NNSWC
Landfill Master Plan

Northeast Nebraska Solid Waste Coalition

Landfill Master Plan
Project No. 124922

Revision 0
4/15/2022

NNSWC
Landfill Master Plan

prepared for

Northeast Nebraska Solid Waste Coalition
Landfill Master Plan
Stanton County, Nebraska

Project No. 124922

Revision 0
4/15/2022

prepared by

Burns & McDonnell Engineering Company, Inc.
Sioux Falls, South Dakota

EXECUTIVE SUMMARY

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) developed the Northeast Nebraska Solid Waste Coalition (NNSWC, Coalition) Landfill Master Plan (Plan) for the NNSWC Regional Sanitary Landfill (Landfill) to provide the Coalition with short-term and long-term plans for optimum development and optimization of the Landfill. The Plan includes details regarding Landfill infrastructure planning and expansion strategy that will maximize the use of the property in a financially and operationally sound manner.

ES. 1 Alternatives and Efficiencies for Landfill Operations

Members of Burns & McDonnell visited the Landfill to conduct an on-site operational review of the Landfill. The purpose of the operation review was to identify key issues and potential opportunities to improve Landfill operations.

Additionally, a desktop evaluation was conducted to explore the potential for the Coalition to implement waste shredding or waste bailing operations. Based on the results of the desktop evaluation, it is recommended that the Coalition proceed with current Landfill operations.

The benefits and impacts of changes to waste acceptances amounts were also explored. A planning level financial model was created to evaluate the impacts of changes in waste receipts. The financial model was developed by evaluating the following scenarios:

- **Baseline Scenario:** Waste received by the Landfill will remain unchanged, “no waste change”
- **Scenario #1:** Assumes a 20-percent waste increase to the overall waste stream
- **Scenario #2:** Assumes a 20-percent waste decrease to the overall waste stream

From the analysis, the Baseline Scenario generally has a positive ending balance throughout the Landfill’s life but experiences a cash deficit near the end of the Landfill’s life. Scenario #1 experiences a positive ending cash balance throughout the Landfill’s life. The results of Scenario # 2 indicated that Coalition would have a negative cash ending balance much sooner in the Landfill’s life.

ES. 2 Landfill Expansion Development

Several Landfill expansion options were identified and evaluated to increase the disposal capacity of the Landfill within the current property boundary. Multiple conceptual expansion alternatives were then presented to the Project Task Force (PTF). The Preferred Expansion Alternative by the PTF was further refined to develop the following conceptual plans and documents:

- A conceptual base grading plan for the planned Landfill lateral expansion
- A conceptual final grading plan for the entire Landfill at closure, including the vertical expansion
- Conceptual stormwater, leachate, and landfill gas conveyance plans
- Preliminary Landfill stability calculations for the lateral and vertical expansion
- Volume calculations to determine airspace allocated for waste and soil balance requirements

Further, for optimum development of the Preferred Expansion Alternative for the Landfill, the following support facilities were evaluated:

- Dedicated space for scales, scale house, equipment building facilities, and customer convenience drop-off area
- Meeting space for employees and educational facilities
- Need for a landfill gas collection system and flare station
- Future off-site soil borrow and stockpile location.

Construction costs for the Preferred Expansion Alternative and support facilities were determined and incorporated into financial models developed for this Plan.

ES. 3 Cell Closure and End of Use Plans

Landfill area closure sequencing options were reviewed and evaluated based on the Preferred Expansion Alternative previously developed. A closure phasing plan was also developed, and the closure costs were incorporated into financial models developed for this Plan. Furthermore, alternative final cover systems were evaluated with the construction costs compared against the current permitted final cover profile. It was determined that an alternative earthen cover system at the Landfill has the potential to reduce final cover construction costs. Finally, incentives for a solar power project were investigated, and the feasibility of processing landfill gas to renewable natural gas was evaluated. The results of these analyzes indicated that these projects have the potential to be financially beneficial for the NNSWC. It is recommended that the Landfill re-analyze these options in the future as the feasibility and cost will vary based on the demand for the product produced and the cost of implementation.

ES. 4 Preliminary Expansion Plans

As part of this Plan, a preliminary review of several off-site expansion options was conducted based on NDEE and Stanton County solid waste guidelines, restrictions, and general construction feasibility. Based on the available data and preliminary analysis conducted, the proposed off-site landfill expansion options were ranked to determine the preferred expansion option. Based on the preliminary analysis, the preferred expansion option was the South Off-Site Expansion Options.

ES. 5 Bylaws and Agreement Review

The NNSWC bylaws and agreement continue to be evaluated by the NNSWC Project Task Force (PTF) and Baird Holm, the Coalition’s legal council. The final updated agreement and bylaws documents will be presented to the NNSWC Board at a later date.

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
2020 Permit Modification	NNSWC Landfill 2020 Permit Modification
2021$	2021 Dollars
2021 Tier 2 Report	2021 Tier 2 Landfill Gas Sampling & Emissions Rate Report
ACAP	Alternative Cover Assessment Program
ADC	Alternative Daily Cover
AUF	Airspace Utilization Factor
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CL	Low Plasticity Clay
CH	High Plasticity Clay
COVID-19	Coronavirus Disease 2019
CRD	Community Refuse Disposal, Inc.
CY	Cubic Yards
EPA	Environmental Protection Agency
ET	Evapotranspiration
FTE	Full Time Equivalent
gpm	Gallons per Minute
H	Horizontal
Landfill	NNSWC Regional Sanitary Landfill
lbs	Pounds
lb/cy	Pounds per Cubic Yard
LFG	Landfill Gas

Abbreviation	**Term/Phrase/Name**
Mg/yr	Megagram per Year
MSW	Municipal Solid Waste
NDEE	Nebraska Department of Environment and Energy
NE	Nebraska
NMOC	Non-Methane Organic Compounds
NNSWC/Coalition	Northeast Nebraska Solid Waste Coalition
NSPS	New Source Performance Standards
O&M	Operation and Maintenance
Plan	NNSWC Landfill Master Plan
PTF	Project Task Force
RFI	Request for Information
RNG	Renewable Natural Gas
V	Vertical
WCI	Waste Connections, Inc.

1.0 INTRODUCTION AND PROJECT APPROACH

The Northeast Nebraska Solid Waste Coalition (NNSWC, Coalition) retained the services of Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) to develop and prepare a Landfill Master Plan (Plan) for the NNSWC Regional Sanitary Landfill (Landfill). This section outlines the approach to complete the analysis and includes a description of the Plan's report organization.

1.1 Project Purpose

The purpose of this Plan is to provide the Coalition with short-term and long-term plans for optimum development and optimization of the Landfill. The Plan includes details regarding Landfill infrastructure planning and expansion strategy that will maximize the use of the property in a financially and operationally sound manner.

It should be noted that this document is intended for planning purposes and should be reviewed on a periodic basis by the Coalition to determine if updates are needed. As with any planning document, implementation often requires modification to adapt to unforeseen changes in waste received, operation methods, etc.

1.2 Project Team

The project team was comprised of representatives from the NNSWC Project Task Force (PTF) representatives and Burns & McDonnell. Members of the NNSWC PTF included:

- Steven Rames
- Rob Mercer
- Randy Gates
- Chuck Sliva
- Brian Newton
- Tyler Ficken

Key Burns & McDonnell representatives included:

- Luke Rodig
- Robert Craggs
- Scott Martin
- Pedro Ruiz Fabian
- Fred Doran

1.3 Project Approach

A series of key tasks were developed that served as a starting point for the Plan. The following tasks were used to collect information about the Landfill's current solid waste system and recommend any necessary changes and future updates with the subsequent project tasks.

1.3.1 Issue Data Request

A detailed data request was submitted to the Coalition to collect historic and background information on operations and practices. The data request served to provide a basis of understanding for the operational and financial considerations to be addressed. The information requested included the following:

- Contact information for representatives of the PTF
- Equipment and fleet inventory
- Organizational charts and personnel rosters
- Operational and productivity data for the Landfill
    - Landfill tonnage and soils usage logs
    - General types of waste disposed at the Landfill
- Detailed financial reports and budgets
- Landfill policies and agreements

1.3.2 Kick-Off Meeting & Project Task Force

Burns & McDonnell met with Coalition representatives on July 29, 2020, to initiate the project. The purpose of the kick-off meeting was to discuss the project scope, key issues to be addressed, key findings from previous engagements, and confirm the timing associated with the various project tasks. Additionally, the project kick-off meeting served to establish a Project Task Force (PTF). The responsibilities of the PTF included participation in the project meetings and workshops, facilitating data collection, providing feedback on preliminary findings, providing critical direction on key recommendations and potential program changes, and providing support to the project team throughout the project. The PTF was comprised of representatives from diverse roles and different communities within the NNSWC. A complete picture of the solid waste system was developed by involving a variety of individuals from different communities with a wide range of responsibilities. Due to safety concerns related to the coronavirus disease 2019 (COVID-19) pandemic, most subsequent project meetings were held virtually. As the Coalition proceeds with recommendations from the Plan, full participation from the PTF members is expected to increase buy-in from other stakeholders and facilitate implementation of the recommendations.

1.3.3 Conduct Field Observations

On-site observations of key operating practices were conducted on October 12 and 13, 2020. A Burns & McDonnell representative observed the Landfill in general, waste filling operations, and scale operations to obtain a proper understanding of the challenges faced, productivity levels achieved, successes, and areas in need of improvement. The representative also conducted interviews with key managers and staff for each operation. The field observations served to gain a critical understanding of the Landfill's solid waste system.

1.4 Report Organization

This Plan is organized into seven sections, plus an executive summary. The key findings and recommendations are provided in their respective sections as well as in the executive summary. A summary of the Plan's sections is listed below:

- Executive Summary
- Section 1.0 – Introduction and Project Approach
- Section 2.0 – Background: provides a consolidation of existing site information related to the site's physical conditions and Landfill operations
- Section 3.0 – Alternatives and Efficiencies for Landfill Operations: provides an operational review of the Landfill and evaluates the benefits and impact of accepting additional waste from outside the Coalition or restricting the amount of waste accepted
- Section 4.0 – Landfill Expansion Development: focuses on lateral and vertical expansion options to maximize the disposal capacity of the Landfill and evaluates the necessary support facilities for optimum development at the existing Landfill site
- Section 5.0 – Cell Closure and Post-Closure Plans: provides cell closure sequencing plans with alternative cover options considered and an evaluation of the end of use plans for the existing Landfill
- Section 6.0 – Preliminary Off-Site Expansion Plans: discusses preliminary options for Landfill expansion in 60+ years outside the current site property
- Section 7.0 – Bylaws and Agreement Review: provides a summary of the review of the current Landfill bylaws and agreements and recommendations to the Coalition and NNSWC's legal council for consideration

2.0 BACKGROUND

2.1 Existing Site Information

The NNSWC, an affiliation of Nebraska cities, counties, towns, and villages, manages Municipal Solid Waste (MSW) in the Northeast region of Nebraska. The current 160-acre Landfill is located in the Northwest 1/4 of Section 21, Township 21 North, Range 3 East in rural Stanton County, Nebraska. The site itself is mostly grassland and has been partly used for row crops on the northwest corner. No major utilities traversed the site. The primary land use of the surrounding area is agriculture. The site is in a rural setting with a population density of less than 0.1 people per acre. Three residences are within ¼ mile of the site. The nearest town is Clarkson, NE with a population of 631. Additionally, the nearest body of water is Maple Creek which runs ¼ mile to the east and 30 feet below the site; it is not reasonable to assume that the creek would ever flood the Landfill property.

A scale and scale house that weigh and record loads into the facility are located near the entrance to the site. A maintenance building and yard are located close to the Landfill operations area on the northern section of the site. An electric service line runs along the north side of the site and provides the site with electricity. Water is supplied by a single well located near the Landfill entrance that is designed to pump 20 to 50 gallons per minute (gpm). A 7,000-gallon underground holding tank stores sanitary wastewater and maintenance facility wastewater on-site. The tank is periodically unloaded, and its contents taken to a wastewater treatment facility for disposal. On the north side of the site an existing tree line provides screening to the entrance of the facility. A 10-foot screening berm also runs along portions of the western and northern sides of the site between the Landfill and the road. Around the entirety of the site there is a 8-foot woven wire and barbed wire fence.

The Landfill currently has five active disposal cell areas. Area 5 is the most recent area constructed, with construction completed on November 11th, 2016. Area 6, the southernmost area, has been permitted but has not yet been constructed. Pending approval of the NNSWC Landfill 2020 Permit Modification (2020 Permit Modification) consisting of expanding the Landfill capacity by increasing the exterior side slopes, the total gross volume of the Landfill is 10,863,820 cubic yards (CY) with a total waste capacity of 10,241,655 CY.

2.2 Site Physical Conditions

Groundwater at the Landfill is monitored by a system of monitoring wells to detect any potential leachate or landfill gas contamination. Additionally, the Landfill has a composite liner and leachate collection system to provide protection of groundwater resources. The Landfill bottom liner is constructed and installed to control migration of waste or waste constituents out of the Landfill into the adjacent subsurface soil, groundwater, or surface water at any time during the active-life of the Landfill and during the post-closure care period. The bottom liner consists of two components; the upper component is a flexible membrane liner (FML) that is installed in direct and uniform contact with the lower component of the composite liner, and the lower component consists of at least two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. Maximum annual leachate generation is estimated to be approximately 792,900 gallons. The existing leachate pond is designed to be able to hold over 3,366,000 gallons of leachate, considerably greater than annual leachate generation.

A permitted surface water drainage system is active at the Landfill to control the surface water from areas around the Landfill and surface water run-off from the Landfill. The surface water drainage system consists of open channels, sedimentation basins, terrace channels, side slope terrace channels, and letdown structures. Site drainage from outside the waste boundary area is kept out of the Landfill by open channels outside the Landfill perimeter road. Temporary berms are placed around the working face of the Landfill to prevent surface water run-off from areas of the Landfill that do not have intermediate cover.

2.3 Site Landfill Operations Overview

Community Refuse Disposal, Inc. (CRD), a Nebraska corporation owned by Waste Connections, Inc. (WCI), is contracted by the NNSWC for specific portions of the operation of the Landfill facility. The facility is open from 7:00 a.m. to 4:00 p.m. Monday through Friday and 7:00 a.m. to 12:00 p.m. on Saturday, and is closed on Sundays and on all major U.S. holidays. The workforce at the site is composed of two experienced heavy equipment operators, one laborer, and a site manager contracted through WCI. NNSWC employees at the Landfill consist of one full-time and one part-time scale clerk. The facility has several pieces of heavy-duty equipment including a compactor, excavator, articulated dump truck, and a bulldozer. The site accepts mostly MSW, as well as special non-hazardous industrial waste approved by the Nebraska Department of Environment and Energy (NDEE).

The site gate remains locked when the operating personnel are not on site. Security cameras also monitor the site and record all incidences of unauthorized access. All trucks are required to be weighed and a record of the time, weight, and vehicle number are kept by the scale clerk personnel. After being weighed, the trucks can proceed to the active disposal areas.

Detailed discussion of the Landfill operations is included in Section 3.1 below.

3.0 ALTERNATIVES AND EFFICIENCIES FOR LANDFILL OPERATIONS

3.1 Landfill Operational Review

A site visit to the Landfill was conducted on October 12 and 13, 2020 to observe operational activities. Based on discussions with staff, the site operations observed reflect a normal weekday operating period for the Landfill. General tasks observed during the site visit included tipping area preparation, waste load inspection, waste placement and compaction, placement of alternative daily cover, and general observations of other support operations such as scale house operations. Through a request for information (RFI), the Coalition provided documents for review related to existing contracts, previous site development, financial and budgeting, personnel, equipment, and environmental operations. As a result of the site visit and informational review, the following key issues were identified as potential opportunities to improve Landfill operations:

- Section 3.1.1 – Facility Traffic Flow
- Section 3.1.2 – Staffing
- Section 3.1.3 – Equipment
- Section 3.1.4 – Scale House Operations
- Section 3.1.5 – Site Infrastructure
- Section 3.1.6 – Working Face Operations
- Section 3.1.7 – Leachate Management
- Section 3.1.8 – Stormwater Controls
- Section 3.1.9 – Litter

This section of the Plan will discuss these key issues with the focus on improving the efficiency and management of the Landfill operations as well as providing for an effective solid waste program while maintaining environmental protection.

3.1.1 Facility Traffic Flow

The Landfill accepts MSW primarily from Coalition member transfer station facilities, and also accepts a small portion of waste from residential and commercial sources. As shown on Figure 3-1, customers enter the site through the scale house entrance from 825th Road with the following options:

- Customers enter the scale house scale to weigh-in and begin their transaction. From the scale house, customers are directed to the following locations depending on the weather:
  - Landfill Area 4 non-wet weather active face; or
  - Landfill Area 5 wet weather active face

- Customers that need to weigh-out to complete their transaction enter the scale at the scale house. Other customers with completed transactions leave via the bypass lane.

Waste that arrives at the Landfill is primarily transfer trailers, however the Landfill also receives other types of waste traffic, including special waste that bypasses transfer stations. Typical waste types and quantities delivered to the Landfill include the following:

- Eight roll offs directly hauled per day on average
- Three to four rural packer trucks per day
- One to two loads of bulky waste per day
- Tire waste
- Construction waste
- Animal carcasses
- Loads by individuals from hog confinements
- Assorted loads including wind mill debris, rubber products, and medical center waste
- Goodyear hoses that the Landfill keeps in a separate area from other waste

Figure 3-1: Existing NNSWC Sanitary Landfill Entrance Waste Flow Diagram

3.1.2 Staffing

The Coalition currently contracts Landfill operations to WCI through a contract established between both parties on December 7, 1992. WCI currently has one fulltime employee to supervise overall Landfill operations, one fulltime laborer, and two fulltime operators. When necessary, WCI utilizes labor from the private operator's other facilities as needed, which include the Butler County and G & P Landfills. The Landfill also has 1.375 full time equivalent (FTE) NNSWC employees attending the scale house and managing customers entering and exiting the site Table 3-1 provides the current staffing at the Landfill. It should be noted that this only includes the on-site staffing at the Landfill and does not include the other supervisory and administrative staffing that is provided by NNSWC.

Table 3-1: Current Staffing for NNSWC Sanitary Landfill Operations

Title/Job Function	Total FTE	Role	Employer
Site Manager	1	Supervisory role managing employees	Waste Connections, Inc.
Laborer	1	Pick up wind blown litter, perform miscellaneous housekeeping tasks	Waste Connections, Inc.
Operator	2	Operate dozer and compactor at active face of Landfill, set wind screens, excavate and haul soil	Waste Connections, Inc.
Landfill Scale Attendant	1.375	Scale house operations, manage customers entering and exiting the site	NNSWC
Total Landfill Staff	**5.25**	-	-

Based on the observations, the current staffing levels at the Landfill appear to be sufficient for operations, contingent upon WCI's ability to continue utilizing staffing from other facilities for back-up labor.

3.1.3 Equipment

Equipment operating in their normal daily functions was witnessed during the site visit. Landfill operations are heavily dependent on having the right piece of equipment available to create an efficient tipping area and optimize airspace utilization. The equipment must be maintained to be operable during all hours of business, and key pieces of equipment should have backups onsite to allow for routine maintenance and unplanned downtime. Minor equipment maintenance is conducted by WCI. Major equipment maintenance is conducted by a CAT dealer. The equipment at the Landfill does not have GPS, therefore, the active face areas in the Landfill are marked with a handheld GPS. Table 3-2 summarizes the current Landfill equipment inventory. All equipment at the Landfill is owned by WCI and is generally in good working condition. At the time of the site visit, the A1-Jon compactor and one of the CAT 826 compactors were down for maintenance. The teeth on the down compactors were in good condition and were greater than six inches. The teeth on the functional CAT 826 compactor were fairly worn down at the time of the site visit.

Table 3-2: NNSWC Sanitary Landfill Equipment List

Type	Make & Model	Current Purpose/Area of Use
Dozer	D6T	Cover soil grading and sloping on active face
	D6N	Finishing off areas and miscellaneous maintenance and borrow activities

Type	Make & Model	Current Purpose/Area of Use
	D6M	Spare piece of equipment that can be used at the active face
Compactor	A1-Jon	Spread and compact waste at working face
	CAT 826G	
	CAT 826G	
Excavator	Komatsu PC400LC	Long reach, Borrow operations, pond cleanouts, etc.
	CAT 322B	Short reach, Active face support (pulling waste out of trailers)
Loader	938G	Miscellaneous site activities
Dump Truck	CAT 730	Articulated miscellaneous site operations
Water Truck	--	4,000 gallon capacity
Payloader	Caterpillar	Miscellaneous site operations (road gravel)
Motor Grader	Caterpillar	Snow removal, haul road grading
Farm Tractor	--	Miscellaneous site operations
Mobile Diesel Wagon	--	Miscellaneous fueling near active face

It is recommended to maintain frontline (i.e., primary) compactor(s) with sufficient teeth length (i.e., greater than six inches) to adequately process and compact waste for optimum airspace utilization. Additionally, it is recommended to install and utilize GPS equipment on the frontline compactor. The GPS should be equipped with a landfill specific package to help track fill elevations as well as real-time compaction rates for efficient waste filling operations.

3.1.4 Scale House Operations

The Landfill is open from 7:00 am to 4:00 pm Monday through Friday, and 7:00 am to 12:00 pm Saturday. The Landfill is closed on Sundays and on all major U.S. Holidays. The scale house is staffed by 1.375 FTE (55 hours per week) scale house attendants. The truck queue is highest within the first hour of the Landfill opening and is intermittent after the first hour. A second rush usually occurs in the early afternoon. Cash accounts are infrequent, as customers are required to bring a check.

3.1.5 Site Infrastructure

During the site visit, existing buildings and roads onsite were observed for current functionality and condition. The following summarizes the major buildings and disposal areas on-site:

- **Scale House.** The scale house was installed in 1995 and is in fair condition but nearing the end of its life, and is not on a permanent foundation.

- **Scale.** A new deck was installed in 2015. Load cells and other components are replaced or upgraded as they fail. The limited access of the scale makes it difficult to clean out; as a result, accumulation of dirt and debris below the scale is an issue.
- **Equipment Building.** The current equipment building is just large enough to store the equipment at the Landfill in the winter; equipment is stored outside at the active areas the rest of the year. The building is 25 years old and does not have a septic system. A 7,000 gallon underground holding tank stores sanitary wastewater and maintenance facility wastewater on-site. The tank is periodically unloaded, and its contents taken to a wastewater treatment facility for disposal. In addition, the building is having some issues with stormwater leaking in due to gravel that is built up higher than the building floor. It is recommended that the future equipment building is larger, has a septic system, and built at a higher elevation to prevent stormwater intrusion.
- **Site Access Roads.** The site access roads are generally maintained as dictated by active filling operations.
- **Perimeter Roads.** The perimeter roads at the Landfill were in good condition at the time of the site visit.

Overall, the site infrastructure is adequate for continued short-term operations. Additional discussion regarding long-term site infrastructure needs and improvements is included in Section 4.4.

3.1.6 Working Face Operations

Working face activities begin around 6:40 am. The Landfill staff typically stockpiles dirt at the end of the day to prepare the active face for the next day. Additional intermediate cover soil is stripped away in the morning where the daily cell area is planned. At the time of the site visit, waste was being placed in 10-foot thick lifts in a daily cell that is typically 80 feet by 40 feet. Shutdowns do not occur regularly but may occur during periods of high winds and when road conditions are poor due to ice or blizzards. Burns & McDonnell staff observed the following operations at the Landfill during the site visit:

- **Equipment at working face.** The Landfill staff currently has one person operating both the dozer and compactor at the active face. Another operator excavates and hauls soil. During normal operations, three to four trucks are dumping at one time. Wet weather operations restrict dumping trucks to two at one time. Area 4 is currently being filled during regular operations, and Area 5 is currently used for wet weather conditions, with waste lifts progressing from the west side to the east side of the cells. Landfill operators compact waste on the slope of the daily cell working face to maintain a small landfill working face and minimize blowing litter. It is typically more efficient for compactors to compact on flat, horizontal lifts.

- **Use of alternative daily cover (ADC) and daily cover.** The Landfill staff uses spray-on ADC to limit soil borrow activities as much as possible. ADC is mixed with leachate in the summer and well water in the winter when leachate is not available (i.e., pond surface is frozen). One water truck load equates to approximately two to three days of ADC. The Landfill is also permitted to use petroleum contaminated soils (PCS) as ADC, but does not receive consistent amounts of this material. The use of ADC helps with achieving a good waste to soil ratio and increases the airspace utilization.
- **Litter Fencing.** Multiple wind screens are set up at the working face to control litter. Significant changes in wind direction were observed during the site visit but the wind screens were setup and relocated effectively to control the litter. A perimeter fence collects litter that blows out of the active face on windy days. The fence is generally in good shape but has some areas that are worn out.

3.1.7 Leachate Management

Leachate collected from the Landfill is conveyed to the existing leachate pond. Leachate is currently managed on-site. Landfill operations uses a sprinkler to apply leachate over areas of daily or intermediate cover and for dust suppression on the interior working areas. Previously, the Landfill also used seepage pits on the active Landfill face to manage leachate, however this practice has been discontinued due to the staffing required to continually monitor the leachate levels within the pit. The pump used for this operation was replaced in 2019 and is in good working condition. At the time of the site visit, there was no significant scaling in the leachate piping, and it appeared to be in good condition. The Landfill should continue to flush the leachate piping annually to not only conduct integrity testing on the pipes but to also clean the manholes and sewer piping from solids build-up. Furthermore, the sewer lines should also continue to be air tested on an annual basis. The pond underdrain leak detection float system infrequently causes maintenance issues. It is recommended that Landfill staff continue keeping a daily log of the elevation in the leachate pond.

3.1.8 Stormwater Controls

Perimeter stormwater ditches are constructed around the Landfill and generally direct stormwater to the stormwater pond located in the southeast corner of the Landfill property. The Landfill is utilizes diversion berms on the south side of Area 4 and north side of Area 5 that feed to the letdown constructed as part of the Area 5 construction project. The letdown structure then drains into the stormwater pond south of Area 4. Landfill staff maintains the stormwater pond, and removes sediment approximately every two years, or as needed. At the time of the site visit, the Landfill staff were working on excavating the stormwater pond and performing erosion related repairs next to the stormwater pond.

Stormwater near the scale area drains fairly well. However, as mentioned previously the equipment building has issues with stormwater leaking into the building. The gravel pad surrounding the building gets built up higher than the floor of the equipment building during operations, preventing water from draining away from the building. It is recommended that the Landfill operator continue to make improvements to divert stormwater away from the equipment building.

