOTE 5)

NOTES

1. REFER TO DRAWING 1 FOR EXISTING CONDITIONS AND DETAILS OF THE TOPOGRAPHIC BASE MAP AND COORDINATE SYSTEM.
2. CONSTRUCTION ENTRANCE AND EXIT LOCATION IS APPROXIMATE AND SHALL BE INSTALLED AT A LOCATION THAT DOES NOT INTERFERE WITH DRAINAGE AND LANDFILL FEATURES.
3. THIS PLAN PRESENTS ONE FILLING OPTION. AN ALTERNATIVE FILLING PLAN THAT PROVIDES FOR SUBCELL ACCESS, CONTACT WATER MANAGEMENT, STORMWATER MANAGEMENT; LIMITS AREAS OF EXPOSED WASTE TO THE ACREAGE SPECIFIED IN THE OPERATIONS PLAN; AND PROVIDES SLOPE STABILITY IS ALSO ACCEPTABLE IF APPROVED BY NAEs.
4. LOCATIONS OF TEMPORARY INTERIOR HAUL ROADS WILL BE DETERMINED BY THE LANDFILL OPERATOR.
5. FUTURE SIDESLOPE DIVERSION BERMS AND DOWNCHUTE ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY. THE SIDESLOPE DIVERSION BERMS AND DOWNCHUTE WILL BE CONSTRUCTED DURING FINAL COVER CONSTRUCTION.



REV	DATE	DESCRIPTION	DRN	APP
△	12/12/2014	REVISIONS TO SUBCELL 2E GRADING, NOTES, AND LEGEND	JJV	MZI
△	9/24/2014	REVISED LEGEND AND NOTES	JJV	MZI
○	6/10/2014	ISSUE FOR CONSTRUCTION	JJV	MZI

NAES
 NAEs CORPORATION
 2161 RATTLESNAKE ROAD
 RIESEL, TEXAS 76682
 PHONE: 254-896-4314

Geosyntec
 consultants
 GEOSYNTEC CONSULTANTS, INC.
 TEXAS ENG. FIRM REGISTRATION NO. 1182
 8217 SHOAL CREEK BLVD., SUITE 200
 AUSTIN, TEXAS 78757
 PHONE: 512.451.4003

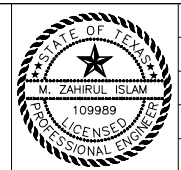
TITLE: **SUBCELL 2E FILLING PLAN**

PROJECT: **OPERATIONS PLAN – SOLID WASTE DISPOSAL FACILITY (CELL 2)**

SITE: **SANDY CREEK ENERGY STATION**

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

Z. Alam
 SIGNATURE
 6/10/2014
 DATE



DESIGN BY: MZI	DATE: JUNE 2014
DRAWN BY: JJV	PROJECT NO.: TXL0208.07.01
CHECKED BY: MZI	FILE: TXL020807-OP-F05
REVIEWED BY: BG	DRAWING NO.: 7 OF 16
APPROVED BY: MZI	

OPERATIONS DRAWING



LEGEND

- 500 EXISTING GROUND ELEVATION (FT, MSL) (NOTES 1, 2)
- EXISTING SURFACE WATER LINE
- EXISTING SITE FENCE
- EXISTING TREE LINE
- EXISTING ROAD
- EXISTING BUILDING
- STATE PLANE COORDINATES
N 10514500
E 3349500
- PROPERTY BOUNDARY
- DEED RECORDED LIMITS OF WASTE
- FINAL COVER LIMIT
- 600 PROPOSED FINISHED GRADE ELEVATION
- PERIMETER ACCESS ROAD
- PERIMETER CHANNEL
- DIRECTION OF WATER FLOW
- EXISTING LEACHATE DRAIN PIPE (NOTE 3)

NOTES:

1. THE EXISTING CONTOUR MAP SHOWN ON THIS DRAWING WAS COMPILED USING EXISTING TOPOGRAPHY DATED APRIL 2006 AND DESIGN GRADES DATED OCTOBER 2007 FROM BLACK & VEATCH CORPORATION; DESIGN GRADES DEVELOPED BY GEOSYNTEC CONSULTANTS, INC. FOR THE LEACHATE EVAPORATION POND AND CELL 2 DATED APRIL 2011 AND APRIL 2014, RESPECTIVELY; AND AREA 59 EXISTING TOPOGRAPHY SURVEY CONDUCTED BY WALKER PARTNERS DATED 9 MAY 2013.
2. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (FT, MSL) AS DEFINED BY THE USGS NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1988. STATE PLANE COORDINATE GRID CORRESPONDS TO TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD-83).
3. THE EXISTING LEACHATE DRAIN PIPE SERVES CELLS 1 AND 2. ADDITIONAL PIPE WILL BE INSTALLED FOR FUTURE CELLS.



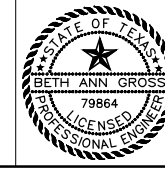
0	12/19/2014	FINAL DESIGN DRAWINGS	JJV	BG
A	7/25/2014	70% DRAFT	JJV	BG
REV	DATE	DESCRIPTION	DRN	APP

NAES
 NAES CORPORATION
 2161 RATTLESNAKE ROAD
 RIESEL, TEXAS 76682
 PHONE: 254-896-4314

Geosyntec consultants
 GEOSYNTEC CONSULTANTS, INC.
 8217 SHOAL CREEK BLVD., SUITE 200
 AUSTIN, TEXAS 78757
 PHONE: 512.451.4003

TITLE:	FINAL COVER GRADING PLAN			
PROJECT:	SOLID WASTE DISPOSAL FACILITY FINAL COVER			
SITE:	SANDY CREEK ENERGY STATION			

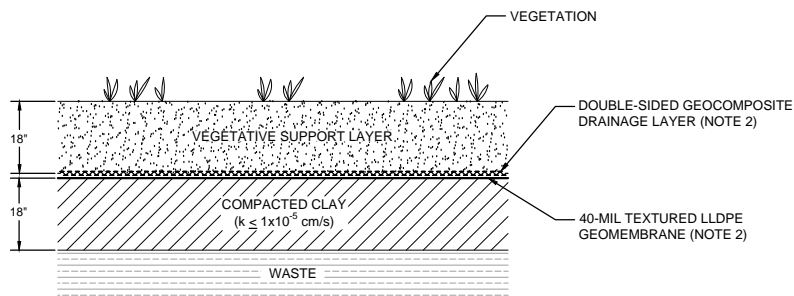
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.
Beth Ann Gross
 SIGNATURE
 12/19/2014
 DATE



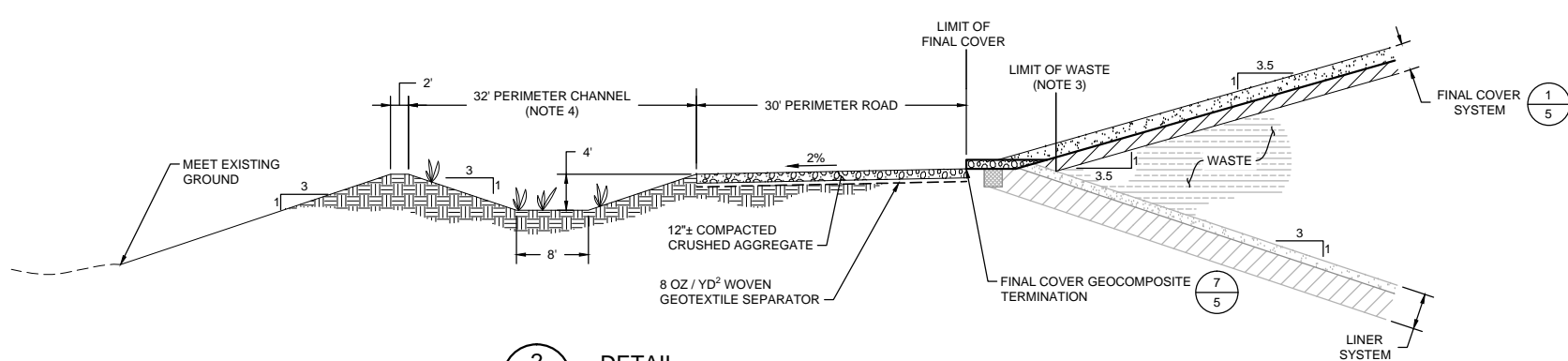
DESIGN BY:	MZI / BK	DATE:	DECEMBER 2014
DRAWN BY:	JJV / KH	PROJECT NO.:	TXL0208.08
CHECKED BY:	MZI	FILE:	TXL020808D01
REVIEWED BY:	BG	DRAWING NO.:	2 OF 7
APPROVED BY:	BG		