3.1.9 Litter

There was minimal litter observed at the Landfill during the site visit with the exception near the active filling areas in Area 4 and Area 5. Windblown litter is typically collected and bagged on the active area. For the most part, the perimeter litter fencing was in good shape at the time of the site visit, but there were some areas that were in need of repair. It was noticed during the site visit that several trucks were not adequately sweeping out their trailers after disposal, which resulted in windblown litter occurring as trucks were pulling away. It is recommended that all trucks sweep out trailers to minimize windblown litter when trucks leave the Landfill, and that Landfill staff repair the portions of the perimeter litter fencing that are in need of repair.

3.2 Waste Shredding and Waste Bailing Evaluations

A desktop evaluation was conducted to explore the potential for the Coalition to implement waste shredding or waste bailing. The evaluation was developed based on Burns & McDonnell’s industry experience and information provided by manufacturers. The cost of material processing was compared with the potential improvements in waste density and associated additional benefits of the incremental airspace gained. The findings of the evaluation are summarized below.

Airspace is the Landfill’s primary asset and the grinding or shredding of waste can increase the airspace utilization factor (AUF) of the Landfill. For the waste shredding evaluation, the Landfill life gained with increased AUF was compared to the cost of owning, operating, and maintaining a shredder at the Landfill. For reference, the full waste shredding evaluation analysis is provided in Appendix A.

The cost of owning, operating, and maintaining a shredder at the Landfill is estimated to be $255,300 per year. This cost considers full depreciation of the shredding equipment over ten years and the cost of operating and maintaining the equipment for 4-hours a day for 160-days per year. Additionally, the cost of 1.0 full-time employee (FTE) is considered to operate the shredder per year prorated by assuming 1.5

FTE required for shredder operations for 160-days per year). Table 3-3 shows a summary of the costs for the waste shredding evaluation.

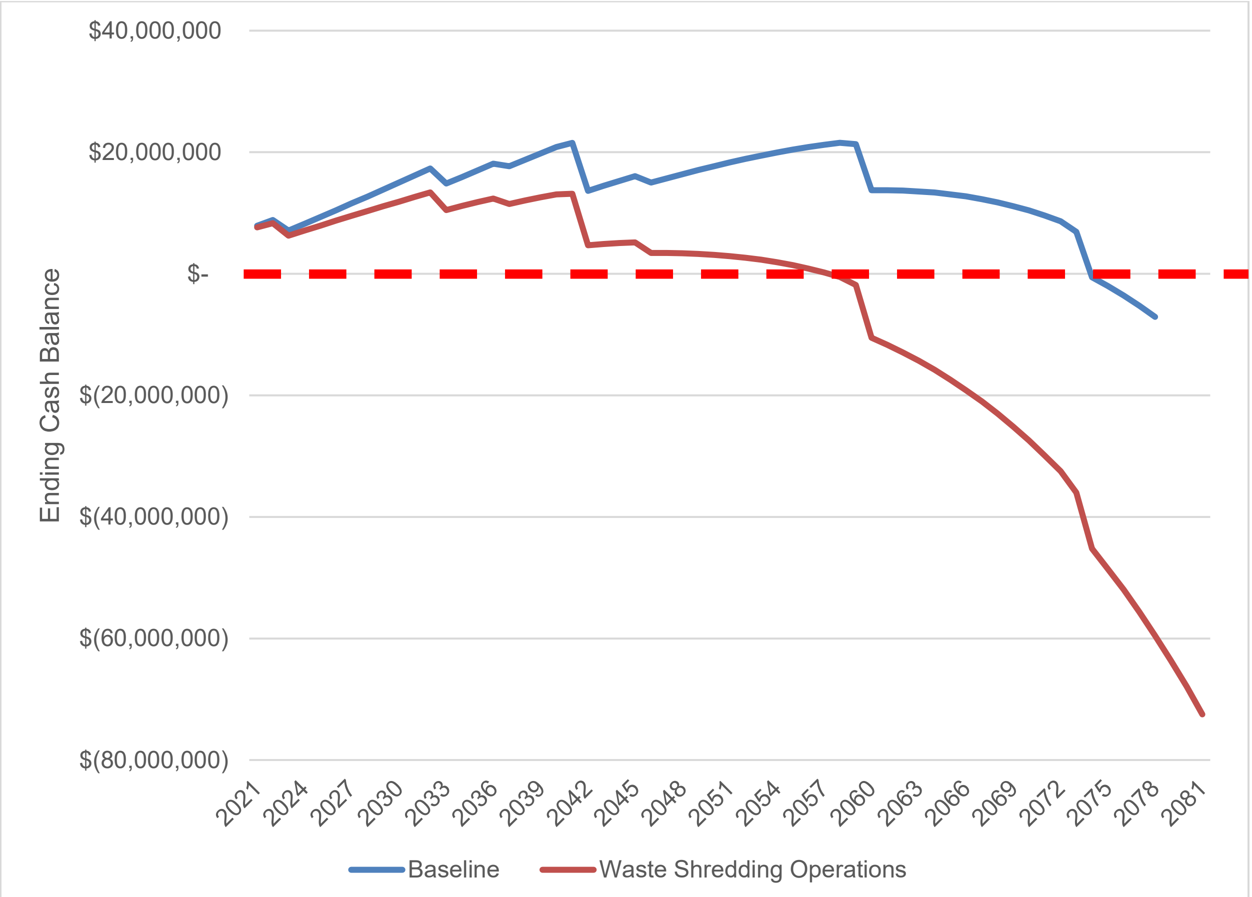
Table 3-3: Summary of Costs for NNSWC Waste Shredding

Annual Costs	2021$
Shredder (owning and operating Costs)	$172,800
Operator (1.0 FTE salary and benefits)	$82,500
Total	**$255,300**

To determine the Landfill life gained, an annual tonnage of 112,000 tons with a future generation growth rate of one percent and a current Landfill AUF of 1,296 pounds per cubic yard (lb/cy) per the 2019 Volume Calculations Report prepared by Burns & McDonnell in April 2020 were assumed. It was also assumed that the current Landfill AUF would increase approximately 300 lb/cy for the volume of waste being shredded. With these assumptions and a shredder capacity of 52,800 tons per year (based on 75-percent maximum throughput capacity of 110 tons per hour, operating 4 hours per day, for 160 days per year), the average effective total AUF for waste shredding operations was calculated to be 1,405 lb/cy. With the average effective total AUF, the Coalition would gain 3.67 years of additional life due to the increase in AUF provided by shredding waste, assuming the Landfill expansion detailed in Section 4.0 is completed.

The additional Landfill life gained, and the costs associated with shredding operations were used as inputs into a financial model (Appendix B) to determine the impacts that waste shredding will have on the Landfill net revenue (Section 3.3 details additional financial model inputs). Figure 3-2 compares the baseline operations versus the operations with waste shredding. From the figure, the Coalition will begin seeing a cash ending balance deficit around 2058 with waste shredding operations at the Landfill because of the additional operating costs of shredding waste. Before this date, the Coalition would need to increase tipping fees to avoid a cash deficit. It is recommended that the Coalition proceed with normal Landfill operations.

Figure 3-2: NNSWC Ending Cash Balance Comparison of Baseline versus Waste Shredding Operations



From Burns & McDonnell's experience, waste bailing operations typically provide an AUF of approximately 1,200 lb/cy for landfills of similar size. As previously explained a landfill's airspace is its most valuable asset. Current Landfill operations yield a calculated AUF value of 1,296 lb/cy, which exceed the expected AUF for waste bailing operations. Additionally, a waste bailing operation would require a bailer building to be constructed and additional FTEs to staff the operation. A bailing operation for the Landfill is not financially justifiable as the Coalition will spend considerable upfront capital costs and operation/maintenance costs for no gain in additional AUF.

3.3 Benefits and Impacts of Changes to Waste Acceptance Amounts

Changes to net revenues and overall costs with increases and decreases in waste receipts were evaluated as part of this task. Tipping fee requirements for NNSWC members were also reviewed. The analysis assumed the Landfill expansion concept and the supporting infrastructure discussed in Section 4.0 are developed. A planning level financial model was created to evaluate the impact of changes in waste receipts, and the detailed worksheets are provided in Appendix C.

The financial model was developed by evaluating the following scenarios:

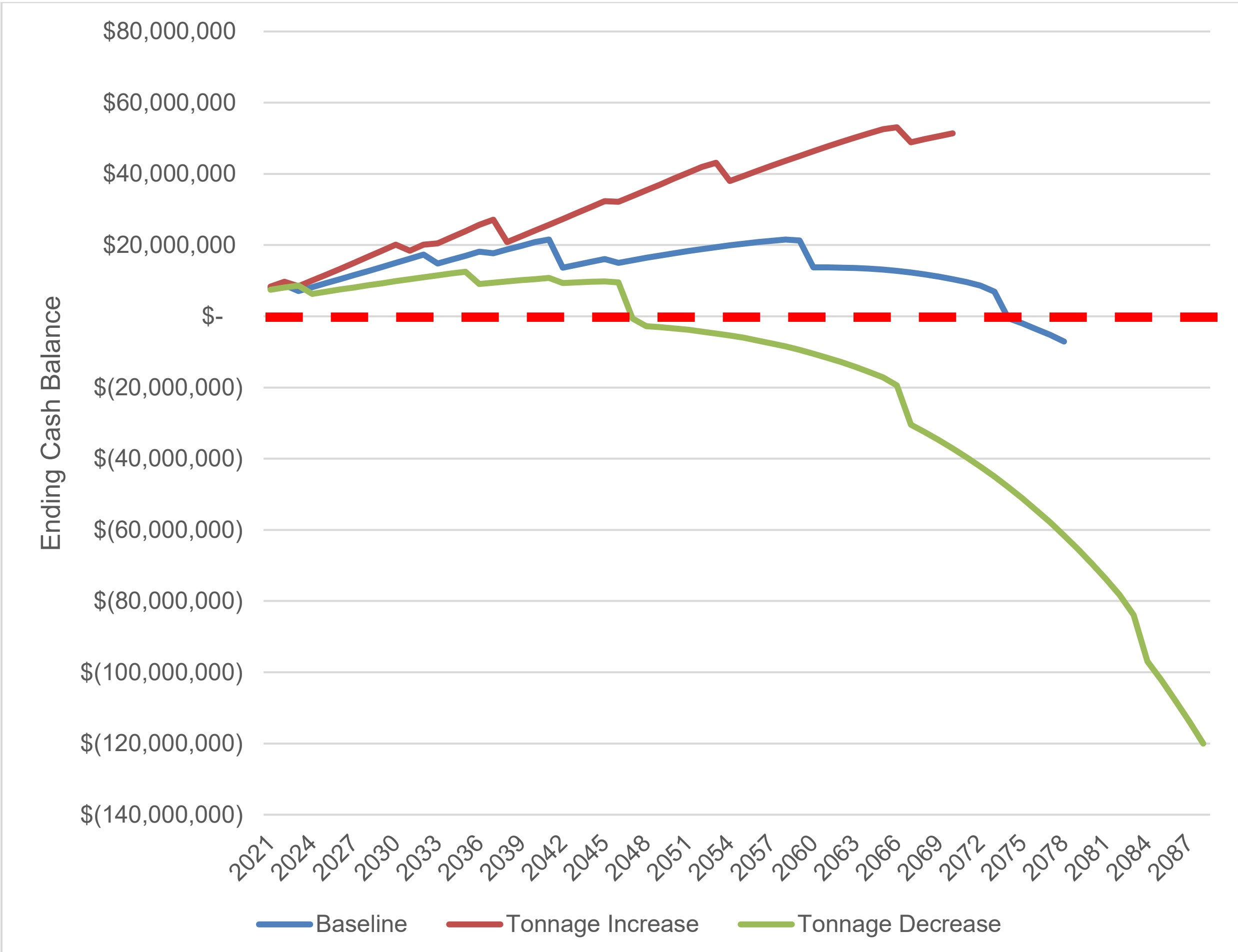
- **Baseline Scenario:** Waste received by the Landfill will remain unchanged, “no waste change.”
- **Scenario #1:** Assumes a 20-percent waste increase to the overall waste stream.
- **Scenario #2:** Assumes a 20-percent waste decrease to the overall waste stream.

For all scenarios, the financial model assumes a waste tonnage rate of 112,000 tons for 2021 with a one-percent tonnage increase per year. The following were additional key inputs into the financial model:

- WCI Operation Costs: The Coalition currently contracts Landfill operations to WCI through a contract established between both parties on December 7, 1992. The contract establishes a “fixed” fee for operating the facility (based at $480,000) as well as a tonnage fee (based at $4.00 per ton of incoming waste, not to exceed $480,000). Additionally, there is a separate special waste fee ($10.50 per ton) collected to manage special wastes.
- Coalition Operating Costs: A total cost of $758,000 net present value was assumed for 2021 with input from the PTF. This value incorporates personnel costs, operating and maintenance costs, other administrative and overhead costs, financial assurance fund transfers, and professional services.
- Operating costs projected include inflationary increases based on the type of cost (2.5 to 3.0 percent)
- Capital costs for supporting infrastructure discussed in Section 4.0 and Section 5.0
- Current Tipping fee of $24.00 to be unchanged
- Closure/Post-Closure costs funded via financial assurance funds

The financial evaluation results are depicted in Figure 3-3 based on the assumptions provided above. The financial evaluation was carried out until the Landfill life was depleted for each scenario. The timing of when cell construction/closure and additional capital improvements vary as determined by the findings described in Section 4.0 per each scenario. Additionally, the ending life of the Landfill varied due to the increase or decrease of waste placed in the Landfill. The objective of the financial model was to evaluate the impact on the NNSWC cash ending balance based on the three scenarios previously described.

Figure 3-3: NNSWC Financial Ending Cash Balance Analysis with Tonnage Adjustments



The Baseline Scenario generally has a positive ending balance throughout the Landfill's life. Close to the end of the baseline scenario, the Coalition begins to experience a cash deficit around 2074. Increases to the tipping fee should be considered and evaluated approximately 10 years prior to the reserves being depleted.

Scenario #1 (tonnage increase scenario) experiences an increase in revenues from the additional tipping fees gained due to the increase in the waste stream. With this scenario, capital project construction dates are accelerated and provide the Coalition with an ending positive cash balance throughout the Landfill's life. The Landfill life is depleted by 2070, with a positive cash balance of approximately $50 million.

The results for Scenario #2 (tonnage reduction scenario) indicate that the Coalition will have a negative ending cash balance beginning in 2047. To avoid a negative cash ending balance, tipping fee increases would need to be considered and evaluated approximately 10 years prior to the reserves being depleted.

With this scenario, the Landfill life is depleted in 2088. Similar to other scenarios, the capital project construction dates are altered (i.e., delayed) with this scenario based on when construction is necessary.

4.0 LANDFILL EXPANSION DEVELOPMENT

Several options were identified and evaluated to increase the disposal capacity of the Landfill within the current property boundary. Multiple conceptual expansion alternatives detailed below were identified and presented to the PTF. Subsequently, the Preferred Expansion Alternative by the PTF was further refined by Burns & McDonnell, and the following conceptual plans and documents were developed:

- A conceptual base grading plan for the planned Landfill lateral expansion
- A conceptual final grading plan for the entire Landfill at closure, including the vertical expansion
- Conceptual stormwater, leachate, and landfill gas conveyance plans
- Preliminary Landfill stability calculations for the lateral and vertical expansion
- Volume calculations to determine airspace allocated for waste and soil balance requirements

An analysis of estimated construction times and net present value construction costs was completed for the lateral/vertical expansion and support facilities and infrastructure. The construction timing and costs developed for the improvements were used as inputs into the financial model developed in Section 3.3 to evaluate the impacts of waste increases or decreases into the Landfill.

4.1 Site Restrictions

A thorough review was conducted of the NDEE site location restrictions, Stanton County siting requirements, and associated historical siting evaluations in the Landfill's permit documents. This review served to establish potential lateral and vertical expansion options within the Landfill's existing property boundary. The following expansion alternatives and final expansion options all meet the restriction requirements set forth by the NDEE and Stanton County.

4.2 Conceptual Expansion Alternatives

Several conceptual expansion alternatives at the Landfill were reviewed. Four primary horizontal expansion alternatives and three vertical expansion alternatives were identified and presented to the Coalition PTF. The conceptual expansion alternatives can be referenced in Figures A through H in Appendix D and are described in further detail below. The figures presented in the appendix depict the horizontal expansion alternatives with a 30-feet vertical expansion graded at a 4 horizontal (H):1 vertical (V) slope. The amount of airspace gained for each conceptual expansion alternative was calculated and is provided in Table 4-1 below. The additional airspace capacity was calculated by subtracting the ultimate permitted airspace capacity from the ultimate airspace capacity determined for each alternative. To better understand how the additional airspace capacity compares to each alternative, the additional expansion life was calculated based on an assume tonnage rate of 112,000 tons, tonnage growth rate of one percent, and a waste density of 1,296 lb/cy.

Table 4-1: Airspace and Expansion Life Summary for the NNSWC Landfill Expansion Alternatives

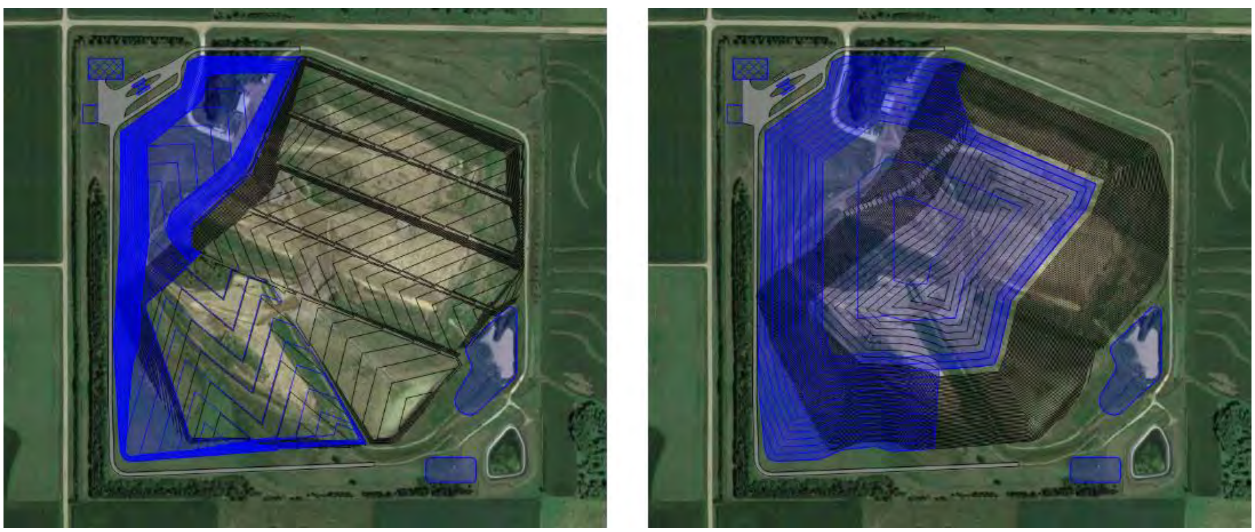
Expansion Alternative		Existing	1	2	3.A	3.B
Crest = 1780 (0ft vertical)	Available Airspace (CY)	9,598,984	12,765,172	11,814,593	13,570,528	12,524,278
	Additional Airspace (CY)	-	3,166,188	2,215,609	3,971,544	2,925,294
	Additional Expansion Life (yrs)[a]	-	13	9.2	16	12
Crest = 1810 (30ft vertical)	Available Airspace (CY)	9,598,984	14,249,672	12,900,177	15,103,410	13,716,381
	Additional Airspace (CY)	-	4,650,688	3,301,193	5,504,426	4,117,397
	Additional Expansion Life (yrs)[a]	-	18.5	13.5	21.6	16.6
Crest = 1840 (60ft vertical)	Available Airspace (CY)	9,598,984	15,207,495	13,462,874	16,145,343	14,339,019
	Additional Airspace (CY)	-	5,608,511	3,863,890	6,546,359	4,740,035
	Additional Expansion Life (yrs)[a]	-	21.9	15.6	25.2	18.8

[a] Landfill life estimates assume a present annualized tonnage of 112,000 tons with a predicted future generation growth rate of one percent. At the time the existing permitted capacity is depleted in 2049, the annualized tonnage is estimated to be 149,000 tons; this value is the starting point for expansion life calculations of the expansion options.

4.2.1 Expansion Alternative 1

Expansion Alternative 1 covers an approximate non-permitted area of 20-acres to the West and Northwest of the existing permitted Landfill footprint. The expansion alternative base grades and final cover plan are presented conceptually in Figure A and Figure B in Appendix D. A snapshot of the base grades and the final cover plan is shown in Figure 4-1. This expansion alternative will provide the Landfill with approximately 13.0-22.0 years of additional life as indicated in Table 4-1. However, it will require existing Landfill infrastructure such as existing inbound/outbound scales, scale house, and equipment building to the property's northwest corner to be relocated.

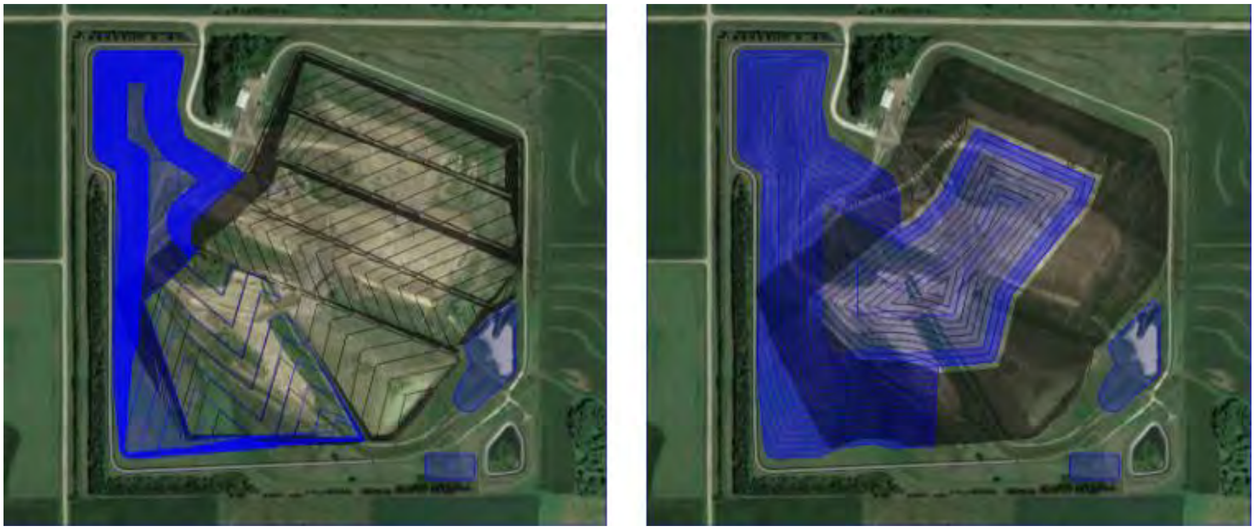
Figure 4-1: NNSWC Expansion Alternative 1 Base Grades (left) and Final Cover (right)



4.2.2 Expansion Alternative 2

Expansion Alternative 2 is located to the West and Northwest of the existing permitted Landfill footprint. This expansion alternative covers an approximate non-permitted area of 18-acres providing the Landfill with 9.3-15.6 years of additional life based on calculations summarized in Table 4-1. The decrease in additional life is primarily due to the expansion not fully piggybacking onto existing Landfill slopes. However, this alternative will not require the relocation of existing infrastructure. The base grades and final cover plan for Expansion Alternative 2 are presented conceptually in Figure C and Figure D, respectively, in Appendix D. Figure 4-2 provides a snapshot of the base grades and final cover plan.

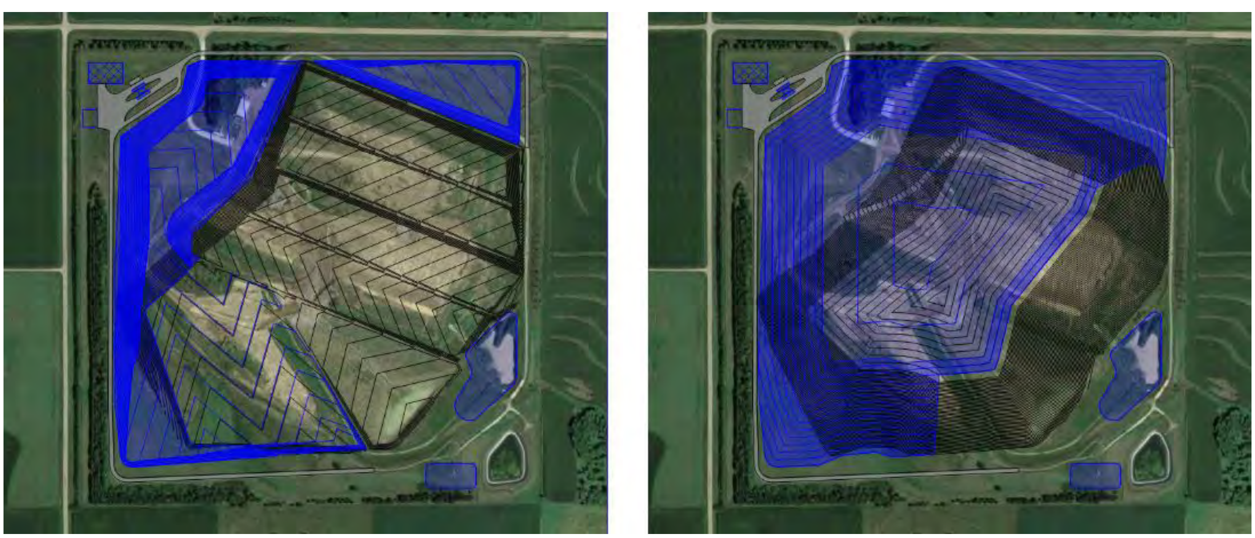
Figure 4-2: NNSWC Expansion Alternative 2 Base Grades (left) and Final Cover (right)



4.2.3 Expansion Alternative 3.A

Expansion Alternative 3.A is the same as Expansion Alternative 1 on the west side of the site, but additional landfill capacity is also added in the Northeast corner of the Landfill. This expansion alternative covers an approximate non-permitted area of 26-acres and will provide the Landfill with 16.1-25.2 years of additional life as indicated in Table 4-1. Similar to Expansion Alternative 1, the Landfill infrastructure will need to relocate to the property's northwest corner. Reference Figure E and Figure F in Appendix D for a conceptual representation of the base grades and final cover plan for this alternative. Figure 4-3 shows a snapshot of the base grade and final cover for this alternative.

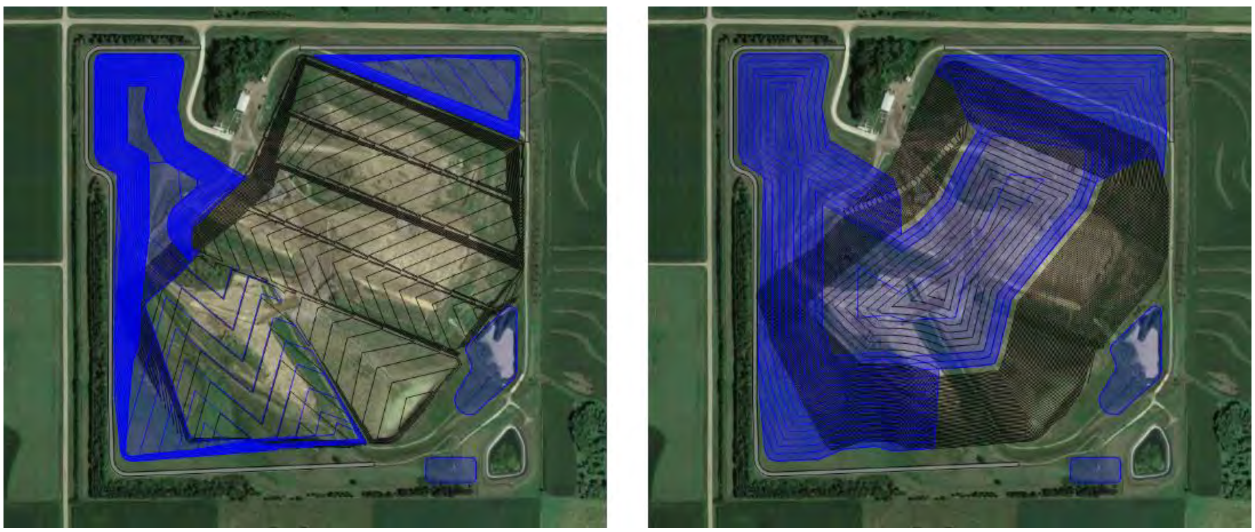
Figure 4-3: NNSWC Expansion Alternative 3.A Base Grades (left) and Final Cover (right)



4.2.4 Expansion Alternative 3.B

Expansion Alternative 3.B is the same as Expansion Alternative 2 but takes advantage of the additional waste capacity in the Northeast corner of the Landfill. The base grades and final cover plan are presented conceptually in Figure G and Figure H, respectively, in Appendix D. A snapshot of the base grades and final cover plan for this alternative is shown in Figure 4-4. This expansion alternative covers an approximate non permitted area of 24-acres and will provide the Landfill with 12.1-18.9 years of additional life as indicated in Table 4-1. Like Expansion Alternative 2, Landfill infrastructure will not need to relocate.

Figure 4-4: NNSWC Expansion Alternative 3.B Base Grades (left) and Final Cover (right)



4.3 Preferred Expansion Alternative

Based on a review of the proposed lateral and vertical expansion alternatives by the Coalition PTF, the preferred configuration for future development was Expansion Alternative 3.A with a vertical expansion of 60-feet. The Preferred Expansion Alternative 3.A was further revised with 3.3(H):1(V) slopes to match the slopes and capacities developed with the NNSWC Landfill 2020 Permit Modification (2020 Permit Modification) prepared by Burns & McDonnell in October 2020. Table 4-2 below provides the final airspace and additional expansion life gained with the revisions to this alternative calculated using the same approach explained in Section 4.2. The preferred configuration allows for the most expansion life and will also phase out existing infrastructure that will be nearing the end of its life at the time of development. With direction from the PTF, Burns & McDonnell further refined Preferred Expansion Alternative 3.A and developed a conceptual design for the alternative.

Table 4-2: Airspace and Expansion Life Summary for the NNSWC Preferred Expansion Alternative 3.A

Expansion Alternative	Crest = 1840 (60ft vertical)		
	Available Airspace (CY)	Additional Airspace (CY)	Additional Expansion Life (yrs)[a]
2020 Permit Modification	10,260,000	-	-
3.A[b]	17,530,000	7,270,000	27.7

[a] Landfill life estimates assume a present annualized tonnage of 112,000 tons with a predicted future generation growth of one-percent. At the time the existing permitted capacity is depleted in 2049, the annualized tonnage is estimated to be 149,000 tons; this value is the starting point for expansion life calculations.

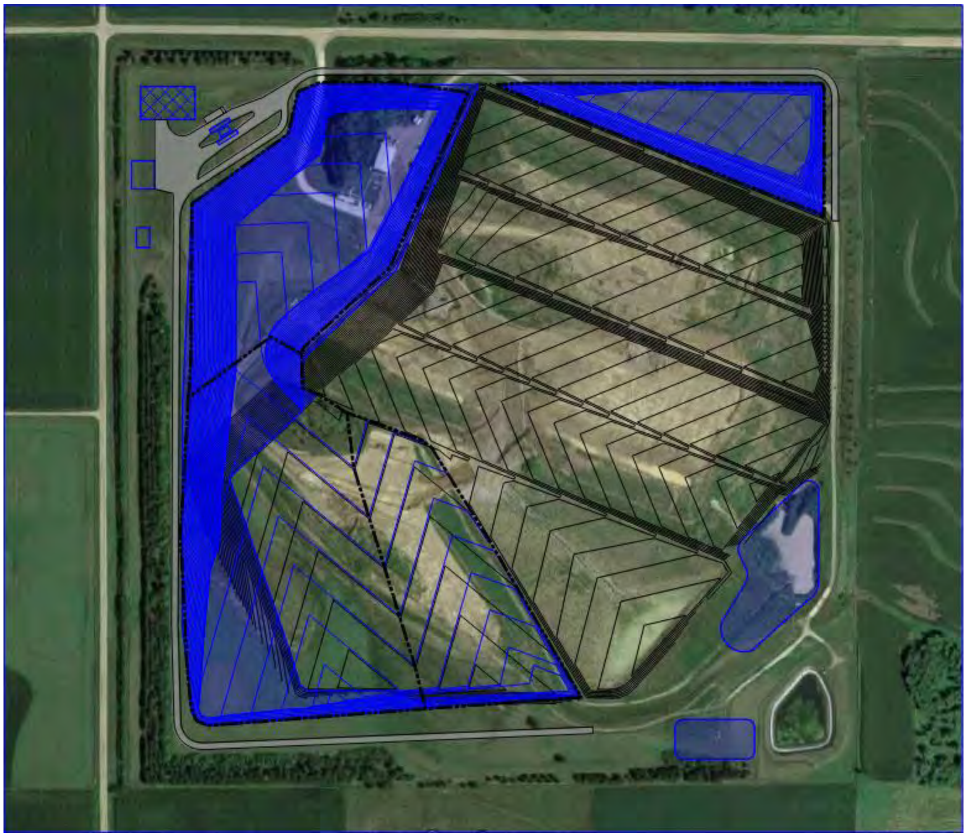
[b] Available airspace capacity adjusted per 2020 Permit Modification 3.3(H):1(V) slopes and adjusted remaining Landfill airspace.

4.3.1 Base Grade Plans

Figure 1 of Appendix E provides a conceptual base grade plan for the Preferred Expansion Alternative 3.A. A snapshot of the proposed base grade plans is shown in Figure 4-5. The new Landfill footprint will cover approximately 104 acres, increasing the Landfill footprint an additional 26-acres from the currently permitted 78-acre footprint. A summary of the proposed expansion areas are:

- **Area 6 Phase 1:** 9.3-acres
- **Area 6 Phase 2:** 19.1-acres
- **Area 7:** 14.0-acres
- **Area 8:** 6.3-acres

Figure 4-5: NNSWC Preferred Expansion Alternative 3.A Base Grade Plan

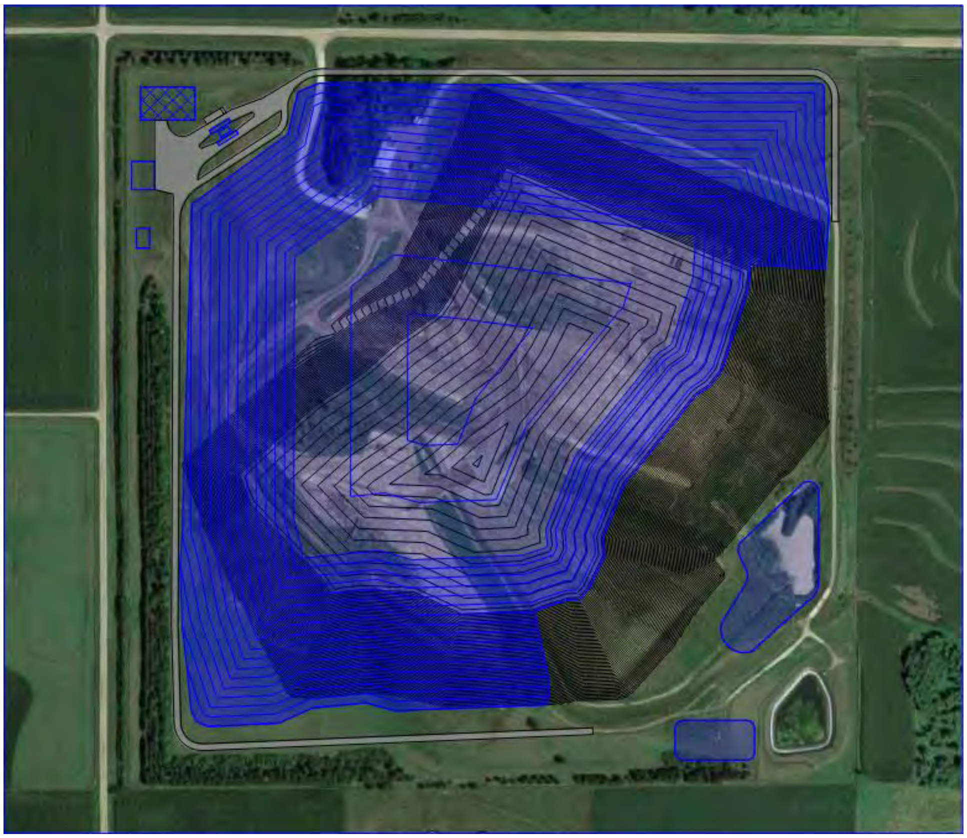


For Area 6 Phase 1-2 and Area 7, the base elevations are graded so that leachate will drain via gravity to the south and then east, connecting into the permitted leachate sewer infrastructure for Area 6. Similarly, the base elevations for Area 8 are graded so that leachate will drain via gravity to the southeast corner of the area, where it will then be pumped into the existing leachate sewer infrastructure near Area 1. Furthermore, the side slopes are graded at a 3(H):1(V) slope to match previous area construction base grades. To fully capture the horizontal expansion potential, permitting and design would need to be completed before developing Area 6 Phase 2 as significant modifications to the permitted Area 6 Phase 2 base grades are necessary. Minor modifications to the permitted Area 6 Phase 1 base grades will be submitted to the NDEE for permitting prior to Area 6 Phase 1 design and construction.

4.3.2 Final Grade Plans

The conceptual final grade plan for the Preferred Expansion Alternative 3.A is provided as Figure 2 of Appendix E. Figure 4-6 provides a snapshot of the final grades. The final grade plan incorporates a 60-feet vertical expansion from the current permitted final grades. It also considers the 3.3(H):1(V) final cover grade slope currently proposed in the 2020 Permit Modification. As provided in Figure 2, additional waste is placed over the proposed lateral landfill expansion and above the existing disposal areas to maximize the Landfill capacity. With the proposed lateral and vertical expansions, the disposal capacity of the Landfill increases by approximately 6.5 million cubic yards. This additional Landfill capacity provides the Coalition with over 25 years of additional site life as indicated in Table 4-2.

Figure 4-6: NNSWC Preferred Expansion Alternative 3.A Final Grade Plan



Landfill stability calculations prepared for the 2020 Permit Modification are provided in Appendix F. The analysis considers the proposed lateral and vertical expansion. From the slope stability report, the proposed lateral and vertical expansion is deemed to be adequate.

4.3.3 Additional Landfill Infrastructure

4.3.3.1 Leachate Conveyance Plans

As previously described in Section 4.3.1 and provided in Figure 3 in Appendix E, a gravity leachate drainage system will be implemented to provide leachate drainage for Area 6 Phase 1-2 and Area 7. For Area 7, leachate will be directed from north to south by a leachate drainage trench up to the toe of the slope of Area 7. At the toe of the slope, a leachate drainage trench will be provided that will directly tie into the leachate drainage trench designed for Area 6 Phase 2. The leachate collected from Area 7 and Area 6 Phase 2 will then be directed from west to east to the Area 6 Phase 1 sump across the south slope toe of both Area 6 Phase 1 and Phase 2 with a leachate drainage trench. Area 6 Phase 1 will have an individual leachate drainage trench running from north to south that will direct leachate into the Area 6 Phase 1 sump. The leachate collected in the Area 6 sump will connect into the existing leachate sewer infrastructure developed for Area 5 and will be transferred to the existing leachate pond.

Leachate in Area 8 will be collected along the toe of the slope adjacent to Area 1. The leachate will be directed via gravity to the Area 8 sump. Due to the topography at the northeast corner of the property, the leachate from the sump in Area 8 will be pumped into the existing leachate collection system adjacent to Area 1.

For the Preferred Expansion Alternative 3.A, it is anticipated that additional leachate holding capacity will be required. A new leachate pond is expected to be built next to the existing leachate pond at the southeast corner of the property, as shown in Figure 1 of Appendix E. Modifications to the existing leachate collection system will be provided as required to transfer leachate into either the existing or the proposed leachate ponds. Timing and estimated capital improvement costs for the proposed new leachate pond are found in Table 4-5 and Table 4-6, respectively, located in Section 4.4.

4.3.3.2 Stormwater Conveyance Plans

Stormwater will be collected and treated on-site through a series of terrace channels, letdown structures, open channels, and sedimentation basins. Precipitation that falls on the active working face and comes in contact with MSW will be managed as leachate. Precipitation that lands on intermediate and final cover soils and does not come in contact with waste will be managed as stormwater. The final cover system is designed to minimize infiltration of precipitation, control odors, provide a pleasing appearance, and provide a base for vegetation establishment. The proposed final cover contours and stormwater drainage of the Landfill expansion are provided on Figure 4 of Appendix E. The stormwater terraces will be constructed during final cover construction. Side slope terrace channels with a one-percent slope will be located at approximately 40-feet vertical increments and will drain to letdown channels that will then drain into stormwater ditches around the perimeter of the Landfill. These ditches will drain to the expanded sedimentation basin located in the southeast corner of the Landfill. Timing and estimated capital improvement costs for the proposed sedimentation basin expansion are provided in Table 4-5 and Table 4-6, respectively, located in Section 4.4.

4.3.3.3 Landfill Gas Conveyance Plans

Management of Landfill Gas (LFG) will continue in accordance with NDEE Title 129 – Nebraska Air Quality Regulations. Title 129 establishes the general air quality criteria that must be maintained and directly incorporates the federal New Source Performance Standards (NSPS) for MSW landfills (40 CFR Part 60). NSPS requires reporting of Non-Methane Organic Compounds (NMOC) emission rate annually or at five-year intervals if the estimated NMOC emission rate is below the emission rate threshold. As currently permitted, the NNSWC facility is subject to 40 CFR Part 62 Subpart OOO regulations. Based on the proposed lateral and vertical expansion, the Landfill will be subject to 40 CFR Part 60 Subpart XXX, which requires an NMOC emission rate threshold of 34 megagram per year (Mg/yr). The increase in disposal capacity and the potential tonnage received are the main drivers that impact the emissions rate model. If, at any time during the landfill operating life, the calculated NMOC emission rate exceeds the threshold defined by NSPS, the Landfill will be required to install a landfill gas collection and control system.

Per the April 2021 Tier 2 Landfill Gas Sampling & Emissions Rate Report prepared by Burns & McDonnell (2021 Tier 2 Report), the Landfill will not exceed the 34 Mg/yr threshold for the foreseeable future. A landfill gas vent system is proposed for the lateral and vertical expansion of the Landfill, which should control decomposition gases generated within the Landfill and prevent the gases from posing a hazard to adjacent properties. Figure 5 of Appendix E provides the proposed Landfill gas venting layout. The proposed system consists of approximately 109 gas vents or one gas vent per acre as currently permitted. Figure 4-7 shows the currently permitted passive gas vents. The passive gas vents are interconnected with perforated gas collection pipes in the waste below the infiltration layer to effectively collect and vent LFG. Figure 4-8 depicts a passive vertical well gas venting system. A passive vertical well gas venting system should be considered at the time of permitting the preferred expansion. A passive vertical well gas venting system has the same functionality as the passive gas vents, but this system is easier to convert to an active gas collection system, if required in the future.

Figure 4-7: Typical Passive Gas Vent Section for NNSWC Landfill Expansion

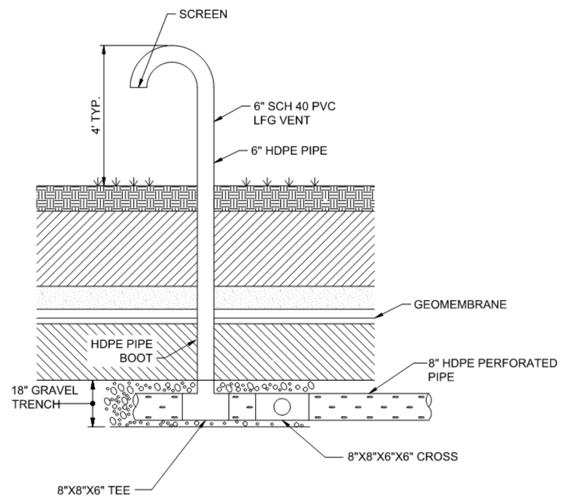
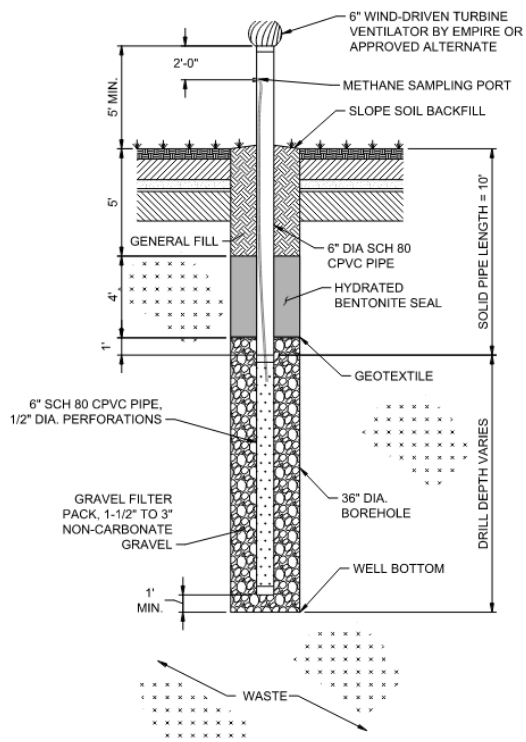


Figure 4-8: Typical Passive Vertical Well Gas Vent Section for NNSWC Landfill Expansion



A landfill gas collection and control system may alter the proposed gas venting system for the Landfill expansion and require installation of a flare station. In this occurrence, a landfill gas collection and control system will be designed and submitted for approval from NDEE. For this Plan, a preliminary flare station location for the gas collection system has been identified at the property's northwest corner and is anticipated to be required 25-30 years out.

4.3.4 Expansion Volume Capacity

The total ultimate Landfill capacity for the Preferred Expansion Alternative 3.A is approximately 18,350,000 cubic yards. The available waste and daily and intermediate cover volume is 17,530,000 cubic yards after subtracting the final cover volume and the base liner protective cover soil volume from the total ultimate capacity. The ultimate capacity represents an increase of 7,270,000 cubic yards in airspace as compared to the 2020 Permit Modification. Based on an AUF of 1,296 lb/cy, a baseline year tonnage of 112,000 tons, and a one-percent waste growth rate through closure, it is anticipated that the additional capacity for the Preferred Expansion Alternative 3.A will add approximately 27.7 years of life to the Landfill as indicated in Table 4-2.

Appendix G provides a breakdown of the Landfill life and capacity by Landfill area and includes airspace projections for three assumed scenarios previously described in Section 3.3 (no waste change, 20-percent waste decrease, and 20-percent waste increase). Table 4-3 summarizes the expected time when the proposed lateral expansion areas will need to begin receiving waste for each assumed scenario. Areas 1-5 are currently active at the Landfill and will continue to be active through the construction of Area 6 Phase 1. From the 2020 Volume Calculation Report prepared by Burns & McDonnell in April 2021 for the Coalition, the construction of Area 6 Phase 1 is expected to occur during the 2023 construction season. As shown in Table 4-3, Area 6 Phase 1 will begin receiving waste at the same time for all three scenarios. Area 6 Phase 1 will need to be constructed prior to permitting the Preferred Expansion Alternative 3.A; however, minor modifications to the current permit are recommended for the base grades of the area to accommodate the future expansion permitting effort.

Table 4-3: NNSWC Preferred Expansion Alternative 3.A Area Construction and Waste Filling Schedule

Area	Baseline: No Waste Change		Scenario 1: 20% Waste Increase		Scenario 2: 20% Waste Decrease	
	Const. Year	Active Year	Const. Year	Active Year	Const. Year	Active Year
Area 1-5	-	Active	-	Active	-	Active
Area 6 PH 1	2023	2024	2023	2024	2023	2024
Area 6 PH 2	2042	2043	2038	2039	2047	2048
Area 7	2060	2061	2054	2055	2067	2068
Area 8	2074	2075	2066	2067	2084	2085

Area construction generally occurs the year prior to commencing waste filling operations in the area. Table 4-3 also summarizes the expected construction date for the proposed Areas. The required construction time for the proposed areas should be reassessed closer to when the areas will need to be constructed. Furthermore, as can be observed in Table 4-3, if waste into the Landfill decreases, each area's expected life is extended and vice versa if waste increases. Finally, from airspace projections, the Landfill life will be depleted in 2078 for the no waste change scenario, 2070 for the 20-percent waste increase scenario, and 2088 for the 20-percent waste decrease scenario.

4.3.5 Expansion Soil Balance

The on-site soil materials available are classified as high plasticity (CH) and low plasticity (CL) clay soils per the Unified Soil Classification System. These soils are deemed adequate by the NDEE Title 132 regulations to be used for daily, intermediate, and final cover.

Appendix G provides the soil volume calculations and a breakdown of the Landfill soil projections for the proposed expansion. The primary sources of on-site soil available for use are the remaining area excavations and the stockpile area located in the northwest corner of the property. Approximately 1,839,000 cubic yards would be removed from the Landfill expansion's proposed footprint. An approximate 309,500 cubic yards of additional soil is available in the northwest stockpile area. The total on-site available soil is approximately 2,148,500 cubic yards.

Soil required for the remaining Landfill life includes daily and intermediate cover soil, final cover soil, and protective cover soil for the proposed Area 6 through Area 8 expansion. Using a 4:1 waste to soil ratio for the remaining Landfill airspace, approximately 2,648,100 cubic yards of soil are required for daily and intermediate cover. The final cover soil required, excluding the sand layer material, is approximately 493,800 cubic yards. An additional 117,900 cubic yards of soil is needed for the 12-inch protective cover soil for Area 6 through Area 8. The total soil that is required for the proposed life of the landfill is approximately 3,259,900 cubic yards. The soil balance calculations show a soil deficit of roughly 1,111,300 cubic yards. The Landfill can improve upon the soil deficit by having efficient soil usage for daily and intermediate cover operations. Ultimately, it is anticipated that the Coalition will be required to purchase new land for soil borrow or purchase and import soil to account for the soil deficit. Similarly to the airspace projection breakdown, the required soil volume calculations assume three distinct scenarios: no waste change, 20-percent waste increase, and 20-percent waste decrease. In summary, the Landfill soil will approximately be depleted in 2063 for the no waste change scenario, 2057 for the 20-percent waste increase scenario, and 2071 for the 20-percent waste decrease scenario. It is recommended that the Coalition purchase adjacent land for soil borrow operations. The timing of land acquisition needs is discussed in further detail in the Section 6.0 below.

4.3.6 Expansion Cost Assessment

The net present value cost was calculated for each area of Preferred Expansion Alternative 3.A for the Landfill. As previously mentioned, the proposed lateral expansion adds approximately 26-acres to the permitted landfill footprint, and the expected area construction dates are summarized in Table 4-3. Table 4-4 shows the cost of each of the expansion areas in 2021 dollars (2021$). The estimated costs generally consist of mobilization, area mass excavation, expansion of the groundwater collection system that lies underneath the Landfill subgrade, construction of composite Landfill liner and leachate collection systems, installation of the protective cover, and extending the leachate and groundwater conveyance piping to its respective retention basin. A budgetary cost per acre for construction is approximately $210,000 (2021$). The estimated construction costs are based on industry experience combined with information from past projects, vendors, and published sources. It is recommended that the construction costs for the proposed areas is reassessed closer to when the areas will need to be constructed.

Table 4-4: NNSWC Preferred Expansion Alternative 3.A Construction Costs

Expansion Area	Total Cost (2021$)
Area 6 PH 1	$ 2,500,000
Area 6 PH 2	$ 3,700,000
Area 7	$ 2,700,000
Area 8	$ 1,500,000

4.4 Support Facilities for Optimum Development

To maximize the disposal capacity at the Landfill, the existing scale, scale house, and equipment maintenance building facilities will require relocation to allow for the implementation of the proposed lateral expansion. The infrastructure is planned to be relocated to the northwest corner of the property, as shown in Figure 1 of Appendix E. The proposed location for the infrastructure allows for the existing property access to remain the same and will not require additional permitting from the County. Additionally, dedicated inbound and outbound scales are included with a by-pass lane located adjacent to the scales to account for increased traffic if additional Coalition members are added and waste to the Landfill increases. Meeting spaces are also incorporated into the new equipment maintenance building. These spaces will not only serve as employee breakrooms and rest areas but will also be able to be configured into educational and training facilities.

A new customer convenience drop-off area is shown in Figure 1 located in the northwest corner of the Landfill property. The drop-off area should be considered if the Coalition allows additional residential self-haulers at the Landfill as a way of separating the residential haulers from the larger commercial haulers for safety and convenience. The Landfill would oversee the hauling and dumping of the roll-offs into the Landfill's active areas once the containers are full.