**DESIGN DRAWINGS
 NOT FOR CONSTRUCTION**

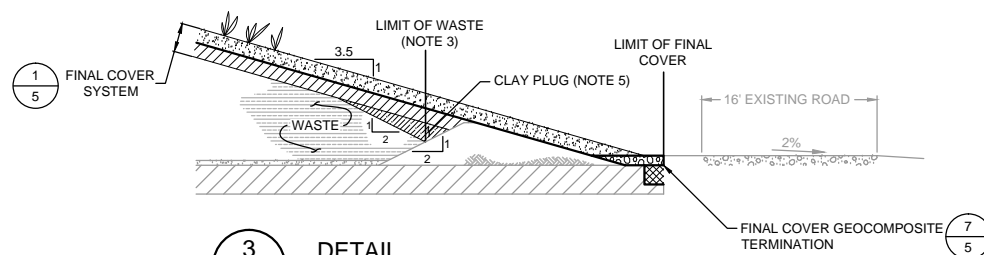
DRAWING: Austin, P. CADD Projects/Sandy Creek PPEING DESIGNS/MDF FINAL COVER DESIGN (TXL0208.08)DRAWINGS/ITXLD020808D01.dwg PLOTTED: Dec 19, 2014 - 7:33pm



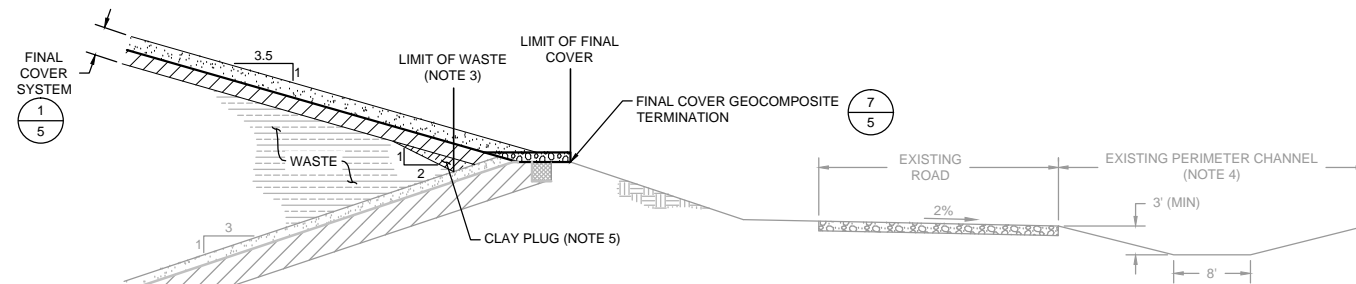
1
2
DETAIL
FINAL COVER SYSTEM
SCALE IN FEET