The area around the scales, scale house, drop-off area, and a portion of the equipment maintenance building is planned to be paved as shown in Figure 1 in Appendix E. The remaining proposed roads outside this area shown in Figure 1 will consist of an aggregate or gravel surfacing.

Before the northwest corner of the property can be developed, the northwest soil stockpile will need to be removed from the location. Based on the soil balance calculations previously presented in Section 4.3.5 and Appendix G, the northwest corner stockpile will be depleted within approximately 10 to 15 years. This timeframe aligns with the end of the remaining life of the existing scale, scale house, and equipment maintenance building. The Landfill should begin removing and using the northwest soil stockpile as a soil borrow source following the excavation and construction of Area 6 Phase 1 to maintain the proposed development timeline of this infrastructure.

As detailed previously in Section 4.3.3.3, the 2021 Tier 2 Report was reviewed and the need for a gas collection system and flare station is not anticipated to be required in the near future. However, the emissions modeling will be impacted by the increase in disposal capacity of the Landfill and the potential increase in tonnage received. For planning purposes, Burns & McDonnell has included a flare station and a gas collection system 25 to30 years out depending on the amount of waste the Landfill receives and potential changes in NMOC emission concentrations. The flare station is proposed to be located adjacent to the relocated equipment maintenance building, as seen in Figure 1 of Appendix E. The proximity of the flare to the new equipment maintenance building will allow for easy access by Landfill personnel. Further, gas collected from the Landfill could be beneficially used as a heating source for the equipment maintenance building and scale house. The need for a gas collection system and flare station should be reevaluated following subsequent Tier 2 and Air Permit renewals.

With the proposed Landfill expansion, an off-site location for future soil borrow and soil stockpile will be required for Landfill operations as described in Section 4.3.5. From the soil balance calculations results, the Landfill is expected to require soil to be stockpiled off-site following the construction of Area 6 Phase 2 and have a soil deficit closer to the Landfill’s end of life. The need for an off-site soil stockpile location earlier in the Landfill life arises from the need to use the soil stockpiled in the northwest corner of the property to allow for the required infrastructure to be relocated. The timing of when the acquisition of land is needed is highly dependent on the waste received by the Landfill. The need for expansion into adjacent lands is discussed in detail in Section 6.0 of this report. The Coalition should consider purchasing this land ahead of time to stockpile excavated soils and utilize as a soil borrow area closer to the end of the Landfill's life.

Table 4-5 summarizes when the Landfill is expected to construct the site improvements to support the Landfill operations. As previously described, the timing of when facilities are required is dependent on the quantity of waste that is received by the Landfill. The planning level present value construction costs for the Landfill support facilities are provided in Table 4-6.

Table 4-5: NNSWC Landfill Expansion Expected Construction Timing for Support Facilities

Facility	Baseline: No Waste Change	Scenario 1: 20% Waste Increase	Scenario 2: 20% Waste Decrease
Scales (x2)			
Scale House			
Equipment Building	2033	2031	2036
Drop-Off Area			
Asphalt Pavement			
Land Acquisition[1]	2037	2033	2042
Sedimentation Basin Expansion	2042	2038	2047
Leachate Pond Addition			
Landfill Gas Flare	2046	2048	2048

[1] Dates provided require the Landfill will acquire land five years prior to needing the land.

Table 4-6: NNSWC Landfill Expansion Support Facilities Net Present Value Construction Costs

Facility	Quantity	Unit	Unit Price[1]	Subtotal
Scales (x2)	2	LS	$150,000	$300,000
Scale House	1	LS	$400,000	$400,000
Equipment Building	6,000	SF	$200	$1,200,000
Drop-Off Area	1	LS	$200,000	$200,000
Asphalt Pavement	86,200	SF	$7.00	$600,000
Land Acquisition	160	AC	$6,000	$1,000,000
Sedimentation Basin Expansion	1	LS	$250,000	$250,000
Leachate Pond Addition	1	LS	$1,000,000	$1,000,000
Landfill Gas Flare	1	LS	$1,000,000	$1,000,000

[1] Costs are provided based on Burns & McDonnell's experience with similar facilities at other landfill sites.

5.0 CELL CLOSURE AND END OF USE PLANS

Landfill area closure sequencing options were reviewed and evaluated based on the Preferred Expansion Alternative previously developed. A closure phasing plan was developed, and the closure sequencing was included in the financial models developed for this Plan.

5.1 Closure Phasing Plan

The Landfill is currently permitted to be closed in one phase. For the proposed expansion option, the Landfill could delay closure until final elevations are reached for all areas. Benefits of this option include deferral of capital construction costs, the economy of scale for closure construction, and the ability to recapture airspace in areas where waste has settled below final elevations. However, the financial assurance liability for closure costs will be more significant as this option includes the largest area of opened Landfill to close. Additionally, the probability of double handling excavated soils will increase as excavated soils will need to be stockpiled off-site and hauled back at the time of closure. Further, delaying closure will result in an overall increase in leachate generation and cost management thereof.

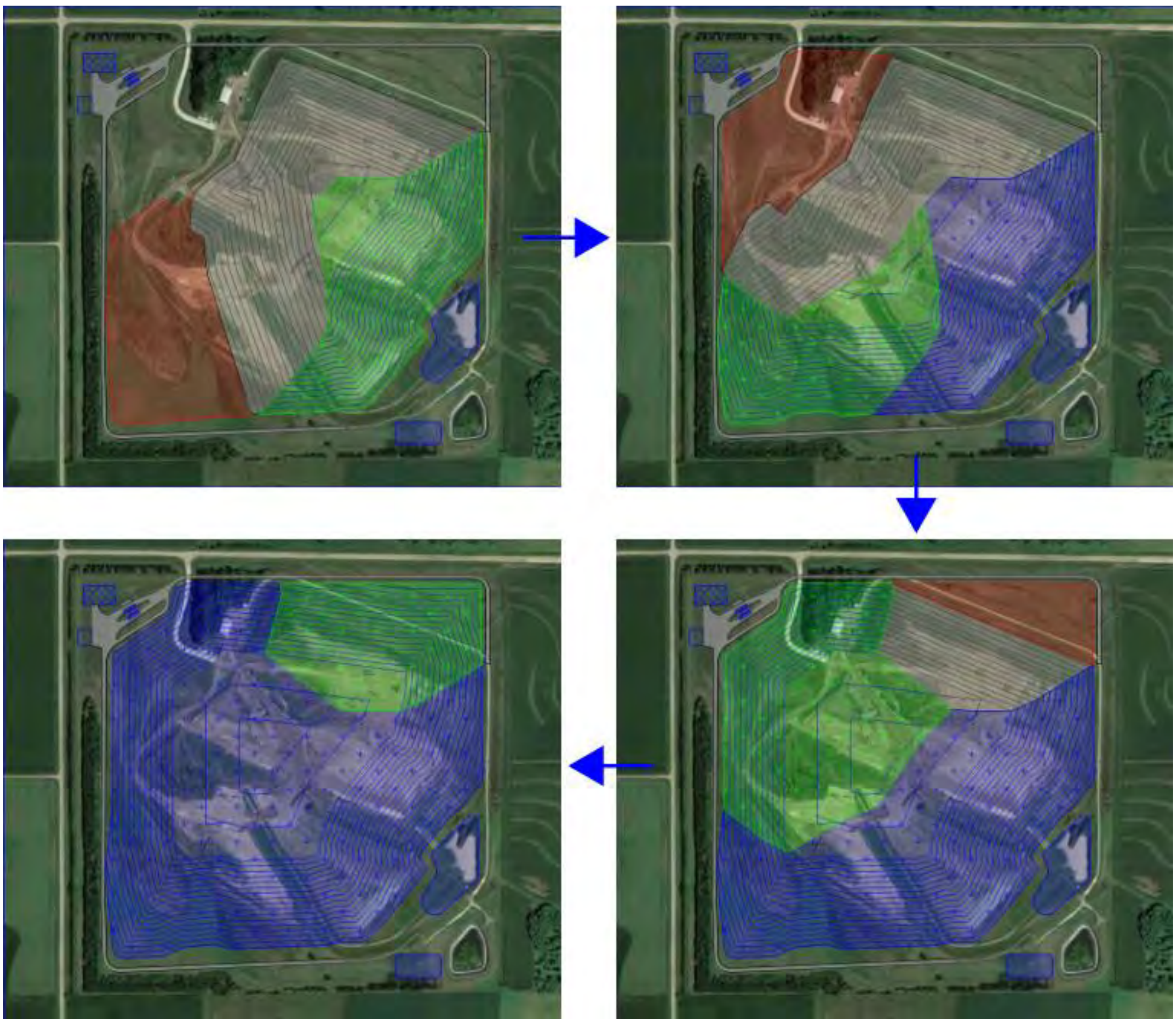
Sequencing the Landfill closure in phases where partial closures are completed as areas reach final waste elevations is recommended. Benefits of this option include reduction of final assurance closure liability as the open area of the Landfill will be reduced, closure construction projects will be manageable and more easily budgeted, and the reduction of leachate generation by capping off areas of the Landfill, thereby reducing stormwater infiltration into the waste. The main drawback with this option is differential settlement may occur as waste breaks down and if areas that have received final cover settle, the airspace cannot be recaptured. In order to mitigate this, area closures will be sequenced such that preliminary settlement should have occurred in the waste before closing the area.

Figures 1 through 4 of Appendix H show the proposed sequencing plan for the Landfill expansion. Table 5-1 provides a summary of expected area closure sequencing timing. The timing of when areas are expected to be closed is highly dependent on the amount of waste the Landfill receives. The area closures are sequenced to be constructed in-phase with new area construction, optimizing the soil usage from excavation areas and avoiding double handling of the soils. The proposed extent of area closure provided is for planning and cost purposes only and the Coalition shall revisit the full extent of the closure area closer to the time of construction. For reference, Figure 5-1 below is a summary of the proposed closure sequencing plan for the Landfill expansion.

Table 5-1: NNSWC Preferred Expansion Alternative 3.A Expected Timing of Area Closure

Closure Area	Area (Acres)	Baseline: No Waste Change	Scenario 1: 20% Waste Increase	Scenario 2: 20% Waste Decrease
Areas 1-6 PH1	26.1	2042	2038	2047
Area 6 PH 2	22.8	2060	2054	2067
Area 7	34.1	2074	2067	2084
Area 8	19.2	2078	2070	2088

Figure 5-1:NNSWC Preferred Expansion Alternative 3.A Proposed Closure Sequencing Plans



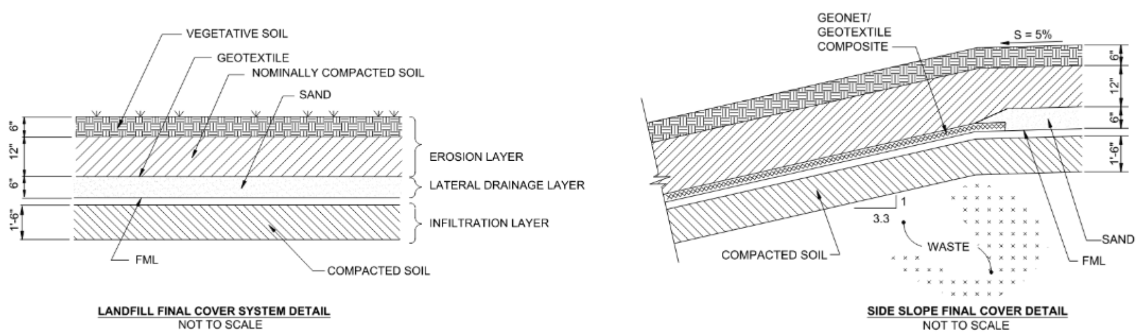
[a] Closure sequencing plans in the figure are presented in a clockwise pattern. The first closure sequence is located on the top left corner of the figure.

[b] Green shading represents proposed final cover closure, blue shading represents existing final cover, red shading represents proposed active area, and gray shading represents intermediate cover.

5.2 Alternative Final Cover System

The current permitted final cover profile consists of a compacted soil liner and geosynthetic flexible membrane liners as indicated in Figure 5-2. Geosynthetic liners add high material costs to closure when compared to soil-only caps. It is in the best interest of the Coalition to consider the implementation of an alternative earther cover system at the Landfill that has the potential to reduce final cover construction costs.

Figure 5-2: NNSWC Permitted Final Cover Profile



The following alternative final cover options were evaluated as part of this Plan:

- Infiltration Cover
- Evapotranspiration (ET) Cover

The sections that follow provide greater detail of the cover systems evaluated and a cost comparison per acre of the various construction types.

5.2.1 Infiltration Covers

The NDEE permits infiltration covers through the Research, Development, & Demonstration (RD&D) Rule (Title 132, Chapter 2, Section 14). Infiltration covers are similar to their ET cover counterparts with respect to the design approach; however, infiltration covers utilize less soil to promote controlled percolation into the waste mass. The design provides additional moisture to the waste after closure, which will generate additional usable landfill gas, promote controlled waste degradation, and afford a reduction in long-term environmental risks.

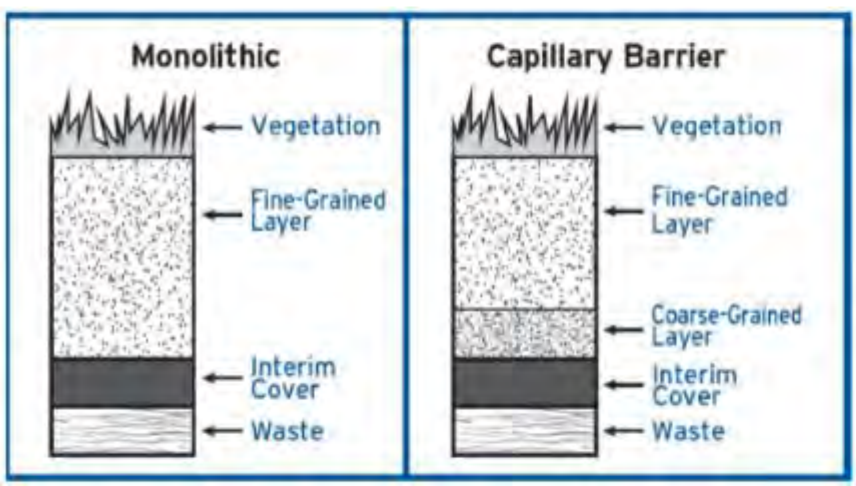
Several drawbacks are associated with permitting an infiltration cover system under the NDEE RD&D rule:

- Under the RD&D rule, the permit would be required to be renewed every three years for a period of up to 12-years. If the project goals are satisfied within the 12 years, the Coalition could then incorporate the infiltration cover as an approved final site-specific design.
- The Landfill should expect an increase in post-closure leachate quantities and associated disposal costs for an infiltration cover.

5.2.2 Evapotranspiration (ET) Covers

NDEE permits ET covers under Title 132, Chapter 3, Section 5. There are two primary types of ET alternative earthen cover systems employed in landfill caps: monolithic barrier and capillary barrier. Both types of cover systems are designed to retain water within the cover, supporting the overlying vegetation, as seen in Figure 5-3. The monolithic barrier cover system option consists of a continuous soil layer that interfaces with the pre-existing landfill intermediate cover. The capillary barrier cover system includes a granular material (sand or fine gravel) at the base of the cover system overlying the pre-existing intermediate cover. In the capillary barrier system, the difference in grain size between the soil layer and the granular material produces a capillary action whereby the soil layer holds the water until the soil's saturation point is reached. Capillary barrier systems have been shown to retain more moisture than monolithic covers of the same soil thickness and can be more economical in certain applications.

Figure 5-3: NNSWC Proposed ET Cover Designs



For comparison, a successful ET final cover system has been installed at the Sioux Falls Regional Sanitary Landfill in Sioux Falls, South Dakota. Sioux Falls also has a comparable environment with similar annual precipitation and slightly longer dormant season than that of Stanton County, Nebraska. Furthermore, the Sioux Fall Landfill has a landfill gas collection system that the ET cover system has not impaired. Therefore, this alternative cover system should be a feasible option for the NNSWC Landfill.

5.2.3 Final Cover Cost Comparison

Table 5-2 illustrates a budgetary construction cost estimate per acre of construction for various landfill cover designs. The table was composed using current regional construction costs. Final cover constructions costs can be reduced significantly for an alternative earthen landfill cover system.

Table 5-2: Cost Comparison per Acre of Construction for Various Landfill Cover Designs

Cover Design	Unit per Acre		Unit Price ($/Unit)	Price per Acre (2021$)
Infiltration Cover (RD&D Cover)				
Vegetative Cover (6" thick)	807	CY	$4.50	$3,632
Soil Cover (24" thick)	3,227	CY	$4.50	$14,522
			Total:	**$18,153**
Monolithic ET Cover				
Vegetative Cover (6" thick)	807	CY	$4.50	$3,632
Soil Cap (48" thick)	6,453	CY	$4.50	$29,039
			Total:	**$32,670**
Capillary Barrier ET Cover				
Vegetative Cover (6" thick)	807	CY	$4.50	$3,632
Soil Cap (30" thick)	4,033	CY	$4.50	$18,149
ASTM C33 Sand (6" thick)	1,089	Ton	$20.00	$21,780
			Total:	**$43,560**
Permitted Cover				
Vegetative Cover (6" thick)	807	CY	$4.50	$3,632
Erosion Layer (12" thick)	1,613	CY	$4.50	$7,259
Drainage Layer	4,840	SY	$8.00	$38,720
Geomembrane	4,840	SY	$9.00	$43,560
Compacted Soil Cap (18" thick)	2,420	CY	$4.50	$10,890
			Total:	**$104,060**

5.2.4 Closure Costs and Recommendations

A capillary barrier ET cover system is recommended for closure of the Landfill once areas reach final grades. The proposed layer thicknesses are highly dependent on the required storage capacity of the site. As shown in Table 5-2, the proposed capillary barrier ET cover will consist of 6-inches of vegetative cover, 30-inches of soil, and 6-inches of sand. The soil layers need to accommodate the design climate conditions, such as snowmelts and summer thunderstorms, or periods during which ET rates are low, or plants are dormant. A study conducted on capillary barrier ET covers at the Douglas County, Nebraska

Recycling and Disposal Facility by the Alternative Cover Assessment Program (ACAP) for the United States Environmental Protection Agency (EPA) has proven that capillary barrier ET covers work with similar environments to the NNSWC Landfill. The ACAP study, provided in Appendix I for reference, concluded that the permeability of the capillary barrier ET cover was better than that required by the NDEE with the soil layers and thicknesses that are being proposed. Furthermore, the thickness of the proposed final cover is the same as the permitted final cover and will not impact the airspace capacity and soil balance results presented in the previous sections. Additionally, the soil layer will need to be compacted to 80-percent to 90-percent density to promote the storage capacity of the soil and allow the growth of the vegetative roots. A permit modification will be required if the Coalition desires to proceed with a capillary barrier ET cover system. Prior to submitting a permit modification, the Coalition might be required to provide a test closure area and a pilot study of the proposed closure alternative to the NDEE.

In addition to the benefits detailed in the previous sections, Table 5-3 compares the proposed final cover closure costs to the permitted final cover design for the Preferred Expansion Alternative. This table considers the Capillary Barrier ET final cover construction costs from Table 5-2 and costs associated with the final grading, installation of landfill gas collection system, and stormwater drainage. Table 5-3 shows that installing a capillary barrier ET cover system will benefit the Landfill financially with a cost savings of over $6,000,000 throughout the Landfill's lifetime.

Table 5-3: NNSWC Area Cover Closure Cost Comparison

Closure Area	Permitted Cover	Capillary Barrier ET Cover	Cost Savings
Area 1-6 PH1	$4,624,817	$3,045,767	$1,579,050
Area 6 PH 2	$4,040,070	$2,660,670	$1,379,400
Area 7	$6,042,385	$3,979,335	$2,063,050
Area 8	$3,402,164	$2,240,564	$1,161,600
Total	**$18,109,436**	**$11,926,336**	**$6,183,100**

5.3 End of Use Plans

Upon the capacity of the Landfill being reached and when the final cover has been applied, short-rooted plants and/or grass are currently permitted to be planted on the remaining unvegetated areas of the facility to control erosion and create an open green space. For this Plan, incentives for a solar power project were investigated and the feasibility of processing LFG to Renewable Natural Gas (RNG) was evaluated.

5.3.1 Solar Power Incentives

A limited review of the financial incentives for developing a solar project on the final cover of the Landfill was conducted. Typically, solar farm projects in the United States cost an average of $500,000 per acre, while general revenues range between $21,250 and $42,500 per acre annually based on web data compiled in 2021. If an investment is made in solar power energy at the Landfill, the Coalition will start to see a return on investment between 12-24 years after installation. In addition to site development costs, upfront costs are necessary to tie the solar power generated into the electric grid. These additional costs can range from several hundred thousand dollars to several million dollars depending on the distance and interconnection requirements. These costs make the project cost prohibited until future infrastructure is developed or solar costs are decreased.

5.3.2 Renewable Natural Gas Feasibility Evaluation

As part of this Plan's development, the NNSWC requested that a high-level feasibility evaluation be performed to determine if using LFG to produce Renewable Natural Gas (RNG) could be an economically viable option in the future. The RNG would potentially be used for commercial purposes (sale to a gas utility for subsequent sale to their customer base as renewable natural gas) or as a transportation fuel as part of the EPA's Renewable Fuel Standards Program. Injection into a local utility pipeline was assumed to be required for both potential end markets.

The estimated total capital and operating costs for an RNG plant range from approximately $32,500,000 to $41,500,000 in 2021 dollars. The projected annual revenue in year one of operation (assumed to be 2049) is estimated at $5.5M and remains somewhat constant, assuming no change in current market prices. In the "Low" capital cost scenario, payback is possible in 7.4 years and is under 10 years for the "High" scenario, assuming 1,000 scfm of LFG is available. Based on the current estimated LFG flow rate, the estimated project payback period is greater than 10 years. The full RNG feasibility evaluation is provided in Appendix L.

The preliminary results indicate that this project has the potential to be financially beneficial for the NNSWC. Upgrading LFG to RNG has the potential to generate considerable revenue from multiple streams but will require investment in new infrastructure and ongoing operating costs. Given the volatility of the RNG market, it is in the best interest of the NNSWC to re-evaluate the development of an RNG project in three to five years.

5.3.3 Recommendation

It is recommended that the Landfill re-analyze these options closer to the end of the Landfill's life or during interim closure phases. The feasibility and cost of the proposed alternatives will vary based on the demand for the product produced and the cost of implementation.

6.0 PRELIMINARY OFF-SITE EXPANSION PLANS

A preliminary review of several 60+ year off-site expansion options using various sets of existing land data was conducted as part of this Plan. Properties off-site the existing Landfill footprint were evaluated based on NDEE and Stanton County solid waste guidelines, restrictions, and general construction feasibility. The following data sources were considered in site analysis:

- US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) digital data
- US Fish & Wildlife Service (USFWS) National Wetland Inventory (NWI) maps
- US Geological Survey (USGS) 7.5-minute topographic maps
- USGS National Hydrography Dataset digital stream and river data
- Nebraska Game and Parks Commission (NGPC) Estimated Current Ranges of Threatened and Endangered Species: List of Species by County
- USFWS Information for Planning and Consultation (IPaC) tool
- State Archeology Office of History Nebraska
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs)

A ranking of the proposed off-site Landfill expansion options was determined based on available data along with site restrictions, regulatory requirements, feasibility, and adaptability.

6.1 Adjacent Land Review and Restrictions

Location and construction of solid waste areas in the state of Nebraska are subject to the rules and regulations of NDEE Title 132 – Integrated Solid Waste Management Regulations. A summary of the NDEE regulations can be found in Table 6-1. Additionally, the proposed off-site expansion options must meet all Stanton county zoning regulations. All parcels considered for expansion are zoned as A-1 primary agricultural district by Stanton County and therefore fall under those specific zoning guidelines. A summary of Stanton County zoning restrictions pertaining to landfills can be found in Table 6-2. Per Stanton County records, all proposed properties have a single owner, which will allow for greater ease in property acquisition. See Appendix J for a summary of the adjacent property owners.

Table 6-1: Summary of NDEE Title 132, Chapter 3 Regulations for NNSWC Off-Site Expansion

Section 2.01	Site must have no detrimental effect on groundwater or surface water
Section 2.02	Application must describe soils, geology, nearby ground and surface water, and potential for pollution and leachate generation

Section 2.01	Site must have no detrimental effect on groundwater or surface water
Section 2.03	Must be 1000 feet from nearest state, interstate, and federal highway unless active area is screened
Section 2.04	Must be adequately distanced from nearby airports
Section 2.05	Cannot be placed in 100-year floodplain unless owner can demonstrate it will not restrict flows, reduce storage capacity, or result in solid waste washout.
Section 2.06	Site cannot be located in a wetland
Section 2.07	Must demonstrate site is not located in an unstable area
Section 2.08	Cannot be located less than 200 feet from a fault that has been displaced since Holocene times
Section 2.09	Cannot be located in seismic impact zone unless owner can demonstrate landfill and other structures can resist horizontal accelerations

Table 6-2: Summary of Stanton County Zoning Regulations for NNSWC Off-Site Expansion

Article 4	Site must be ¾ mile from the nearest dwelling
Article 4	Site must be 1000 feet from the nearest wellhead
Article 4	Site must be 100 feet from the nearest road centerline
Article 5	Sites can apply for conditional use permits if they do not fully meet zoning criteria

All proposed off-site expansion option sites meet the state and local criteria except for the East Expansion Option (described in greater detailed below). The East Expansion Option fails to meet NDEE Title 132, Chapter 3 Sections 2.05 and 2.06 as the proposed location is situated in an existing wetland and stretch of a 100-year floodplain. Therefore, the East Expansion Option will require additional site investigations and permitting if selected as the final option for a 60+ year expansion.

6.2 Off-Site Expansion Options

Four off-site locations adjacent to the existing Landfill have been evaluated for 60+ year expansion alternatives. All proposed off-site expansion option sites are located adjacent to the existing Landfill to provide greater airspace efficiency and utilization of existing site infrastructure, thus reducing development costs. All locations can be characterized by Non-Hydric soils of the Nora-Moody-Crofton complex, consisting of a variety of silty clay loams typical for the region (Appendix K). Clay soils are ideal for constructing landfills as they typically provide the levels of permeability required by the NDEE. For any of these sites, the permeability levels of the soils are expected to be adequate since they resemble the soils encountered at the existing Landfill. Additionally, these soils are ideal for soil borrow and stockpiling operations for current and future existing Landfill operations. Vegetation is primarily grassland with some areas of tree cover for all sites, requiring minimal site clearing before future construction. The following subsections describe the various expansion options that the project team developed for this Plan.

6.2.1 North Off-Site Expansion Option

The North Off-Site Expansion Option has a footprint of approximately 71-acres and an estimated maximum capacity of 8.55 million cubic yards of waste. The estimated lifespan of this option is shown in Table 6-3. The property is located directly north of the existing Landfill and across a county road, which will require new landfill infrastructure to be developed. Figure 6-1 shows a preliminary landfill infrastructure layout and a final grading plan. The final cover is graded at a 4(H):1(V) slope, and the proposed final crest elevation is at 1790 feet above mean sea level with a five-percent slope crown to allow for adequate runoff and drainage. The topography of the site slopes towards the northeast portion of the parcel, making it the ideal location for a leachate pond and a sedimentation basin. However, a small section of a riverine habitat also runs through the northeast portion of the parcel. This environmental constraint can be mitigated by placing the sedimentation basin and leachate pond an adequate distance away from the riverine habitat or by rerouting the habitat around the sedimentation basin and leachate ponds.

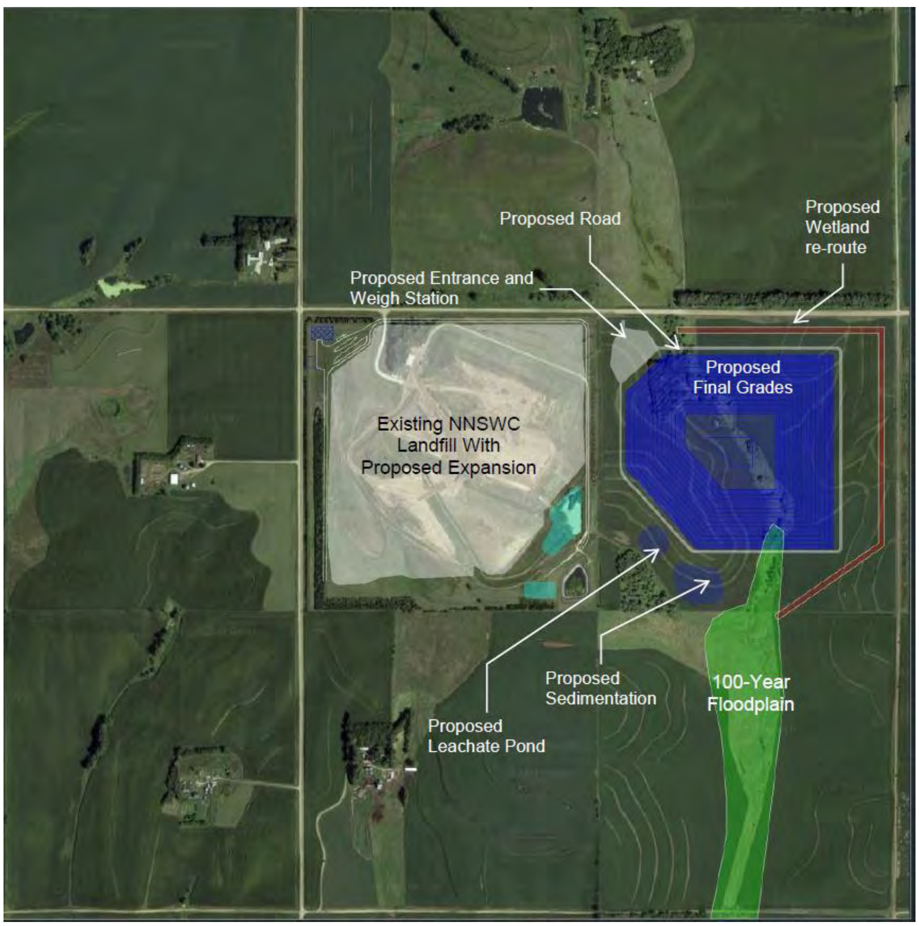
Figure 6-1: Proposed NNSWC North Off-Site Expansion Option Infrastructure Layout and Grading Plan

6.2.2 East Off-Site Expansion Option

The East Off-Site Expansion Option has a footprint of 65-acres and an estimated maximum capacity of 8.70 million cubic yards of waste. The estimated lifespan of this option is presented in Table 6-3. It is located on an adjacent parcel of land directly east of the existing Landfill, providing the Coalition the opportunity to utilize some existing infrastructure. If the Coalition desires, a new weigh station can be placed on the northwest corner of the property. The site's topography features the lowest elevations running north to south through the center of the property, sloping upwards to the east and west on each respective side. This low elevation area includes an emergent wetland habitat running north to south through the property and a portion of a 100-year floodplain in the southern region. Mitigation options for the wetland and floodplain include rerouting the wetland around the proposed expansion site and modifying the floodplain to maintain the storage capacity. As explained for the South Off-Site Expansion Option below, piggybacking from the existing Landfill could be considered for this option but is not recommended since it will interfere with the existing leachate management infrastructure already developed on the east side of the existing Landfill.

Additionally, a sedimentation basin and leachate pond will need to be situated outside of the wetland and floodplain, which would make the southwest portion of the parcel the most suitable location. Due to these environmental restrictions, additional investigation and permitting will be required for this expansion option. Figure 6-2 presents a preliminary landfill infrastructure layout and a final grading plan, with the final cover graded with 4(H):1(V) slopes. The proposed final crest elevation is 1770 feet above mean sea level with a five-percent slope crown to allow for runoff and drainage.

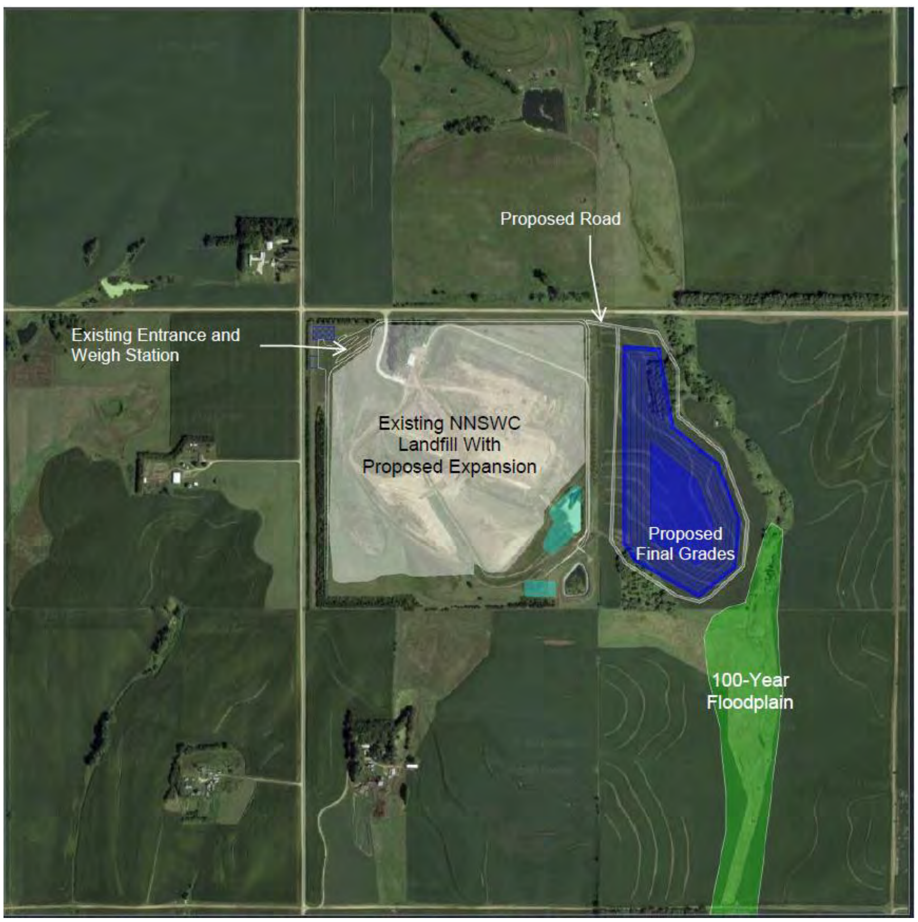
Figure 6-2: Proposed NNSWC East Off-Site Expansion Option Infrastructure Layout and Final Grading Plan



6.2.3 East Alternative Off-Site Expansion Option

Considering the restrictions posed by the wetland and 100-year floodplain for the East Off-Site Expansion Option, an alternative design could be considered that avoids interference with both the wetland and the floodplain. The East Alternative Off-Site Expansion Option has a footprint of 34-acres and an estimated maximum capacity of 1.18 million cubic yards of waste. With a smaller footprint, this option will need to use the existing Landfill infrastructure to optimize the site use. A preliminary landfill infrastructure layout and a final cover plan are shown in Figure 6-3, and the estimated lifespan is presented in Table 6-3. The proposed final crest elevation is 1690 feet above mean sea level with a five-percent slope crown to allow for adequate runoff and drainage. The volume and expected lifespan of the East Alternative Off-Site Expansion Option are significantly less than the other expansion options. Lastly, as explained for the East Off-Site Expansion Option, piggybacking from the existing Landfill could be considered for this option but is not recommended since it will interfere with the existing leachate management infrastructure on the east side of the Landfill.

Figure 6-3: Proposed NNSWC East Alternative Off-Site Expansion Option Infrastructure Layout and Grading Plan



6.2.4 South Off-Site Expansion Option

The South Off-Site Expansion Option has a footprint of approximately 118-acres and an estimated maximum capacity of 17.52 million cubic yards of waste. The estimated lifespan of this option is shown in Table 6-3. This proposed expansion option is adjacent to the existing Landfill and can utilize the current Landfill entrance and weigh station to maximize the Landfill capacity. Additionally, the South Off-Site Expansion Option's proposed design will tie into and piggyback from the existing Landfill, maximizing the lifespan and airspace capacity of the option. The topography features low elevations in the northeast and southwest portions of the property. This makes the northeast corner of the property ideal for siting of the sedimentation basin and leachate pond as they will also be adjacent to the existing ponds. A drawback to this option includes a small section of a riverine habitat located in the northeast portion of the property. Proper placement of the sedimentation basin and leachate pond can mitigate the riverine habitat. Additionally, dwellings on and around the property can pose a challenge. A dwelling directly on the property can cause the land to be more expensive at the time of purchase, and a dwelling directly to the west of the property might impact permitting of the site. This can be mitigated by adding additional trees on the west side of the new landfill property to block the landfill view from the adjacent dwelling. Figure 6-4 shows a preliminary landfill infrastructure layout and a final grading plan. The final cover plan is graded with 3.3(H):1(V) slopes to match the 2020 Permit Modification slopes. The proposed final crest elevation is 1840 feet above mean sea level with a five-percent slope crown to allow for runoff and draining.

Figure 6-4: Proposed NNSWC South Off-Site Expansion Option Infrastructure Layout and Grading Plan

6.2.5 West Off-Site Expansion Option

The West Off-Site Expansion Option has a footprint of approximately 81-acres and an estimated maximum capacity of 11.99 million cubic yards of waste. The estimated lifespan of the expansion is in Table 6-3. A preliminary landfill infrastructure layout and a final cover plan are presented in Figure 6-5, with the final cover graded with a 4(H):1(V) slope. The proposed final crest elevation is at 1840 feet above mean sea level with a five-percent slope crown to allow for adequate runoff and drainage. The new landfill site is located across the road from the existing landfill, requiring new infrastructure to be developed. From the figure, the new infrastructure is proposed to be located on the northeast corner of the property with a sedimentation basin and leachate pond placed at a low elevation area in the southeast corner of the property. A small portion of a pond and riverine habitat is located along the northern border of the property. The placement of the landfill should be adequately distanced away from the existing pond and riverine habitat. Similar to the South Off-Site Expansion Option, a dwelling is situated on the property potentially causing the land to be more expensive at the time of purchase, and nearby dwellings are directly north and south of this option posing a challenge at the time of permitting the landfill. This can be mitigated by planting trees along the property boundary to block the view of the Landfill.

Figure 6-5: Proposed NNSWC West Off-Site Expansion Option Infrastructure Layout and Grading Plan

6.3 Landfill Capacity Calculations

Five options for potential off-site expansion outside the current Landfill footprint were reviewed. A summary of each option's available airspace capacity and expansion life is presented in Table 6-3. The Landfill airspace capacity was calculated using the proposed off-site expansion options estimated volumes from the approximate base and final grades generated within AutoCAD Civil3D. The expansion life was then calculated based on current disposal rates and Landfill densities. Table 6-3 shows that the North, East, and West Off-Site Expansion Options have comparable available airspace while the South Off-Site Expansion Option provides the Coalition with the most airspace capacity. The East Alternative Off-Site Expansion Option has the least amount of airspace available.

Table 6-3: Proposed NNSWC Off-Site Expansion Lifespan Estimates

Options	Estimated Available Airspace (CY)	Additional Expansion Life (yrs)[a]
North	8,549,000	26.0
East	8,696,000	26.4
East Alternative	1,180,000	4.8
South	17,521,000	46.9
West	11,994,000	34.6

[a] Off-Site Landfill Expansion life estimates assume a present annualized tonnage of 112,000 tons with a predicted future generation growth of one-percent. At the time the Baseline Landfill expansion capacity is depleted in 2078, the annualized tonnage is estimated to be 196,000 tons; this value is the starting point for expansion life calculations.

6.4 Recommended Expansion Option

A ranked summary of all the proposed off-site expansion options in order of most to least preferred is provided in Table 6-4 below. Development costs are not associated with these rankings. The only cost considered for this analysis was the average land acquisition cost detailed in Section 4.4.

Table 6-4: Summary of Advantages and Disadvantages for the Proposed Off-Site Expansion Options for the NNSWC Landfill

Rank	Option	Advantages	Disadvantages
1	South	• Highest estimated lifespan • Adjacent to existing Landfill • Ability to piggyback on existing Landfill • Ability to utilize existing Landfill infrastructure	• Nearby dwelling directly to the west • Potentially more expensive land because of a dwelling on the property • Small riverine habitat on the northeast corner of the property
2	West	• Second highest estimated lifespan	• Across the road from existing Landfill requiring new Landfill infrastructure • Nearby dwelling directly north and south • Potentially more expensive land because of a dwelling on the property • Pond riverine habitat in the northwest corner of the site

Rank	Option	Advantages	Disadvantages
3	North	• Ideal topography for gravity leachate drainage • Similar capacity to the West and East Options	• Across the road from existing Landfill requiring new Landfill infrastructure • Riverine habitat in the northeast corner of the site
4	East	• Adjacent to existing Landfill • Ability to utilizes existing Landfill infrastructure	• Numerous environmental constraints • 100-yr floodplain and wetland running directly through the middle of the property • Extensive permitting and mitigation efforts will be required
5	East Alternative	• Adjacent to existing Landfill • Ability to utilize existing Landfill infrastructure • Avoids wetland and floodplain issues on the property • Good source of borrow soil	• Considerably less airspace • Better suited as a soil borrow source

Based on the preliminary estimates, the preferred expansion option would be the South Off-Site Expansion Option. This option is optimal since it can maximize the airspace capacity by being incorporated into the existing landfill and by utilizing the existing landfill infrastructure that has already been developed. Additionally, this site had the greatest estimated volume and lifespan and demonstrated very few siting restrictions.

7.0 BYLAWS AND AGREEMENT REVIEW

At the time of this final report submittal, the NNSWC Bylaws and Agreement continue to be evaluated by the NNSWC PTF and Baird Holm, the Coalition's legal council. The final updated agreement and bylaws documents will be presented to the NNSWC Board at a later date.

APPENDIX A – WASTE SHREDDING EVALUATION CALCULATIONS

BURNS McDONNELL

CLIENT: NNSWC	**MADE BY:** PRF
PROJECT: Landfill Master Plan	**CHECKED BY:** LAR
PROJECT NUMBER: 124922	**DATE:** 5/28/21

Shredder Costs: (*from Attachment 1*)			
Estimated Owning Costs		$ 160.00	per Hour
Estimated O&M Costs		$ 110.00	per Hour
Annual Usage (@4 hrs/day, 160 days/yr)		640	Hours
Annual Cost		$ (172,800)	per Year
Operator Costs:			
1 FTE ($55,000 base salary + 50% base salary for benefits)		$ (82,500)	per Year
Total Waste Shredding Cost (Shredder + Operator Costs)		**$ (255,300)**	**per Year**
Remaining Landfill Life:		Date Capacity is Reached	
Current AUF	1,296 lb/cy	May 1, 2078	*Attachment 3*
Average Effective Total AUF w/ Shredder (*from Attachment 2*)	1,405 lb/cy	January 1, 2082	*Attachment 4*
Additional Life w/ Increased AUF		**3.67**	**Years**

ATTACHMENT 1 - Shredder Estimated Owning and Operating Costs

Estimated Owning and Operating Costs
Terminator 6000

GENERAL STATEMENT:

The following owning and operating cost analysis is based on reported contractor information and test runs conducted by Komptech. There will be cost variations depending upon the conditions and type of material being processed. This analysis is based on 10 years or 6,400 hours (640 hours per year).

Please note: There will be considerable value of the unit after the 10 year period. However, to ensure maximum figures for budget purposes, we have fully depreciated the equipment.

OWNING COSTS

Purchase Price:

Based on a $773,000 purchase price, amortized over 6,400 hours: **$120.78/hr.**

Interest:

Figuring 4.25% per year on a declining balance of $773,000, total interest costs will be $177,210.56, divided by 6,400 hours: **$27.69/hr.**

Insurance:

Based on a replacement value of $773,000 and an average rate of 1.00% per year, yearly insurance costs will be $7,730.00, divided by 640 hours: **$12.08/hr.**

TOTAL OWNING COSTS: $160.55/hr.

OPERATING COSTS

Maintenance:

Labor and materials for daily maintenance involving lubrication, inspection, and wear parts as listed on page 3, "Detailed Maintenance Costs": **$23.48/hr.**

Estimated Owning and Operating Costs
Terminator 6000 (Continued)

Fuel:

Fuel Consumption for the Cat C-18 (580-HP) engine is estimated at 17 gallons per hour, multiplied by the estimated cost of $3.00 per gallon:	**$51.00/hr.**
TOTAL OPERATING COSTS:	**$74.48/hr.**

SUMMARY OF OWNING AND OPERATING COSTS

Owning Costs	
1. Depreciation:	$120.78/hr.
2. Interest:	$27.69/hr.
3. Insurance:	$12.08/hr.
TOTAL OWNING COSTS:	**$160.55/hr.**

Operating Costs	
1. Maintenance:	$23.48/hr.
2. Fuel:	$51.00/hr.
TOTAL OPERATING COSTS:	**$74.48/hr.**

TOTAL OWNING AND OPERATING COSTS PER HOUR: $235.03/hr.

Prepared For: ______________________ ______________________
Name Company

Prepared By: ______________________ ______________________
Name Company

DISCLAIMER: The previous owning and operating costs are estimates only based on reported contractor information and factory test runs. These costs do not imply any absolutes or guarantees by Komptech.

Estimated Detailed Maintenance Costs
Terminator 6000

Teeth and Bolts:		
	32 Teeth @ $90.00 each, every 250 hours:	$11.52/hr.
	32 Teeth Bolts @ $13.00 each, every 250 hours:	$1.66/hr.
Counterteeth:		
	17 Counterteeth @ $420.00 each, every 2,500 hours:	$2.86/hr.
Belly Belt:		
	Belly Belt @ $4,500.00 every 3,500 hours:	$1.29/hr.
Discharge Belt:		
	Discharge Belt @ $7,000.00 every 5,000 hours:	$1.40/hr.
Labor:		
	Labor involved in changing wear parts and general maintenance @ $30.00/hour, every 40 hours:	$0.75/hr.
Engine Maintenance:		
	Approximate maintenance costs for the Cat C-18 (580-HP)	$2.00/hr.
Miscellaneous Parts:		
	Includes an estimated cost for all non-standard maintenance such as seal kits, bearings, etc.:	$2.00/hr.
TOTAL MAINTENANCE COSTS:		**$23.48/hr.**

SHREDDING

LOW-SPEED, HIGH-TORQUE WASTE SHREDDERS

Waste processors and recycling facilities today demand shredding equipment that will handle just about any material. Komptech industrial shredders are built with aggressive feed capabilities and heavy duty reversing shafts to efficiently shred the toughest materials and deliver product at the right size.

Scan this code to watch our shredders in action!

TERMINATOR

LOW-SPEED SINGLE-SHAFT SHREDDER

The Terminator is a low-speed, high-torque, single-shaft shredder designed to process nearly all types of difficult waste, including heavy contaminated C&D debris, bulky waste, white goods, mattresses, tires and municipal solid waste (MSW).

» Remote-controlled hopper with 11-foot feed opening.

» The hydraulic drum drive can reverse at any time for self-cleaning.

Continuous cutting gap adjustment enables various output particle sizes.

Full access to all maintenance points and shredding chamber.

	3400 S	6000 S
Power		
Diesel Engine / Horsepower:	CAT® C9 Tier 4F / 330 HP	CAT® C18 Tier 4F / 600 HP
Proportion *(dependent on equipment)*		
Transport Dimensions (LxWxH):	25'8" x 9'4" x 11'10" (7.8 x 2.9 x 3.6 m)	
Maximum Weight:	57,000 lbs	60,000 lbs
Performance *(dependent on material)*		
Maximum Throughput:	up to 55 tons/hr	up to 110 tons/hr

CRAMBO

LOW-SPEED DUAL-SHAFT SHREDDER

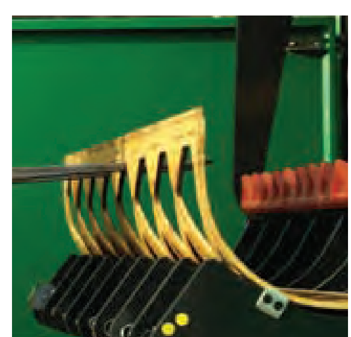
The Crambo is a dual-shaft shredder engineered to deliver high-throughput shredding of the toughest wood and organic waste materials while mixing and blending to provide a homogeneous output.

» Designed to withstand heavy contamination.

» Low maintenance, fuel consumption and operating costs.

	3400	6000
Power		
Diesel Engine / Horsepower:	CAT® C9 Tier 4F / 330 HP	CAT® C18 Tier 4F / 600 HP
Proportion *(dependent on equipment)*		
Transport Dimensions (LxWxH):	25' x 9'4" x 11'2" (7.5 x 2.9 x 3.4 m)	
Maximum Weight:	54,000 lbs	58,000 lbs
Performance *(dependent on material)*		
Maximum Throughput:	up to 50 tons/hr	up to 110 tons/hr

Counter rotating drums with overload protection and auto reverse function.



Easy sizing with quick screen basket changes. Output sizes from 2" to 24".