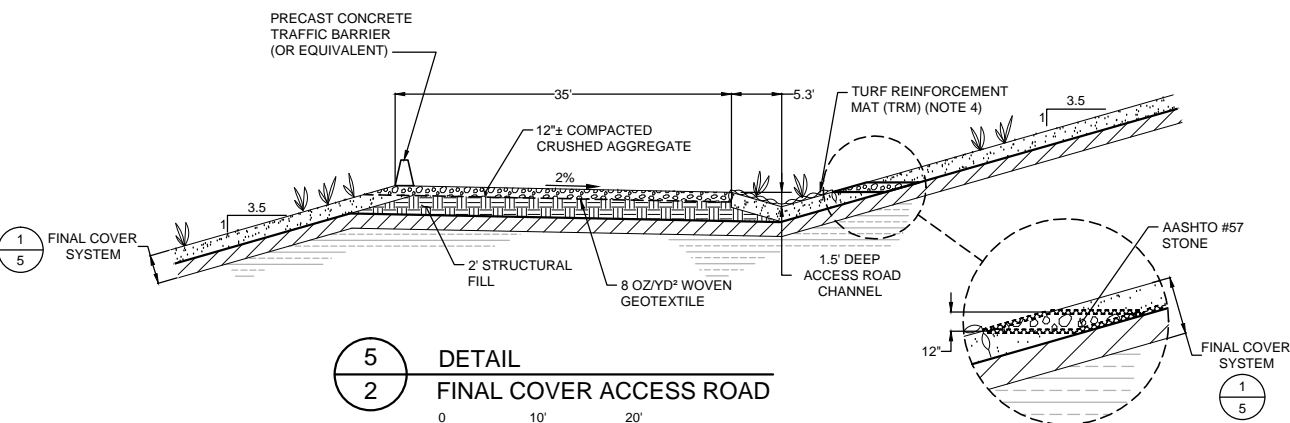
2
2
DETAIL
PROPOSED LANDFILL PERIMETER
SCALE IN FEET



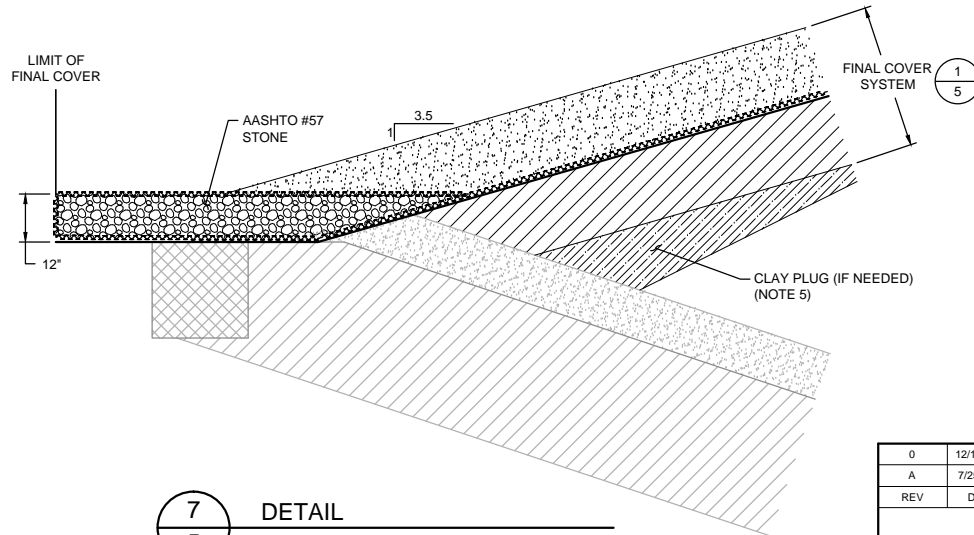
3
2
DETAIL
EXISTING CELL 1 PERIMETER
SCALE IN FEET