ATTACHMENT 2
Northeast Nebraska Solid Waste Coalition
Waste Shredding Evaluation

5/28/2021
by:PRF
ck:LAR

MSW/Industrial Tonnage (Assumed) =	112,000	tons
Predicted Future Generation Growth =	1.00%	
Current Airspace Utilization Factor (AUF) =	1,296	lb/cy
Assumed AUF Increase w/ Waste Shredding =	300	lb/cy
Estimated Waste Shredding AUF =	1,600	lb/cy
Shredder Capacity =	52,800	tons/year

assuming 75% of maximum throughput capacity of 110 tons/hr (from Attachment 1) operating @ 4 hr per day, 160 days/yar

Average Effective Total AUF = 1,405 lb/cy

Year	Total Tonnage	Effective AUF (lb/cy)
2021	112,000	1,439
2022	113,120	1,438
2023	114,251	1,436
2024	115,394	1,435
2025	116,548	1,434
2026	117,713	1,432
2027	118,890	1,431
2028	120,079	1,430
2029	121,280	1,428
2030	122,493	1,427
2031	123,718	1,426
2032	124,955	1,424
2033	126,204	1,423
2034	127,466	1,422
2035	128,741	1,421
2036	130,029	1,419
2037	131,329	1,418
2038	132,642	1,417
2039	133,969	1,416
2040	135,308	1,415
2041	136,661	1,413
2042	138,028	1,412
2043	139,408	1,411
2044	140,802	1,410
2045	142,210	1,409
2046	143,632	1,408
2047	145,069	1,407
2048	146,519	1,406
2049	147,985	1,404
2050	149,464	1,403
2051	150,959	1,402
2052	152,469	1,401
2053	153,993	1,400
2054	155,533	1,399
2055	157,089	1,398
2056	158,660	1,397
2057	160,246	1,396
2058	161,849	1,395
2059	163,467	1,394
2060	165,102	1,393
2061	166,753	1,392

2062	168,420	1,391
2063	170,104	1,390
2064	171,806	1,389
2065	173,524	1,389
2066	175,259	1,388
2067	177,011	1,387
2068	178,782	1,386
2069	180,569	1,385
2070	182,375	1,384
2071	184,199	1,383
2072	186,041	1,382
2073	187,901	1,381
2074	189,780	1,381
2075	191,678	1,380
2076	193,595	1,379
2077	195,531	1,378
2078	197,486	1,377

ATTACHMENT 3 5/28/2021
Northeast Nebraska Solid Waste Coalition by:PRF
Waste Shredding Evaluation ck:LAR
Remaining Airspace Projections w/ Expansion - Current AUF = 1,296 lb/cy

MSW/Industrial Tonnage (Assumed) =	112,000	tons
Predicted Future Generation Growth =	1.00%	
Airspace Utilization Factor (AUF) =	1,296	lb/cy
Ultimate Capacity without final cover and protective soil layer (waste + soil) =	17,530,000	cy

Remaining Area Capacity	
Area 1/2/3/4/5	2,210,000
Area 6 PH 1	2,060,000
Area 6 PH 2	4,180,000
Area 7	3,900,000
Area 8	970,000
Total	13,320,000

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (cy)	Waste Remaining Expansion Ultimate Capacity (cy)	Year End Remaining Cell Capacity	Active Area
2021	112,000	172,840	13,147,160	2,037,160	Area 1/2/3/4/5
2022	113,120	174,568	12,972,593	1,862,593	
2023	114,251	176,314	12,796,279	1,686,279	
2024	115,394	178,077	12,618,202	3,568,202	Area 6 PH 1
2025	116,548	179,857	12,438,345	3,388,345	
2026	117,713	181,656	12,256,689	3,206,689	
2027	118,890	183,473	12,073,216	3,023,216	
2028	120,079	185,307	11,887,909	2,837,909	
2029	121,280	187,160	11,700,748	2,650,748	
2030	122,493	189,032	11,511,716	2,461,716	
2031	123,718	190,922	11,320,794	2,270,794	
2032	124,955	192,832	11,127,962	2,077,962	
2033	126,204	194,760	10,933,203	1,883,203	
2034	127,466	196,707	10,736,495	1,686,495	
2035	128,741	198,675	10,537,821	1,487,821	
2036	130,029	200,661	10,337,159	1,287,159	
2037	131,329	202,668	10,134,491	1,084,491	
2038	132,642	204,695	9,929,797	879,797	
2039	133,969	206,742	9,723,055	673,055	
2040	135,308	208,809	9,514,246	464,246	
2041	136,661	210,897	9,303,349	253,349	
2042	138,028	213,006	9,090,343	40,343	
2043	139,408	215,136	8,875,207	4,005,207	Area 6 PH 2
2044	140,802	217,287	8,657,920	3,787,920	
2045	142,210	219,460	8,438,459	3,568,459	
2046	143,632	221,655	8,216,804	3,346,804	
2047	145,069	223,871	7,992,933	3,122,933	
2048	146,519	226,110	7,766,823	2,896,823	
2049	147,985	228,371	7,538,452	2,668,452	
2050	149,464	230,655	7,307,797	2,437,797	
2051	150,959	232,962	7,074,835	2,204,835	
2052	152,469	235,291	6,839,544	1,969,544	
2053	153,993	237,644	6,601,900	1,731,900	
2054	155,533	240,021	6,361,879	1,491,879	
2055	157,089	242,421	6,119,459	1,249,459	
2056	158,660	244,845	5,874,614	1,004,614	
2057	160,246	247,293	5,627,320	757,320	
2058	161,849	249,766	5,377,554	507,554	
2059	163,467	252,264	5,125,290	255,290	
2060	165,102	254,787	4,870,503	503	
2061	166,753	257,334	4,613,169	3,643,169	Area 7
2062	168,420	259,908	4,353,261	3,383,261	
2063	170,104	262,507	4,090,754	3,120,754	
2064	171,806	265,132	3,825,622	2,855,622	

2065	173,524	267,783	3,557,839	2,587,839	
2066	175,259	270,461	3,287,378	2,317,378	
2067	177,011	273,166	3,014,212	2,044,212	
2068	178,782	275,897	2,738,315	1,768,315	
2069	180,569	278,656	2,459,658	1,489,658	
2070	182,375	281,443	2,178,215	1,208,215	
2071	184,199	284,257	1,893,958	923,958	
2072	186,041	287,100	1,606,858	636,858	
2073	187,901	289,971	1,316,887	346,887	
2074	189,780	292,871	1,024,017	54,017	
2075	191,678	295,799	728,217	728,217	Area 8
2076	193,595	298,757	429,460	429,460	
2077	195,531	301,745	127,715	127,715	
2078	197,486	304,762	-177,047	-177,047	Life Depleted May 2078
2079	199,461	307,810	-484,857	-484,857	
2080	201,455	310,888	-795,745	-795,745	

ATTACHMENT 4 5/28/2021
Northeast Nebraska Solid Waste Coalition by:PRF
Waste Shredding Evaluation ck:LAR
Remaining Airspace Projections w/ Expansion - Average Effective Total AUF = 1,405 lb/cy

MSW/Industrial Tonnage (Assumed) =	112,000	tons
Predicted Future Generation Growth =	1.00%	
Average Effective Total AUF =	1,405	lb/cy
Ultimate Capacity without final cover and protective soil layer (waste + soil) =	17,530,000	cy

Remaining Area Capacity	
Area 1/2/3/4/5	2,210,000
Area 6 PH 1	2,060,000
Area 6 PH 2	4,180,000
Area 7	3,900,000
Area 8	970,000
Total	13,320,000

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (cy)	Waste Remaining Expansion Ultimate Capacity (cy)	Year End Remaining Cell Capacity
2021	112,000	159,382	13,160,618	13,160,618
2022	113,120	160,976	12,999,643	12,999,643
2023	114,251	162,585	12,837,057	12,837,057
2024	115,394	164,211	12,672,846	12,672,846
2025	116,548	165,853	12,506,993	12,506,993
2026	117,713	167,512	12,339,481	12,339,481
2027	118,890	169,187	12,170,294	12,170,294
2028	120,079	170,879	11,999,415	11,999,415
2029	121,280	172,588	11,826,828	11,826,828
2030	122,493	174,313	11,652,514	11,652,514
2031	123,718	176,057	11,476,458	11,476,458
2032	124,955	177,817	11,298,640	11,298,640
2033	126,204	179,595	11,119,045	11,119,045
2034	127,466	181,391	10,937,654	10,937,654
2035	128,741	183,205	10,754,449	10,754,449
2036	130,029	185,037	10,569,411	10,569,411
2037	131,329	186,888	10,382,524	10,382,524
2038	132,642	188,757	10,193,767	10,193,767
2039	133,969	190,644	10,003,123	10,003,123
2040	135,308	192,551	9,810,573	9,810,573
2041	136,661	194,476	9,616,097	9,616,097
2042	138,028	196,421	9,419,676	9,419,676
2043	139,408	198,385	9,221,291	9,221,291
2044	140,802	200,369	9,020,922	9,020,922
2045	142,210	202,373	8,818,549	8,818,549
2046	143,632	204,396	8,614,153	8,614,153
2047	145,069	206,440	8,407,713	8,407,713
2048	146,519	208,505	8,199,208	8,199,208
2049	147,985	210,590	7,988,619	7,988,619
2050	149,464	212,696	7,775,923	7,775,923
2051	150,959	214,823	7,561,100	7,561,100
2052	152,469	216,971	7,344,130	7,344,130
2053	153,993	219,140	7,124,989	7,124,989
2054	155,533	221,332	6,903,657	6,903,657
2055	157,089	223,545	6,680,112	6,680,112
2056	158,660	225,781	6,454,332	6,454,332
2057	160,246	228,038	6,226,293	6,226,293
2058	161,849	230,319	5,995,974	5,995,974
2059	163,467	232,622	5,763,352	5,763,352
2060	165,102	234,948	5,528,404	5,528,404
2061	166,753	237,298	5,291,106	5,291,106
2062	168,420	239,671	5,051,436	5,051,436
2063	170,104	242,067	4,809,368	4,809,368
2064	171,806	244,488	4,564,880	4,564,880
2065	173,524	246,933	4,317,947	4,317,947

2066	175,259	249,402	4,068,545	4,068,545	
2067	177,011	251,896	3,816,649	3,816,649	
2068	178,782	254,415	3,562,233	3,562,233	
2069	180,569	256,959	3,305,274	3,305,274	
2070	182,375	259,529	3,045,745	3,045,745	
2071	184,199	262,124	2,783,621	2,783,621	
2072	186,041	264,746	2,518,875	2,518,875	
2073	187,901	267,393	2,251,482	2,251,482	
2074	189,780	270,067	1,981,415	1,981,415	
2075	191,678	272,768	1,708,648	1,708,648	
2076	193,595	275,495	1,433,152	1,433,152	
2077	195,531	278,250	1,154,902	1,154,902	
2078	197,486	281,033	873,869	873,869	Life Depleted May 2078 w/ AUF = 1,296 lb/cy
2079	199,461	283,843	590,026	590,026	
2080	201,455	286,681	303,345	303,345	
2081	203,470	289,548	13,796	13,796	
2082	205,505	292,444	-278,647	-278,647	Life Depleted January 2082 w/ AUF = 1,405 lb/cy
2083	207,560	295,368	-574,016	-574,016	
2084	209,635	298,322	-872,337	-872,337	
2085	211,732	301,305	-1,173,643	-1,173,643	

APPENDIX B – NNSWC WASTE SHREDDING FINANCIAL EVALUATION

NNSWC Financial Model - Waste Shredding Evaluation

Financial Model Inputs

Hours of Operation: M-F 7AM-4PM; Sat 7AM-12PM

Interest:	3.50%	
Inflation:	2.50%	
Current Year:	2021	
Starting Year:	2021	

WCI Operation Costs		
WCI Fixed Fee:	$ 480,000	annually
Annual Increase in Fixed Fee:	3%	
WCI Tonnage Fee:	$4	per ton
Annual Increase in Tonnage Fee:	0%	
WCI Special Waste Fee:	$10.50	per ton
Annual Increase in Special Waste Fee:	0%	
2020 Annual Tonnage (assumed):	112,000	tons
2020 Special Waste Tonnage (assumed):	50	tons
Annual Tonnage Increase:	1%	per year

Coalition Operation Costs		
Personnel Costs	$ 94,734	
Operating & Maintenance Costs	$ 30,577	
Other Admin. and Overhead	$ 22,455	
Other Misc.	$ 10,000	
FA Fund Transfers	$ 350,000	***Covers Closure & Post-Closure Care Costs***
Professional Services	$ 250,000	Annual Average
Total Coalition Costs:	**$ (758,000)**	2021$

NNSWC Revenue Analysis - Baseline

Interest:	3.50%		[input from "operation inputs"]
Inflation:	2.50%		[input from "operation inputs"]
Current Year:	2021		[input from "operation inputs"]
WCI Operation Costs			
WCI Fixed Fee:	$ 480,000	annually	[input from "operation inputs"]
Annual Increase in Fixed Fee:	3.0%		[input from "operation inputs"]
WCI Tonnage Fee:	$4	per ton	[input from "operation inputs"]
Annual Increase in Tonnage Fee:	0%		[input from "operation inputs"]
WCI Special Waste Fee:	$10.50	per ton	[input from "operation inputs"]
Annual Increase in Special Waste Fee:	0%		[input from "operation inputs"]
2020 Annual Tonnage (assumed):	112,000	tons	[input from "operation inputs"]
2020 Special Waste Tonnage (assumed):	50	tons	[input from "operation inputs"]
Annual Tonnage Increase:	1%	per year	[input from "operation inputs"]
Starting Year:	2021		[input from "operation inputs"]
Coalition Operating Costs			
Personnel Costs	$ 94,734		[input from "operation inputs"]
Operating & Maintenance Costs	$ 30,577		[input from "operation inputs"]
Other Admin. and Overhead	$ 22,455		[input from "operation inputs"]
Other Misc.	$ 10,000		[input from "operation inputs"]
FA Fund Transfers	$ 350,000		[input from "operation inputs"]
Professional Services	$ 250,000		[input from "operation inputs"]
Total Coalition Costs:	**$ (758,000)**		

Capital Costs

	PV Cost	Execution Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Cell 6 Ph 1 Engineering	$ 200,000	2022	$ 250,000	$ 205,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 Construction	$ 2,500,000	2023	$ -	$ -	$ 2,626,570	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 CA	$ 250,000	2023	$ -	$ -	$ 262,660	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scales	$ 300,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scale House	$ 400,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Equipment Building	$ 1,200,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Drop-Off Area	$ 200,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Asphalt Pavement	$ 600,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Land Acquisition	$ 1,000,000	2037	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Engineering	$ 200,000	2041	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Construction	$ 3,700,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 CA	$ 370,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 1-6 Ph 1 Closure*	$ 3,100,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Sedimentation Basin	$ 250,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Leachate Pond	$ 1,000,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Landfill Gas Flare	$ 1,000,000	2046	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Engineering	$ 200,000	2059	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Construction	$ 2,700,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 CA	$ 270,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Closure*	$ 2,700,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Engineering	$ 200,000	2073	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Construction	$ 1,500,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 CA	$ 200,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Closure*	$ 4,000,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Ph 2 Closure*	$ 2,300,000	2078	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Insert Row Above Here			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Total CIP	**$ 250,000**	**$ 205,000**	**$ 2,889,230**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Revenues

	2020 Rates	% Increase/ Decrease	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annual Tonnage	112,000	1%	112,000	113,120	114,251	115,394	116,548	117,713	118,890	120,079	121,280	122,493	123,718
Tipping Fee	$ 24.00	0%	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
		Total Revenues	**$ 2,688,000**	**$ 2,714,880**	**$ 2,742,029**	**$ 2,769,449**	**$ 2,797,144**	**$ 2,825,115**	**$ 2,853,366**	**$ 2,881,900**	**$ 2,910,719**	**$ 2,939,826**	**$ 2,969,224**

*Closure cost to be funded via FA funds

2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 403,470	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 537,960	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 1,613,870	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 268,980	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 806,940	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ 1,484,510	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 327,730	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,214,460	$ -	$ -	$ -	$ -	$ -	$ -
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$ -	**$ 3,631,220**	**$ -**	**$ -**	**$ -**	**$ 1,484,510**	**$ -**	**$ -**	**$ -**	**$ 327,730**	**$ 8,935,400**	**$ -**	**$ -**	**$ -**	**$ 1,853,950**	**$ -**	**$ -**

2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
124,955	126,204	127,466	128,741	130,029	131,329	132,642	133,969	135,308	136,661	138,028	139,408	140,802	142,210	143,632	145,069	146,519
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 2,998,917	**$ 3,028,906**	**$ 3,059,195**	**$ 3,089,787**	**$ 3,120,685**	**$ 3,151,891**	**$ 3,183,410**	**$ 3,215,244**	**$ 3,247,397**	**$ 3,279,871**	**$ 3,312,670**	**$ 3,345,796**	**$ 3,379,254**	**$ 3,413,047**	**$ 3,447,177**	**$ 3,481,649**	**$ 3,516,465**

2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
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2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
147,985	149,464	150,959	152,469	153,993	155,533	157,089	158,660	160,246	161,849	163,467	165,102	166,753	168,420	170,104	171,806	173,524
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 3,551,630	**$ 3,587,146**	**$ 3,623,018**	**$ 3,659,248**	**$ 3,695,841**	**$ 3,732,799**	**$ 3,770,127**	**$ 3,807,828**	**$ 3,845,906**	**$ 3,884,366**	**$ 3,923,209**	**$ 3,962,441**	**$ 4,002,066**	**$ 4,042,086**	**$ 4,082,507**	**$ 4,123,332**	**$ 4,164,566**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
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$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 722,230	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,552,090	$ -	$ -	$ -	$ -
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2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
175,259	177,011	178,782	180,569	182,375	184,199	186,041	187,901	189,780	191,678	193,595	195,531	197,486
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 4,206,211	**$ 4,248,273**	**$ 4,290,756**	**$ 4,333,664**	**$ 4,377,000**	**$ 4,420,770**	**$ 4,464,978**	**$ 4,509,628**	**$ 4,554,724**	**$ 4,600,271**	**$ 4,646,274**	**$ 4,692,737**	**$ 4,739,664**

NNSWC Revenue Analysis - Baseline

Beginning Balance:	$ 7,000,000
Interest:	3.50%
Inflation:	2.50%
Investment APR:	2.00%
Starting Year:	2021

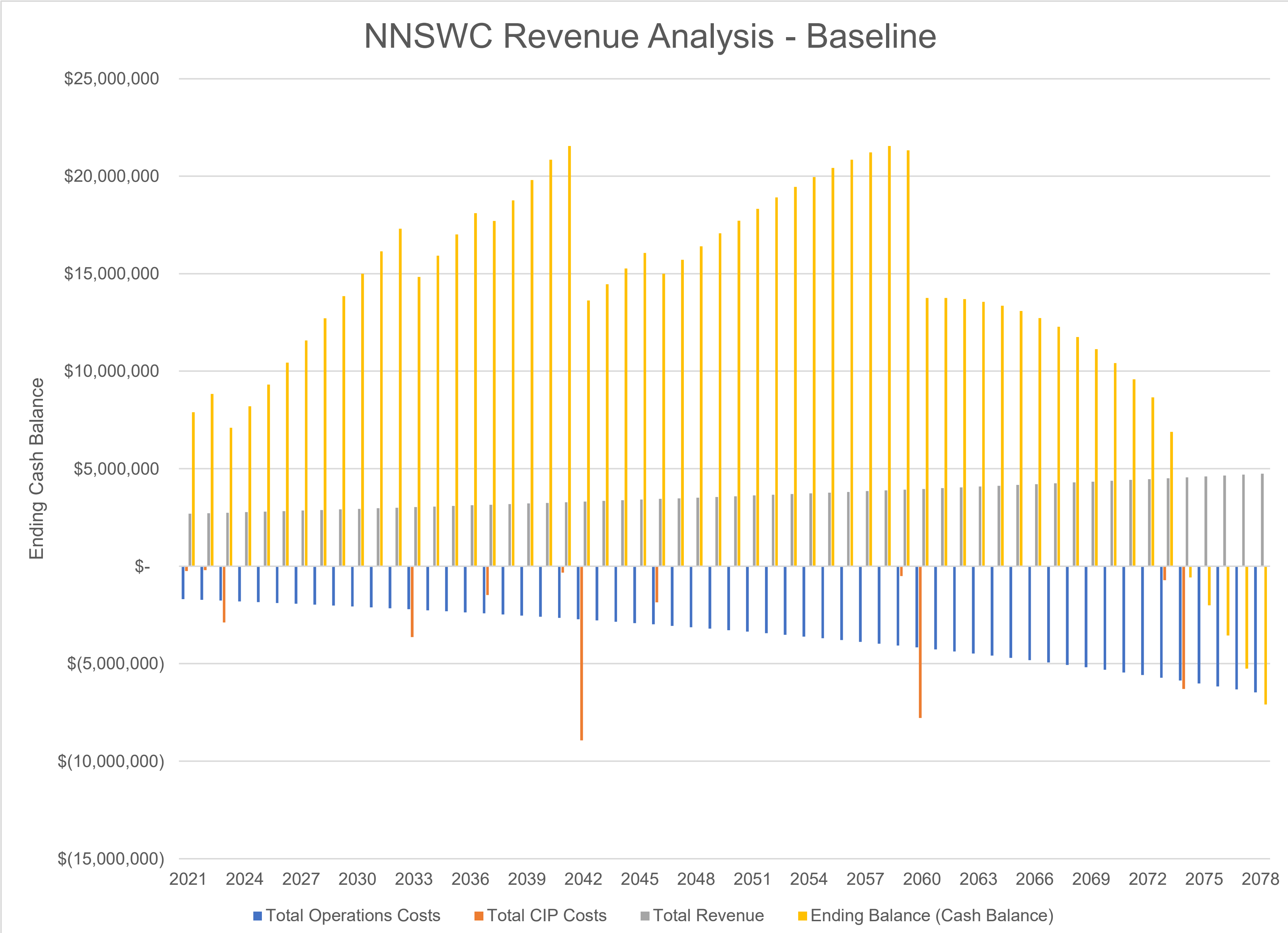
ProForma

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual Tonnages	112,000	113,120	114,251	115,394	116,548	117,713	118,890	120,079	121,280	122,493	123,718	124,955	126,204	127,466
Fixed Fee	$ 480,000	$ 494,400	$ 509,232	$ 524,509	$ 540,244	$ 556,452	$ 573,145	$ 590,339	$ 608,050	$ 626,291	$ 645,080	$ 664,432	$ 684,365	$ 704,896
Tonnage Fee	$ 448,000	$ 452,480	$ 457,005	$ 461,575	$ 466,191	$ 470,853	$ 475,561	$ 480,317	$ 485,120	$ 489,971	$ 494,871	$ 499,819	$ 504,818	$ 509,866
Special Waste Fee	$ 525	$ 530	$ 536	$ 541	$ 546	$ 552	$ 557	$ 563	$ 568	$ 574	$ 580	$ 586	$ 592	$ 597
Total WCI Operations Costs	**$ (928,525)**	**$ (947,410)**	**$ (966,772)**	**$ (986,625)**	**$ (1,006,981)**	**$ (1,027,856)**	**$ (1,049,263)**	**$ (1,071,219)**	**$ (1,093,738)**	**$ (1,116,836)**	**$ (1,140,531)**	**$ (1,164,837)**	**$ (1,189,774)**	**$ (1,215,359)**
Total Coalition Operating Costs	**$ (758,000)**	**$ (776,950)**	**$ (796,374)**	**$ (816,283)**	**$ (836,690)**	**$ (857,607)**	**$ (879,048)**	**$ (901,024)**	**$ (923,549)**	**$ (946,638)**	**$ (970,304)**	**$ (994,562)**	**$ (1,019,426)**	**$ (1,044,911)**
Total Operations Costs	**$ (1,686,525)**	**$ (1,724,360)**	**$ (1,763,146)**	**$ (1,802,908)**	**$ (1,843,671)**	**$ (1,885,463)**	**$ (1,928,311)**	**$ (1,972,243)**	**$ (2,017,287)**	**$ (2,063,474)**	**$ (2,110,835)**	**$ (2,159,399)**	**$ (2,209,200)**	**$ (2,260,271)**
Total CIP Costs	**$ (250,000)**	**$ (205,000)**	**$ (2,889,230)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (3,631,220)**	**$ -**
Total Revenue	**$ 2,688,000**	**$ 2,714,880**	**$ 2,742,029**	**$ 2,769,449**	**$ 2,797,144**	**$ 2,825,115**	**$ 2,853,366**	**$ 2,881,900**	**$ 2,910,719**	**$ 2,939,826**	**$ 2,969,224**	**$ 2,998,917**	**$ 3,028,906**	**$ 3,059,195**
Beginning Balance	**$ 7,000,000**	**$ 7,891,475**	**$ 8,832,024**	**$ 7,095,217**	**$ 8,200,192**	**$ 9,314,899**	**$ 10,437,624**	**$ 11,567,770**	**$ 12,704,681**	**$ 13,847,661**	**$ 14,995,975**	**$ 16,148,845**	**$ 17,305,449**	**$ 14,833,702**
Annual Change	**$ 751,475**	**$ 785,520**	**$ (1,910,347)**	**$ 966,541**	**$ 953,472**	**$ 939,652**	**$ 925,055**	**$ 909,657**	**$ 893,431**	**$ 876,352**	**$ 858,390**	**$ 839,517**	**$ (2,811,514)**	**$ 798,924**
Change From Investments	**$ 140,000**	**$ 155,030**	**$ 173,540**	**$ 138,434**	**$ 161,235**	**$ 183,073**	**$ 205,091**	**$ 227,254**	**$ 249,549**	**$ 271,962**	**$ 294,480**	**$ 317,087**	**$ 339,767**	**$ 289,879**
Ending Balance (Cash Balance)	**$ 7,891,475**	**$ 8,832,024**	**$ 7,095,217**	**$ 8,200,192**	**$ 9,314,899**	**$ 10,437,624**	**$ 11,567,770**	**$ 12,704,681**	**$ 13,847,661**	**$ 14,995,975**	**$ 16,148,845**	**$ 17,305,449**	**$ 14,833,702**	**$ 15,922,505**

2035	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
128,741	130,029	131,329	132,642	133,969	135,308	136,661	138,028	139,408	140,802	142,210	143,632	145,069	146,519	147,985	149,464
$ 726,043	$ 747,824	$ 770,259	$ 793,367	$ 817,168	$ 841,683	$ 866,933	$ 892,941	$ 919,730	$ 947,322	$ 975,741	$ 1,005,013	$ 1,035,164	$ 1,066,219	$ 1,098,205	$ 1,131,151
$ 514,964	$ 520,114	$ 525,315	$ 530,568	$ 535,874	$ 541,233	$ 546,645	$ 552,112	$ 557,633	$ 563,209	$ 568,841	$ 574,530	$ 580,275	$ 586,078	$ 591,938	$ 597,858
$ 603	$ 610	$ 616	$ 622	$ 628	$ 634	$ 641	$ 647	$ 653	$ 660	$ 667	$ 673	$ 680	$ 687	$ 694	$ 701
$ (1,241,611)	**$ (1,268,548)**	**$ (1,296,190)**	**$ (1,324,557)**	**$ (1,353,670)**	**$ (1,383,550)**	**$ (1,414,219)**	**$ (1,445,700)**	**$ (1,478,016)**	**$ (1,511,191)**	**$ (1,545,249)**	**$ (1,580,216)**	**$ (1,616,119)**	**$ (1,652,983)**	**$ (1,690,837)**	**$ (1,729,710)**
$ (1,071,034)	**$ (1,097,810)**	**$ (1,125,255)**	**$ (1,153,387)**	**$ (1,182,221)**	**$ (1,211,777)**	**$ (1,242,071)**	**$ (1,273,123)**	**$ (1,304,951)**	**$ (1,337,575)**	**$ (1,371,014)**	**$ (1,405,290)**	**$ (1,440,422)**	**$ (1,476,432)**	**$ (1,513,343)**	**$ (1,551,177)**
$ (2,312,645)	**$ (2,366,358)**	**$ (2,421,445)**	**$ (2,477,944)**	**$ (2,535,891)**	**$ (2,595,327)**	**$ (2,656,290)**	**$ (2,718,823)**	**$ (2,782,967)**	**$ (2,848,765)**	**$ (2,916,263)**	**$ (2,985,506)**	**$ (3,056,541)**	**$ (3,129,416)**	**$ (3,204,181)**	**$ (3,280,887)**
$ -	**$ -**	**$ (1,484,510)**	**$ -**	**$ -**	**$ -**	**$ (327,730)**	**$ (8,935,400)**	**$ -**	**$ -**	**$ -**	**$ (1,853,950)**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,089,787	**$ 3,120,685**	**$ 3,151,891**	**$ 3,183,410**	**$ 3,215,244**	**$ 3,247,397**	**$ 3,279,871**	**$ 3,312,670**	**$ 3,345,796**	**$ 3,379,254**	**$ 3,413,047**	**$ 3,447,177**	**$ 3,481,649**	**$ 3,516,465**	**$ 3,551,630**	**$ 3,587,146**
$ 15,922,505	**$ 17,012,299**	**$ 18,100,618**	**$ 17,701,887**	**$ 18,754,285**	**$ 19,801,785**	**$ 20,842,528**	**$ 21,547,455**	**$ 13,628,669**	**$ 14,455,617**	**$ 15,269,936**	**$ 16,066,441**	**$ 14,989,497**	**$ 15,708,089**	**$ 16,403,431**	**$ 17,072,783**
$ 777,142	**$ 754,327**	**$ (754,064)**	**$ 705,467**	**$ 679,353**	**$ 652,070**	**$ 295,850**	**$ (8,341,553)**	**$ 562,829**	**$ 530,489**	**$ 496,784**	**$ (1,392,279)**	**$ 425,108**	**$ 387,050**	**$ 347,450**	**$ 306,260**
$ 312,653	**$ 333,993**	**$ 355,333**	**$ 346,931**	**$ 368,147**	**$ 388,673**	**$ 409,077**	**$ 422,768**	**$ 264,118**	**$ 283,830**	**$ 299,722**	**$ 315,334**	**$ 293,483**	**$ 308,292**	**$ 321,903**	**$ 335,018**
$ 17,012,299	**$ 18,100,618**	**$ 17,701,887**	**$ 18,754,285**	**$ 19,801,785**	**$ 20,842,528**	**$ 21,547,455**	**$ 13,628,669**	**$ 14,455,617**	**$ 15,269,936**	**$ 16,066,441**	**$ 14,989,497**	**$ 15,708,089**	**$ 16,403,431**	**$ 17,072,783**	**$ 17,714,060**

2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
150,959	152,469	153,993	155,533	157,089	158,660	160,246	161,849	163,467	165,102	166,753	168,420	170,104	171,806	173,524
$ 1,165,086	$ 1,200,039	$ 1,236,040	$ 1,273,121	$ 1,311,315	$ 1,350,654	$ 1,391,174	$ 1,432,909	$ 1,475,896	$ 1,520,173	$ 1,565,778	$ 1,612,751	$ 1,661,134	$ 1,710,968	$ 1,762,297
$ 603,836	$ 609,875	$ 615,973	$ 622,133	$ 628,354	$ 634,638	$ 640,984	$ 647,394	$ 653,868	$ 660,407	$ 667,011	$ 673,681	$ 680,418	$ 687,222	$ 694,094
$ 708	$ 715	$ 722	$ 729	$ 736	$ 744	$ 751	$ 759	$ 766	$ 774	$ 782	$ 789	$ 797	$ 805	$ 813
$ (1,769,630)	**$ (1,810,628)**	**$ (1,852,735)**	**$ (1,895,983)**	**$ (1,940,405)**	**$ (1,986,036)**	**$ (2,032,909)**	**$ (2,081,062)**	**$ (2,130,531)**	**$ (2,181,354)**	**$ (2,233,571)**	**$ (2,287,222)**	**$ (2,342,349)**	**$ (2,398,995)**	**$ (2,457,205)**
$ (1,589,956)	**$ (1,629,705)**	**$ (1,670,448)**	**$ (1,712,209)**	**$ (1,755,014)**	**$ (1,798,890)**	**$ (1,843,862)**	**$ (1,889,958)**	**$ (1,937,207)**	**$ (1,985,637)**	**$ (2,035,278)**	**$ (2,086,160)**	**$ (2,138,314)**	**$ (2,191,772)**	**$ (2,246,567)**
$ (3,359,586)	**$ (3,440,333)**	**$ (3,523,183)**	**$ (3,608,192)**	**$ (3,695,420)**	**$ (3,784,925)**	**$ (3,876,771)**	**$ (3,971,020)**	**$ (4,067,738)**	**$ (4,166,991)**	**$ (4,268,849)**	**$ (4,373,382)**	**$ (4,480,664)**	**$ (4,590,768)**	**$ (4,703,771)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (511,140)**	**$ (7,780,150)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,623,018	**$ 3,659,248**	**$ 3,695,841**	**$ 3,732,799**	**$ 3,770,127**	**$ 3,807,828**	**$ 3,845,906**	**$ 3,884,366**	**$ 3,923,209**	**$ 3,962,441**	**$ 4,002,066**	**$ 4,042,086**	**$ 4,082,507**	**$ 4,123,332**	**$ 4,164,566**
$ 17,714,060	**$ 18,325,073**	**$ 18,903,538**	**$ 19,447,075**	**$ 19,953,206**	**$ 20,419,347**	**$ 20,842,808**	**$ 21,220,789**	**$ 21,550,373**	**$ 21,317,388**	**$ 13,750,582**	**$ 13,750,452**	**$ 13,688,832**	**$ 13,559,059**	**$ 13,357,437**
$ 263,432	**$ 218,915**	**$ 172,658**	**$ 124,607**	**$ 74,707**	**$ 22,903**	**$ (30,864)**	**$ (86,654)**	**$ (655,669)**	**$ (7,984,700)**	**$ (266,783)**	**$ (331,296)**	**$ (398,156)**	**$ (467,435)**	**$ (539,206)**
$ 347,581	**$ 359,550**	**$ 370,880**	**$ 381,524**	**$ 391,434**	**$ 400,558**	**$ 408,845**	**$ 416,239**	**$ 422,683**	**$ 417,894**	**$ 266,654**	**$ 269,676**	**$ 268,383**	**$ 265,814**	**$ 261,832**
$ 18,325,073	**$ 18,903,538**	**$ 19,447,075**	**$ 19,953,206**	**$ 20,419,347**	**$ 20,842,808**	**$ 21,220,789**	**$ 21,550,373**	**$ 21,317,388**	**$ 13,750,582**	**$ 13,750,452**	**$ 13,688,832**	**$ 13,559,059**	**$ 13,357,437**	**$ 13,080,064**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
175,259	177,011	178,782	180,569	182,375	184,199	186,041	187,901	189,780	191,678	193,595	195,531	197,486
$ 1,815,166	$ 1,869,621	$ 1,925,710	$ 1,983,481	$ 2,042,985	$ 2,104,275	$ 2,167,403	$ 2,232,425	$ 2,299,398	$ 2,368,380	$ 2,439,431	$ 2,512,614	$ 2,587,993
$ 701,035	$ 708,046	$ 715,126	$ 722,277	$ 729,500	$ 736,795	$ 744,163	$ 751,605	$ 759,121	$ 766,712	$ 774,379	$ 782,123	$ 789,944
$ 822	$ 830	$ 838	$ 846	$ 855	$ 863	$ 872	$ 881	$ 890	$ 898	$ 907	$ 917	$ 926
$ (2,517,023)	**$ (2,578,496)**	**$ (2,641,674)**	**$ (2,706,605)**	**$ (2,773,340)**	**$ (2,841,933)**	**$ (2,912,438)**	**$ (2,984,911)**	**$ (3,059,408)**	**$ (3,135,990)**	**$ (3,214,718)**	**$ (3,295,654)**	**$ (3,378,862)**
$ (2,302,731)	**$ (2,360,299)**	**$ (2,419,306)**	**$ (2,479,789)**	**$ (2,541,784)**	**$ (2,605,328)**	**$ (2,670,462)**	**$ (2,737,223)**	**$ (2,805,654)**	**$ (2,875,795)**	**$ (2,947,690)**	**$ (3,021,382)**	**$ (3,096,917)**
$ (4,819,753)	**$ (4,938,795)**	**$ (5,060,980)**	**$ (5,186,394)**	**$ (5,315,124)**	**$ (5,447,262)**	**$ (5,582,900)**	**$ (5,722,134)**	**$ (5,865,062)**	**$ (6,011,785)**	**$ (6,162,408)**	**$ (6,317,036)**	**$ (6,475,779)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (722,230)**	**$ (6,292,370)**	**$ -**	**$ -**	**$ -**	**$ -**
$ 4,206,211	**$ 4,248,273**	**$ 4,290,756**	**$ 4,333,664**	**$ 4,377,000**	**$ 4,420,770**	**$ 4,464,978**	**$ 4,509,628**	**$ 4,554,724**	**$ 4,600,271**	**$ 4,646,274**	**$ 4,692,737**	**$ 4,739,664**
$ 13,080,064	**$ 12,722,886**	**$ 12,281,695**	**$ 11,752,118**	**$ 11,129,618**	**$ 10,409,482**	**$ 9,586,820**	**$ 8,656,558**	**$ 6,891,200**	**$ (577,071)**	**$ (2,002,816)**	**$ (3,558,721)**	**$ (5,253,399)**
$ (613,542)	**$ (690,522)**	**$ (770,224)**	**$ (852,730)**	**$ (938,124)**	**$ (1,026,491)**	**$ (1,117,922)**	**$ (1,934,736)**	**$ (7,602,708)**	**$ (1,411,514)**	**$ (1,516,134)**	**$ (1,624,299)**	**$ (1,736,115)**
$ 256,365	**$ 249,330**	**$ 240,647**	**$ 230,229**	**$ 217,988**	**$ 203,830**	**$ 187,660**	**$ 169,378**	**$ 134,436**	**$ (14,230)**	**$ (39,772)**	**$ (70,379)**	**$ (103,660)**
$ 12,722,886	**$ 12,281,695**	**$ 11,752,118**	**$ 11,129,618**	**$ 10,409,482**	**$ 9,586,820**	**$ 8,656,558**	**$ 6,891,200**	**$ (577,071)**	**$ (2,002,816)**	**$ (3,558,721)**	**$ (5,253,399)**	**$ (7,093,175)**


NNSWC Revenue Analysis - Baseline
Ending Cash Balance
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$-
$(5,000,000)
$(10,000,000)
$(15,000,000)
2021
2024
2027
2030
2033
2036
2039
2042
2045
2048
2051
2054
2057
2060
2063
2066
2069
2072
2075
2078
Total Operations Costs
Total CIP Costs
Total Revenue
Ending Balance (Cash Balance)

NNSWC Revenue Analysis - Baseline w/ Waste Shredding

Interest:	3.50%		[input from "operation inputs"]
Inflation:	2.50%		[input from "operation inputs"]
Current Year:	2021		[input from "operation inputs"]
WCI Operation Costs			
WCI Fixed Fee:	$ 480,000	annually	[input from "operation inputs"]
Annual Increase in Fixed Fee:	3.0%		[input from "operation inputs"]
WCI Tonnage Fee:	$4	per ton	[input from "operation inputs"]
Annual Increase in Tonnage Fee:	0%		[input from "operation inputs"]
WCI Special Waste Fee:	$10.50	per ton	[input from "operation inputs"]
Annual Increase in Special Waste Fee:	0%		[input from "operation inputs"]
2020 Annual Tonnage (assumed):	112,000	tons	[input from "operation inputs"]
2020 Special Waste Tonnage (assumed):	50	tons	[input from "operation inputs"]
Annual Tonnage Increase:	1%	per year	[input from "operation inputs"]
Starting Year:	2021		[input from "operation inputs"]
Coalition Operating Costs			
Personnel Costs	$ 94,734		[input from "operation inputs"]
Operating & Maintenance Costs	$ 30,577		[input from "operation inputs"]
Other Admin. and Overhead	$ 22,455		[input from "operation inputs"]
Other Misc.	$ 10,000		[input from "operation inputs"]
FA Fund Transfers	$ 350,000		[input from "operation inputs"]
Professional Services	$ 250,000		[input from "operation inputs"]
Waste Shredding Costs	$ 255,300		
Total Coalition Costs:	**$ (1,014,000)**		

Capital Costs

	PV Cost	Execution Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Cell 6 Ph 1 Engineering	$ 200,000	2022	$ 250,000	$ 205,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 Construction	$ 2,500,000	2023	$ -	$ -	$ 2,626,570	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 CA	$ 250,000	2023	$ -	$ -	$ 262,660	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scales	$ 300,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scale House	$ 400,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Equipment Building	$ 1,200,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Drop-Off Area	$ 200,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Asphalt Pavement	$ 600,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Land Acquisition	$ 1,000,000	2037	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Engineering	$ 200,000	2041	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Construction	$ 3,700,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 CA	$ 370,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 1-6 Ph 1 Closure*	$ 3,100,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Sedimentation Basin	$ 250,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Leachate Pond	$ 1,000,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Landfill Gas Flare	$ 1,000,000	2046	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Engineering	$ 200,000	2059	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Construction	$ 2,700,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 CA	$ 270,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Closure*	$ 2,700,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Engineering	$ 200,000	2073	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Construction	$ 1,500,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 CA	$ 200,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Closure*	$ 4,000,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Ph 2 Closure*	$ 2,300,000	2078	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Insert Row Above Here			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Total CIP	**$ 250,000**	**$ 205,000**	**$ 2,889,230**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Revenues

	2020 Rates	% Increase/ Decrease	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Annual Tonnage	112,000	1%	112,000	113,120	114,251	115,394	116,548	117,713	118,890	120,079	121,280	122,493	123,718	124,955
Tipping Fee	$ 24.00	0%	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
		Total Revenues	**$ 2,688,000**	**$ 2,714,880**	**$ 2,742,029**	**$ 2,769,449**	**$ 2,797,144**	**$ 2,825,115**	**$ 2,853,366**	**$ 2,881,900**	**$ 2,910,719**	**$ 2,939,826**	**$ 2,969,224**	**$ 2,998,917**

*Closure cost to be funded via FA funds

2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 403,470	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 537,960	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 1,613,870	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 268,980	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 806,940	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ 1,484,510	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 327,730	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,214,460	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 621,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 419,900	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,679,590	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ 3,631,220	**$ -**	**$ -**	**$ -**	**$ 1,484,510**	**$ -**	**$ -**	**$ -**	**$ 327,730**	**$ 8,935,400**	**$ -**	**$ -**	**$ -**	**$ 1,853,950**	**$ -**	**$ -**	**$ -**

2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
126,204	127,466	128,741	130,029	131,329	132,642	133,969	135,308	136,661	138,028	139,408	140,802	142,210	143,632	145,069	146,519	147,985
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 3,028,906	**$ 3,059,195**	**$ 3,089,787**	**$ 3,120,685**	**$ 3,151,891**	**$ 3,183,410**	**$ 3,215,244**	**$ 3,247,397**	**$ 3,279,871**	**$ 3,312,670**	**$ 3,345,796**	**$ 3,379,254**	**$ 3,413,047**	**$ 3,447,177**	**$ 3,481,649**	**$ 3,516,465**	**$ 3,551,630**

2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
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2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
149,464	150,959	152,469	153,993	155,533	157,089	158,660	160,246	161,849	163,467	165,102	166,753	168,420	170,104	171,806	173,524	175,259
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 3,587,146	**$ 3,623,018**	**$ 3,659,248**	**$ 3,695,841**	**$ 3,732,799**	**$ 3,770,127**	**$ 3,807,828**	**$ 3,845,906**	**$ 3,884,366**	**$ 3,923,209**	**$ 3,962,441**	**$ 4,002,066**	**$ 4,042,086**	**$ 4,082,507**	**$ 4,123,332**	**$ 4,164,566**	**$ 4,206,211**

2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081
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$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,552,090	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 740,280	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 722,230**	**$ 6,292,370**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081
177,011	178,782	180,569	182,375	184,199	186,041	187,901	189,780	191,678	193,595	195,531	197,486	199,461	201,455	203,470
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 4,248,273	**$ 4,290,756**	**$ 4,333,664**	**$ 4,377,000**	**$ 4,420,770**	**$ 4,464,978**	**$ 4,509,628**	**$ 4,554,724**	**$ 4,600,271**	**$ 4,646,274**	**$ 4,692,737**	**$ 4,739,664**	**$ 4,787,061**	**$ 4,834,931**	**$ 4,883,281**

NNSWC Revenue Analysis - Baseline w/ Waste Shredding

Beginning Balance:	$ 7,000,000
Interest:	3.50%
Inflation:	2.50%
Investment APR:	2.00%
Starting Year:	2021

ProForma

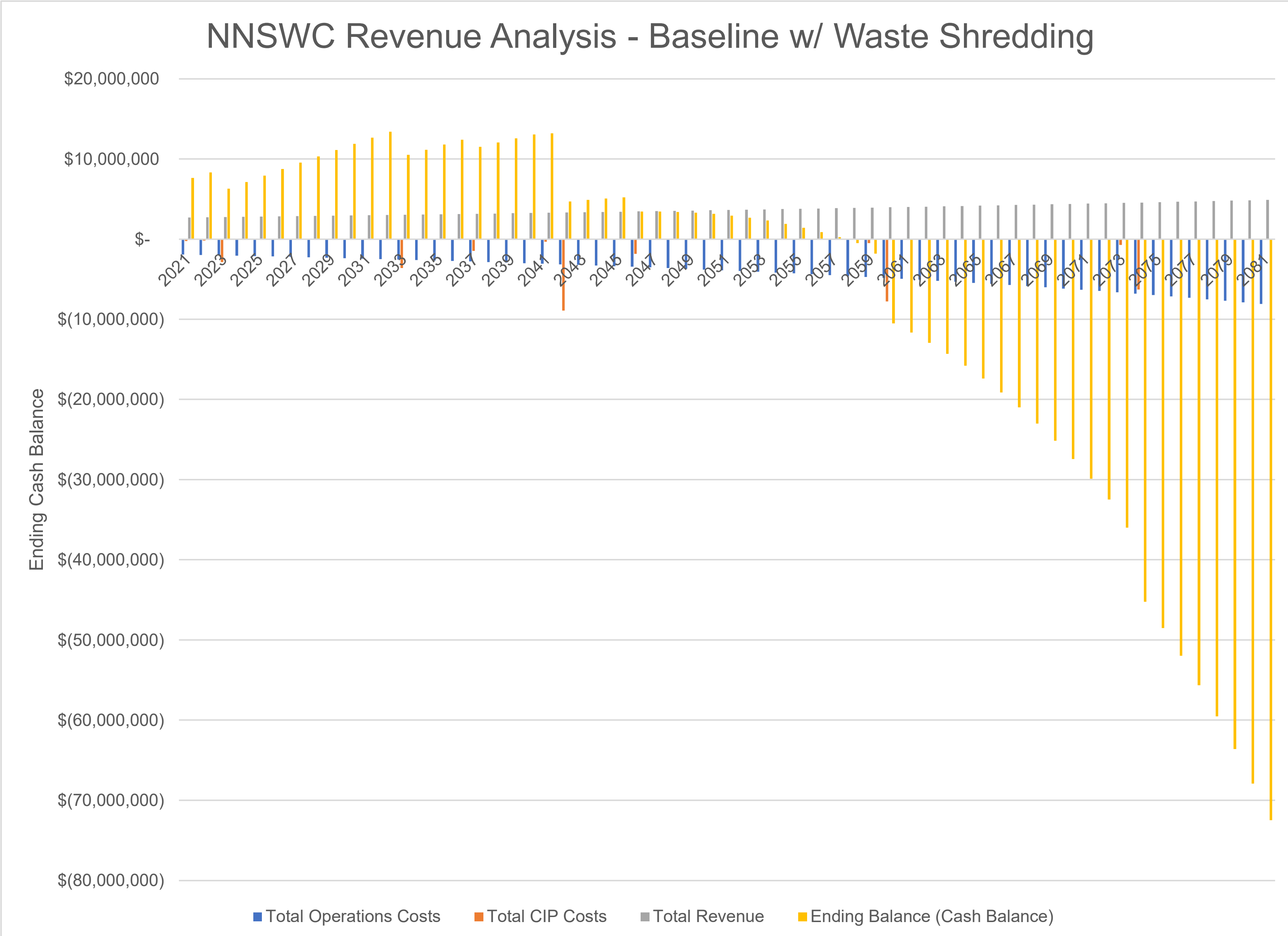
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**
Annual Tonnages	112,000	113,120	114,251	115,394	116,548	117,713	118,890	120,079	121,280	122,493	123,718	124,955	126,204	127,466
Fixed Fee	$ 480,000	$ 494,400	$ 509,232	$ 524,509	$ 540,244	$ 556,452	$ 573,145	$ 590,339	$ 608,050	$ 626,291	$ 645,080	$ 664,432	$ 684,365	$ 704,896
Tonnage Fee	$ 448,000	$ 452,480	$ 457,005	$ 461,575	$ 466,191	$ 470,853	$ 475,561	$ 480,317	$ 485,120	$ 489,971	$ 494,871	$ 499,819	$ 504,818	$ 509,866
Special Waste Fee	$ 525	$ 530	$ 536	$ 541	$ 546	$ 552	$ 557	$ 563	$ 568	$ 574	$ 580	$ 586	$ 592	$ 597
Total WCI Operations Costs	**$ (928,525)**	**$ (947,410)**	**$ (966,772)**	**$ (986,625)**	**$ (1,006,981)**	**$ (1,027,856)**	**$ (1,049,263)**	**$ (1,071,219)**	**$ (1,093,738)**	**$ (1,116,836)**	**$ (1,140,531)**	**$ (1,164,837)**	**$ (1,189,774)**	**$ (1,215,359)**
Total Coalition Operating Costs	**$ (1,014,000)**	**$ (1,039,350)**	**$ (1,065,334)**	**$ (1,091,967)**	**$ (1,119,266)**	**$ (1,147,248)**	**$ (1,175,929)**	**$ (1,205,327)**	**$ (1,235,461)**	**$ (1,266,347)**	**$ (1,298,006)**	**$ (1,330,456)**	**$ (1,363,717)**	**$ (1,397,810)**
Total Operations Costs	**$ (1,942,525)**	**$ (1,986,760)**	**$ (2,032,106)**	**$ (2,078,592)**	**$ (2,126,247)**	**$ (2,175,104)**	**$ (2,225,193)**	**$ (2,276,546)**	**$ (2,329,198)**	**$ (2,383,183)**	**$ (2,438,536)**	**$ (2,495,293)**	**$ (2,553,492)**	**$ (2,613,170)**
Total CIP Costs	**$ (250,000)**	**$ (205,000)**	**$ (2,889,230)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (3,631,220)**	**$ -**
Total Revenue	**$ 2,688,000**	**$ 2,714,880**	**$ 2,742,029**	**$ 2,769,449**	**$ 2,797,144**	**$ 2,825,115**	**$ 2,853,366**	**$ 2,881,900**	**$ 2,910,719**	**$ 2,939,826**	**$ 2,969,224**	**$ 2,998,917**	**$ 3,028,906**	**$ 3,059,195**
Beginning Balance	**$ 7,000,000**	**$ 7,635,475**	**$ 8,308,504**	**$ 6,292,369**	**$ 7,105,810**	**$ 7,916,371**	**$ 8,721,916**	**$ 9,521,417**	**$ 10,313,773**	**$ 11,097,828**	**$ 11,872,377**	**$ 12,636,154**	**$ 13,387,839**	**$ 10,494,828**
Annual Change	**$ 495,475**	**$ 523,120**	**$ (2,179,307)**	**$ 690,857**	**$ 670,896**	**$ 650,011**	**$ 628,174**	**$ 605,354**	**$ 581,520**	**$ 556,643**	**$ 530,688**	**$ 503,623**	**$ (3,155,806)**	**$ 446,025**
Change From Investments	**$ 140,000**	**$ 149,910**	**$ 163,172**	**$ 122,584**	**$ 139,665**	**$ 155,534**	**$ 171,328**	**$ 187,002**	**$ 202,535**	**$ 217,906**	**$ 233,089**	**$ 248,061**	**$ 262,796**	**$ 204,641**
Ending Balance (Cash Balance)	**$ 7,635,475**	**$ 8,308,504**	**$ 6,292,369**	**$ 7,105,810**	**$ 7,916,371**	**$ 8,721,916**	**$ 9,521,417**	**$ 10,313,773**	**$ 11,097,828**	**$ 11,872,377**	**$ 12,636,154**	**$ 13,387,839**	**$ 10,494,828**	**$ 11,145,494**

2035	2036	2037	2038	2039	2040	2041	2042
128,741	130,029	131,329	132,642	133,969	135,308	136,661	138,028
$ 726,043	$ 747,824	$ 770,259	$ 793,367	$ 817,168	$ 841,683	$ 866,933	$ 892,941
$ 514,964	$ 520,114	$ 525,315	$ 530,568	$ 535,874	$ 541,233	$ 546,645	$ 552,112
$ 603	$ 610	$ 616	$ 622	$ 628	$ 634	$ 641	$ 647
$ (1,241,611)	**$ (1,268,548)**	**$ (1,296,190)**	**$ (1,324,557)**	**$ (1,353,670)**	**$ (1,383,550)**	**$ (1,414,219)**	**$ (1,445,700)**
$ (1,432,755)	**$ (1,468,574)**	**$ (1,505,289)**	**$ (1,542,921)**	**$ (1,581,494)**	**$ (1,621,031)**	**$ (1,661,557)**	**$ (1,703,096)**
$ (2,674,366)	**$ (2,737,122)**	**$ (2,801,479)**	**$ (2,867,478)**	**$ (2,935,164)**	**$ (3,004,581)**	**$ (3,075,776)**	**$ (3,148,796)**
$ -	**$ -**	**$ (1,484,510)**	**$ -**	**$ -**	**$ -**	**$ (327,730)**	**$ (8,935,400)**
$ 3,089,787	**$ 3,120,685**	**$ 3,151,891**	**$ 3,183,410**	**$ 3,215,244**	**$ 3,247,397**	**$ 3,279,871**	**$ 3,312,670**
$ 11,145,494	**$ 11,779,732**	**$ 12,394,512**	**$ 11,503,681**	**$ 12,044,821**	**$ 12,561,294**	**$ 13,050,608**	**$ 13,183,055**
$ 415,420	**$ 383,562**	**$ (1,134,097)**	**$ 315,932**	**$ 280,081**	**$ 242,816**	**$ (123,635)**	**$ (8,771,526)**
$ 218,817	**$ 231,218**	**$ 243,266**	**$ 225,208**	**$ 236,392**	**$ 246,498**	**$ 256,082**	**$ 258,539**
$ 11,779,732	**$ 12,394,512**	**$ 11,503,681**	**$ 12,044,821**	**$ 12,561,294**	**$ 13,050,608**	**$ 13,183,055**	**$ 4,670,068**

2043	2044	2045	2046	2047	2048	2049	2050
139,408	140,802	142,210	143,632	145,069	146,519	147,985	149,464
$ 919,730	$ 947,322	$ 975,741	$ 1,005,013	$ 1,035,164	$ 1,066,219	$ 1,098,205	$ 1,131,151
$ 557,633	$ 563,209	$ 568,841	$ 574,530	$ 580,275	$ 586,078	$ 591,938	$ 597,858
$ 653	$ 660	$ 667	$ 673	$ 680	$ 687	$ 694	$ 701
$ (1,478,016)	**$ (1,511,191)**	**$ (1,545,249)**	**$ (1,580,216)**	**$ (1,616,119)**	**$ (1,652,983)**	**$ (1,690,837)**	**$ (1,729,710)**
$ (1,745,673)	**$ (1,789,315)**	**$ (1,834,048)**	**$ (1,879,899)**	**$ (1,926,897)**	**$ (1,975,069)**	**$ (2,024,446)**	**$ (2,075,057)**
$ (3,223,689)	**$ (3,300,506)**	**$ (3,379,297)**	**$ (3,460,116)**	**$ (3,543,015)**	**$ (3,628,052)**	**$ (3,715,283)**	**$ (3,804,767)**
$ -	**$ -**	**$ -**	**$ (1,853,950)**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,345,796	**$ 3,379,254**	**$ 3,413,047**	**$ 3,447,177**	**$ 3,481,649**	**$ 3,516,465**	**$ 3,551,630**	**$ 3,587,146**
$ 4,670,068	**$ 4,880,405**	**$ 5,054,997**	**$ 5,187,930**	**$ 3,422,817**	**$ 3,427,871**	**$ 3,383,513**	**$ 3,286,186**
$ 122,107	**$ 78,748**	**$ 33,750**	**$ (1,866,888)**	**$ (61,366)**	**$ (111,587)**	**$ (163,653)**	**$ (217,620)**
$ 88,231	**$ 95,843**	**$ 99,183**	**$ 101,775**	**$ 66,421**	**$ 67,229**	**$ 66,326**	**$ 64,397**
$ 4,880,405	**$ 5,054,997**	**$ 5,187,930**	**$ 3,422,817**	**$ 3,427,871**	**$ 3,383,513**	**$ 3,286,186**	**$ 3,132,962**