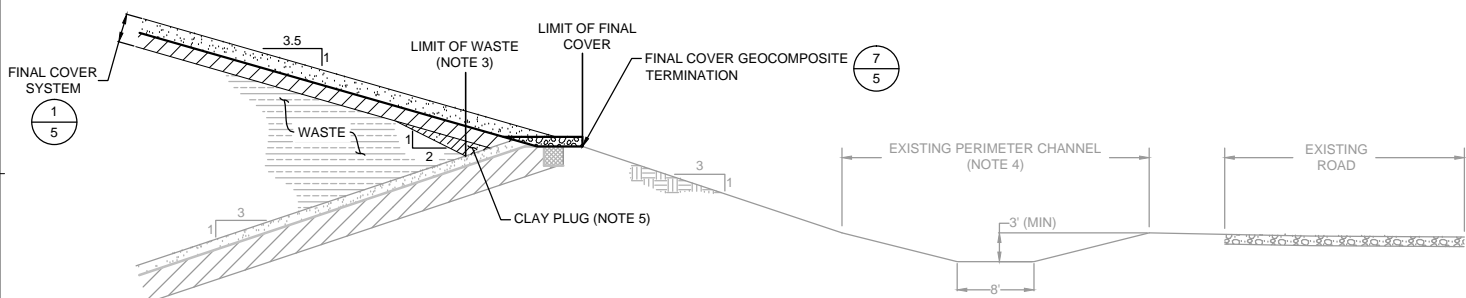
4
2
DETAIL
EXISTING CELL 2 NORTH PERIMETER
SCALE IN FEET



5
2
DETAIL
FINAL COVER ACCESS ROAD
SCALE IN FEET



7
5
DETAIL
FINAL COVER GEOCOMPOSITE TERMINATION (NOTE 6)
SCALE IN FEET



6
2
DETAIL
EXISTING CELL 2 EAST AND SOUTH PERIMETER
SCALE IN FEET

- NOTES:
1. DETAILS ARE DRAWN TO SCALE AS NOTED EXCEPT FOR GEOSYNTHETICS, WHICH MAY BE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
 2. A SINGLE-SIDED GEOCOMPOSITE AND 40-MIL SMOOTH LLDPE MAY BE USED ON THE LANDFILL TOP DECK (E.G., 3% TOP SLOPE).
 3. DURING CELL OPERATION, THE LIMIT OF WASTE SHALL BE 2 FEET VERTICAL FROM CREST OF PERIMETER SLOPE. TOP OF PERIMETER SLOPE MAY BE EXTENDED BY CONSTRUCTING AN EXTENSION DIKE ON THE PERIMETER BERM.
 4. THE PERIMETER CHANNEL SHALL BE GRASS-LINED. IN ADDITION, THE SOUTH PORTION OF THE EXISTING CELL 2 EAST CHANNEL SHALL BE LINED WITH TXDOT CLASS II, TYPE G OR H TURF REINFORCEMENT MAT WITH A MINIMUM RESISTANCE TO TRACTIVE STRESS OF 6-8 PSF.
 5. CLAY MATERIAL SHALL BE PLACED AS NEEDED ALONG THE LANDFILL PERIMETER TO ACHIEVE THE SUBGRADE ELEVATIONS FOR THE FINAL COVER SYSTEM.
 6. DETAIL DOES NOT APPLY BENEATH DOWNCHUTE.

0	12/19/2014	FINAL DESIGN DRAWINGS	JJV	BG
A	7/25/2014	70% DRAFT	JJV	BG
REV	DATE	DESCRIPTION	DRN	APP



NAES CORPORATION
2161 RATTLESNAKE ROAD
RIESEL, TEXAS 76682
PHONE: 254-896-4314



GEOSYNTEC CONSULTANTS, INC.
2161 RATTLESNAKE ROAD
RIESEL, TEXAS 76682
PHONE: 512.451.4003

TITLE: **FINAL COVER SYSTEM DETAILS**

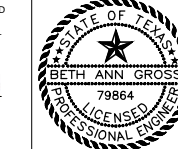
PROJECT: **SOLID WASTE DISPOSAL FACILITY FINAL COVER**

SITE: **SANDY CREEK ENERGY STATION**

DESIGN BY: MZI / BK	DATE: DECEMBER 2014
DRAWN BY: JJV / KH	PROJECT NO.: TXL0208.08
CHECKED BY: MZI	FILE: TXL020808D04
REVIEWED BY: BG	DRAWING NO.: 5 OF 7
APPROVED BY: BG	

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

Beth Ann Gross
SIGNATURE
12/19/2014
DATE



**DESIGN DRAWINGS
NOT FOR CONSTRUCTION**