2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
150,959	152,469	153,993	155,533	157,089	158,660	160,246	161,849	163,467	165,102	166,753	168,420	170,104	171,806	173,524
$ 1,165,086	$ 1,200,039	$ 1,236,040	$ 1,273,121	$ 1,311,315	$ 1,350,654	$ 1,391,174	$ 1,432,909	$ 1,475,896	$ 1,520,173	$ 1,565,778	$ 1,612,751	$ 1,661,134	$ 1,710,968	$ 1,762,297
$ 603,836	$ 609,875	$ 615,973	$ 622,133	$ 628,354	$ 634,638	$ 640,984	$ 647,394	$ 653,868	$ 660,407	$ 667,011	$ 673,681	$ 680,418	$ 687,222	$ 694,094
$ 708	$ 715	$ 722	$ 729	$ 736	$ 744	$ 751	$ 759	$ 766	$ 774	$ 782	$ 789	$ 797	$ 805	$ 813
$ (1,769,630)	**$ (1,810,628)**	**$ (1,852,735)**	**$ (1,895,983)**	**$ (1,940,405)**	**$ (1,986,036)**	**$ (2,032,909)**	**$ (2,081,062)**	**$ (2,130,531)**	**$ (2,181,354)**	**$ (2,233,571)**	**$ (2,287,222)**	**$ (2,342,349)**	**$ (2,398,995)**	**$ (2,457,205)**
$ (2,126,934)	**$ (2,180,107)**	**$ (2,234,610)**	**$ (2,290,475)**	**$ (2,347,737)**	**$ (2,406,430)**	**$ (2,466,591)**	**$ (2,528,256)**	**$ (2,591,462)**	**$ (2,656,249)**	**$ (2,722,655)**	**$ (2,790,721)**	**$ (2,860,489)**	**$ (2,932,001)**	**$ (3,005,301)**
$ (3,896,563)	**$ (3,990,735)**	**$ (4,087,345)**	**$ (4,186,458)**	**$ (4,288,142)**	**$ (4,392,466)**	**$ (4,499,500)**	**$ (4,609,317)**	**$ (4,721,992)**	**$ (4,837,602)**	**$ (4,956,225)**	**$ (5,077,943)**	**$ (5,202,838)**	**$ (5,330,997)**	**$ (5,462,506)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (511,140)**	**$ (7,780,150)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,623,018	**$ 3,659,248**	**$ 3,695,841**	**$ 3,732,799**	**$ 3,770,127**	**$ 3,807,828**	**$ 3,845,906**	**$ 3,884,366**	**$ 3,923,209**	**$ 3,962,441**	**$ 4,002,066**	**$ 4,042,086**	**$ 4,082,507**	**$ 4,123,332**	**$ 4,164,566**
$ 3,132,962	**$ 2,920,788**	**$ 2,646,490**	**$ 2,306,772**	**$ 1,898,212**	**$ 1,417,260**	**$ 860,226**	**$ 223,285**	**$ (497,534)**	**$ (1,817,491)**	**$ (10,508,951)**	**$ (11,672,567)**	**$ (12,937,686)**	**$ (14,312,185)**	**$ (15,801,010)**
$ (273,546)	**$ (331,487)**	**$ (391,504)**	**$ (453,659)**	**$ (518,015)**	**$ (584,638)**	**$ (653,593)**	**$ (724,952)**	**$ (1,309,923)**	**$ (8,655,311)**	**$ (954,160)**	**$ (1,035,857)**	**$ (1,120,331)**	**$ (1,207,664)**	**$ (1,297,941)**
$ 61,371	**$ 57,188**	**$ 51,786**	**$ 45,100**	**$ 37,062**	**$ 27,604**	**$ 16,652**	**$ 4,133**	**$ (10,033)**	**$ (36,149)**	**$ (209,456)**	**$ (229,262)**	**$ (254,168)**	**$ (281,160)**	**$ (310,397)**
$ 2,920,788	**$ 2,646,490**	**$ 2,306,772**	**$ 1,898,212**	**$ 1,417,260**	**$ 860,226**	**$ 223,285**	**$ (497,534)**	**$ (1,817,491)**	**$ (10,508,951)**	**$ (11,672,567)**	**$ (12,937,686)**	**$ (14,312,185)**	**$ (15,801,010)**	**$ (17,409,348)**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081
175,259	177,011	178,782	180,569	182,375	184,199	186,041	187,901	189,780	191,678	193,595	195,531	197,486	199,461	201,455	203,470
$ 1,815,166	$ 1,869,621	$ 1,925,710	$ 1,983,481	$ 2,042,985	$ 2,104,275	$ 2,167,403	$ 2,232,425	$ 2,299,398	$ 2,368,380	$ 2,439,431	$ 2,512,614	$ 2,587,993	$ 2,665,632	$ 2,745,601	$ 2,827,969
$ 701,035	$ 708,046	$ 715,126	$ 722,277	$ 729,500	$ 736,795	$ 744,163	$ 751,605	$ 759,121	$ 766,712	$ 774,379	$ 782,123	$ 789,944	$ 797,843	$ 805,822	$ 813,880
$ 822	$ 830	$ 838	$ 846	$ 855	$ 863	$ 872	$ 881	$ 890	$ 898	$ 907	$ 917	$ 926	$ 935	$ 944	$ 954
$ (2,517,023)	**$ (2,578,496)**	**$ (2,641,674)**	**$ (2,706,605)**	**$ (2,773,340)**	**$ (2,841,933)**	**$ (2,912,438)**	**$ (2,984,911)**	**$ (3,059,408)**	**$ (3,135,990)**	**$ (3,214,718)**	**$ (3,295,654)**	**$ (3,378,862)**	**$ (3,464,411)**	**$ (3,552,368)**	**$ (3,642,803)**
$ (3,080,434)	**$ (3,157,445)**	**$ (3,236,381)**	**$ (3,317,290)**	**$ (3,400,223)**	**$ (3,485,228)**	**$ (3,572,359)**	**$ (3,661,668)**	**$ (3,753,210)**	**$ (3,847,040)**	**$ (3,943,216)**	**$ (4,041,796)**	**$ (4,142,841)**	**$ (4,246,412)**	**$ (4,352,572)**	**$ (4,461,387)**
$ (5,597,457)	**$ (5,735,941)**	**$ (5,878,055)**	**$ (6,023,895)**	**$ (6,173,563)**	**$ (6,327,162)**	**$ (6,484,797)**	**$ (6,646,579)**	**$ (6,812,618)**	**$ (6,983,030)**	**$ (7,157,934)**	**$ (7,337,450)**	**$ (7,521,704)**	**$ (7,710,823)**	**$ (7,904,940)**	**$ (8,104,190)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (722,230)**	**$ (6,292,370)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
$ 4,206,211	**$ 4,248,273**	**$ 4,290,756**	**$ 4,333,664**	**$ 4,377,000**	**$ 4,420,770**	**$ 4,464,978**	**$ 4,509,628**	**$ 4,554,724**	**$ 4,600,271**	**$ 4,646,274**	**$ 4,692,737**	**$ 4,739,664**	**$ 4,787,061**	**$ 4,834,931**	**$ 4,883,281**
$ (17,409,348)	**$ (19,142,572)**	**$ (21,006,252)**	**$ (23,006,155)**	**$ (25,148,257)**	**$ (27,438,747)**	**$ (29,884,035)**	**$ (32,490,757)**	**$ (35,988,015)**	**$ (45,245,277)**	**$ (48,518,802)**	**$ (51,983,022)**	**$ (55,648,344)**	**$ (59,522,939)**	**$ (63,615,308)**	**$ (67,934,251)**
$ (1,391,245)	**$ (1,487,668)**	**$ (1,587,298)**	**$ (1,690,231)**	**$ (1,796,563)**	**$ (1,906,391)**	**$ (2,019,819)**	**$ (2,859,181)**	**$ (8,550,264)**	**$ (2,382,759)**	**$ (2,511,660)**	**$ (2,644,713)**	**$ (2,782,039)**	**$ (2,923,762)**	**$ (3,070,009)**	**$ (3,220,909)**
$ (341,979)	**$ (376,012)**	**$ (412,605)**	**$ (451,871)**	**$ (493,928)**	**$ (538,896)**	**$ (586,903)**	**$ (638,077)**	**$ (706,999)**	**$ (890,766)**	**$ (952,561)**	**$ (1,020,609)**	**$ (1,092,555)**	**$ (1,168,608)**	**$ (1,248,934)**	**$ (1,333,706)**
$ (19,142,572)	**$ (21,006,252)**	**$ (23,006,155)**	**$ (25,148,257)**	**$ (27,438,747)**	**$ (29,884,035)**	**$ (32,490,757)**	**$ (35,988,015)**	**$ (45,245,277)**	**$ (48,518,802)**	**$ (51,983,022)**	**$ (55,648,344)**	**$ (59,522,939)**	**$ (63,615,308)**	**$ (67,934,251)**	**$ (72,488,867)**


NNSWC Revenue Analysis - Baseline w/ Waste Shredding
$20,000,000
$10,000,000
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$(30,000,000)
$(40,000,000)
$(50,000,000)
$(60,000,000)
$(70,000,000)
$(80,000,000)
Ending Cash Balance
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2023
2025
2027
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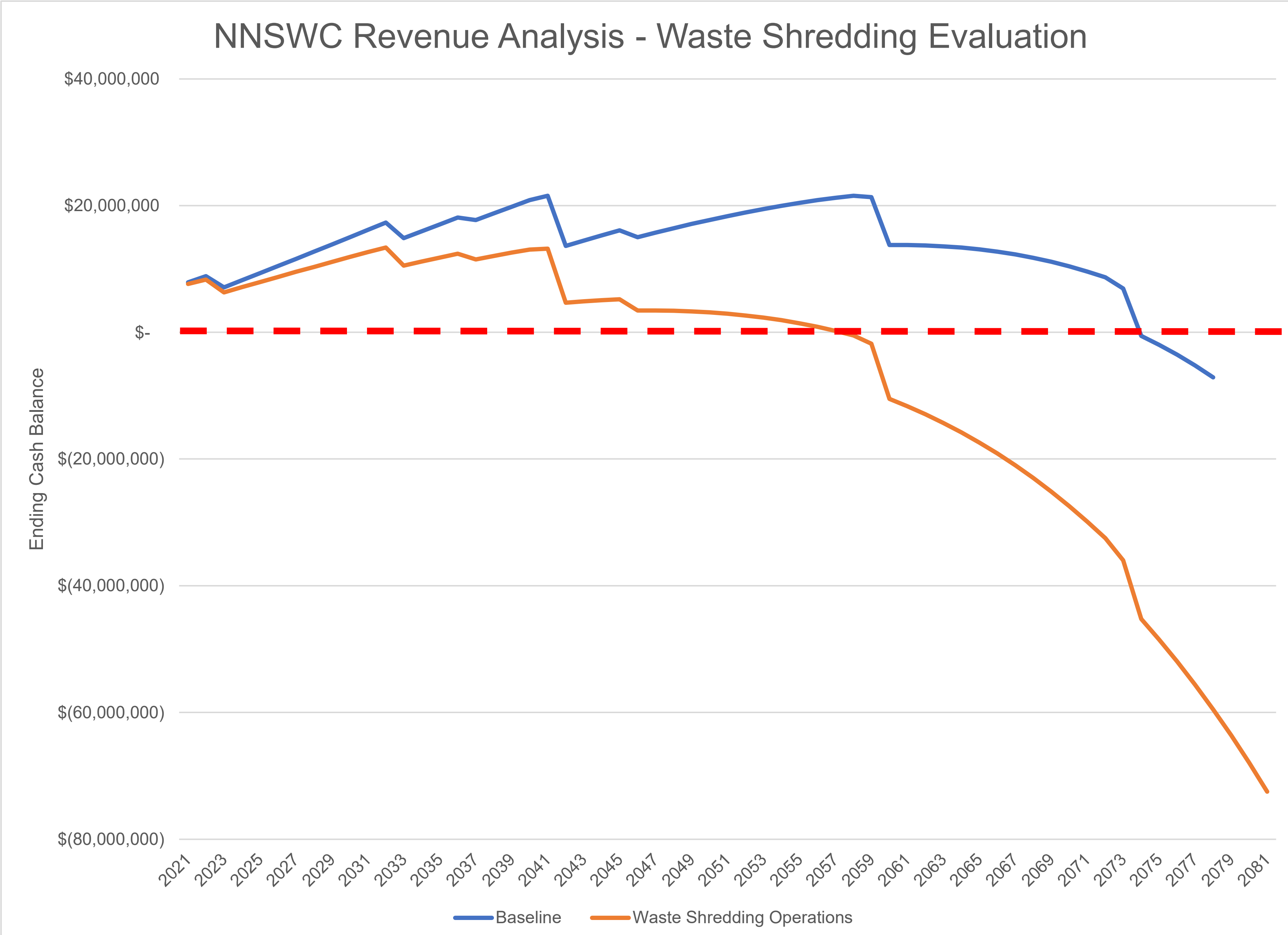
Total Operations Costs
Total CIP Costs
Total Revenue
Ending Balance (Cash Balance)


NNSWC Revenue Analysis - Waste Shredding Evaluation
$40,000,000
$20,000,000
$-
$(20,000,000)
$(40,000,000)
$(60,000,000)
$(80,000,000)
Ending Cash Balance
2021
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Baseline
Waste Shredding Operations

APPENDIX C – NNSWC FINANCIAL EVALUATION

NNSWC Financial Model

Financial Model Inputs

Hours of Operation: M-F 7AM-4PM; Sat 7AM-12PM

Interest:	3.50%		
Inflation:	2.50%		
Current Year:	2021		
Starting Year:	2021		
WCI Operation Costs			
WCI Fixed Fee:	$	480,000	annually
Annual Increase in Fixed Fee:		3%	
WCI Tonnage Fee:		$4	per ton
Annual Increase in Tonnage Fee:		0%	
WCI Special Waste Fee:		$10.50	per ton
Annual Increase in Special Waste Fee:		0%	
2020 Annual Tonnage (assumed):		112,000	tons
2020 Special Waste Tonnage (assumed):		50	tons
Annual Tonnage Increase:		1%	per year
Coalition Operation			
Personnel Costs	$	94,734	
Operating & Maintenance Costs	$	30,577	
Other Admin. and Overhead	$	22,455	
Other Misc.	$	10,000	
FA Fund Transfers	$	350,000	***Covers Closure and Post-Closure Care Costs***
Professional Services	$	250,000	Annual Average
Total Coalition Costs:	**$**	**(758,000)**	2021$

NNSWC Revenue Analysis - Baseline

Interest:	3.50%		[input from "operation inputs"]
Inflation:	2.50%		[input from "operation inputs"]
Current Year:	2021		[input from "operation inputs"]
WCI Operation Costs			
WCI Fixed Fee:	$ 480,000	annually	[input from "operation inputs"]
Annual Increase in Fixed Fee:	3.0%		[input from "operation inputs"]
WCI Tonnage Fee:	$4	per ton	[input from "operation inputs"]
Annual Increase in Tonnage Fee:	0%		[input from "operation inputs"]
WCI Special Waste Fee:	$10.50	per ton	[input from "operation inputs"]
Annual Increase in Special Waste Fee:	0%		[input from "operation inputs"]
2020 Annual Tonnage (assumed):	112,000	tons	[input from "operation inputs"]
2020 Special Waste Tonnage (assumed):	50	tons	[input from "operation inputs"]
Annual Tonnage Increase:	1%	per year	[input from "operation inputs"]
Starting Year:	2021		[input from "operation inputs"]
Coalition Operating Costs			
Personnel Costs	$ 94,734		[input from "operation inputs"]
Operating & Maintenance Costs	$ 30,577		[input from "operation inputs"]
Other Admin. and Overhead	$ 22,455		[input from "operation inputs"]
Other Misc.	$ 10,000		[input from "operation inputs"]
FA Fund Transfers	$ 350,000		[input from "operation inputs"]
Professional Services	$ 250,000		[input from "operation inputs"]
Total Coalition Costs:	**$ (758,000)**		

Capital Costs

	PV Cost	Execution Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Cell 6 Ph 1 Engineering	$ 200,000	2022	$ 250,000	$ 205,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 Construction	$ 2,500,000	2023	$ -	$ -	$ 2,626,570	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 CA	$ 250,000	2023	$ -	$ -	$ 262,660	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scales	$ 300,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scale House	$ 400,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Equipment Building	$ 1,200,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Drop-Off Area	$ 200,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Asphalt Pavement	$ 600,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Land Acquisition	$ 1,000,000	2037	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Engineering	$ 200,000	2041	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Construction	$ 3,700,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 CA	$ 370,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 1-6 Ph 1 Closure*	$ 3,100,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Sedimentation Basin	$ 250,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Leachate Pond	$ 1,000,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Landfill Gas Flare	$ 1,000,000	2046	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Engineering	$ 200,000	2059	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Construction	$ 2,700,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 CA	$ 270,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Closure*	$ 2,700,000	2060	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Engineering	$ 200,000	2073	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Construction	$ 1,500,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 CA	$ 200,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Closure*	$ 4,000,000	2074	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Ph 2 Closure*	$ 2,300,000	2078	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Insert Row Above Here			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Total CIP	**$ 250,000**	**$ 205,000**	**$ 2,889,230**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Revenues

	2020 Rates	% Increase/ Decrease	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annual Tonnage	112,000	1%	112,000	113,120	114,251	115,394	116,548	117,713	118,890	120,079	121,280	122,493	123,718
Tipping Fee	$ 24.00	0%	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
		Total Revenues	**$ 2,688,000**	**$ 2,714,880**	**$ 2,742,029**	**$ 2,769,449**	**$ 2,797,144**	**$ 2,825,115**	**$ 2,853,366**	**$ 2,881,900**	**$ 2,910,719**	**$ 2,939,826**	**$ 2,969,224**

*Closure cost to be funded via FA funds

2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 403,470	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 537,960	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 1,613,870	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 268,980	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 806,940	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ 1,484,510	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 621,450	$ -	$ -	$ -	$ -	$ -	$ -
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$ -	**$ 3,631,220**	**$ -**	**$ -**	**$ -**	**$ 1,484,510**	**$ -**	**$ -**	**$ -**	**$ 327,730**	**$ 8,935,400**	**$ -**	**$ -**	**$ -**	**$ 1,853,950**	**$ -**	**$ -**

2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
124,955	126,204	127,466	128,741	130,029	131,329	132,642	133,969	135,308	136,661	138,028	139,408	140,802	142,210	143,632	145,069	146,519
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 2,998,917	**$ 3,028,906**	**$ 3,059,195**	**$ 3,089,787**	**$ 3,120,685**	**$ 3,151,891**	**$ 3,183,410**	**$ 3,215,244**	**$ 3,247,397**	**$ 3,279,871**	**$ 3,312,670**	**$ 3,345,796**	**$ 3,379,254**	**$ 3,413,047**	**$ 3,447,177**	**$ 3,481,649**	**$ 3,516,465**

2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
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2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
147,985	149,464	150,959	152,469	153,993	155,533	157,089	158,660	160,246	161,849	163,467	165,102	166,753	168,420	170,104	171,806	173,524
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 3,551,630	**$ 3,587,146**	**$ 3,623,018**	**$ 3,659,248**	**$ 3,695,841**	**$ 3,732,799**	**$ 3,770,127**	**$ 3,807,828**	**$ 3,845,906**	**$ 3,884,366**	**$ 3,923,209**	**$ 3,962,441**	**$ 4,002,066**	**$ 4,042,086**	**$ 4,082,507**	**$ 4,123,332**	**$ 4,164,566**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
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$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,552,090	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 740,280	$ -	$ -	$ -	$ -
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$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 722,230**	**$ 6,292,370**	**$ -**	**$ -**	**$ -**	**$ -**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
175,259	177,011	178,782	180,569	182,375	184,199	186,041	187,901	189,780	191,678	193,595	195,531	197,486
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 4,206,211	**$ 4,248,273**	**$ 4,290,756**	**$ 4,333,664**	**$ 4,377,000**	**$ 4,420,770**	**$ 4,464,978**	**$ 4,509,628**	**$ 4,554,724**	**$ 4,600,271**	**$ 4,646,274**	**$ 4,692,737**	**$ 4,739,664**

NNSWC Revenue Analysis - Baseline

Beginning Balance:	$ 7,000,000
Interest:	3.50%
Inflation:	2.50%
Investment APR:	2.00%
Starting Year:	2021

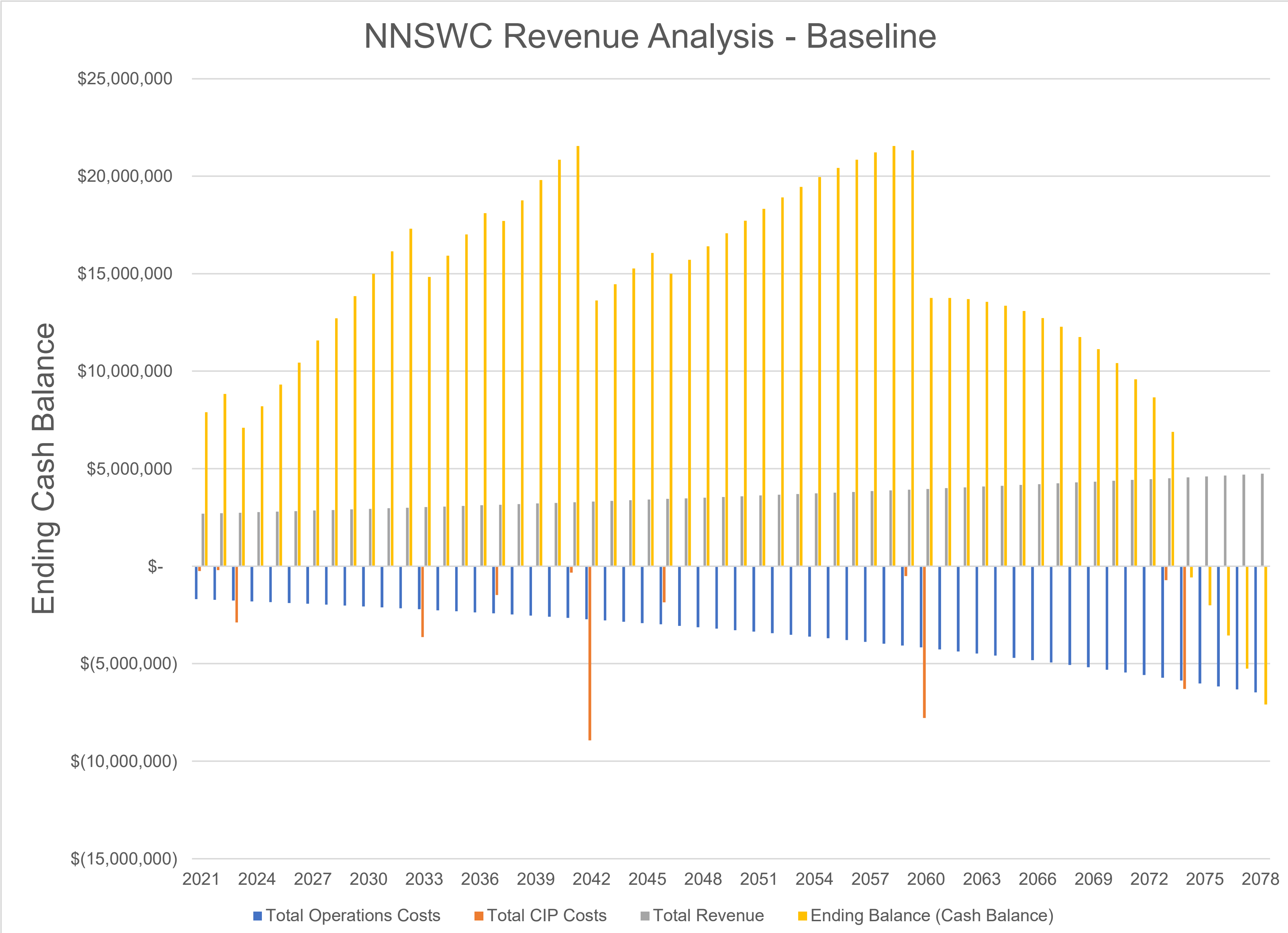
ProForma

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual Tonnages	112,000	113,120	114,251	115,394	116,548	117,713	118,890	120,079	121,280	122,493	123,718	124,955	126,204	127,466
Fixed Fee	$ 480,000	$ 494,400	$ 509,232	$ 524,509	$ 540,244	$ 556,452	$ 573,145	$ 590,339	$ 608,050	$ 626,291	$ 645,080	$ 664,432	$ 684,365	$ 704,896
Tonnage Fee	$ 448,000	$ 452,480	$ 457,005	$ 461,575	$ 466,191	$ 470,853	$ 475,561	$ 480,317	$ 485,120	$ 489,971	$ 494,871	$ 499,819	$ 504,818	$ 509,866
Special Waste Fee	$ 525	$ 530	$ 536	$ 541	$ 546	$ 552	$ 557	$ 563	$ 568	$ 574	$ 580	$ 586	$ 592	$ 597
Total WCI Operations Costs	**$ (928,525)**	**$ (947,410)**	**$ (966,772)**	**$ (986,625)**	**$ (1,006,981)**	**$ (1,027,856)**	**$ (1,049,263)**	**$ (1,071,219)**	**$ (1,093,738)**	**$ (1,116,836)**	**$ (1,140,531)**	**$ (1,164,837)**	**$ (1,189,774)**	**$ (1,215,359)**
Total Coalition Operating Costs	**$ (758,000)**	**$ (776,950)**	**$ (796,374)**	**$ (816,283)**	**$ (836,690)**	**$ (857,607)**	**$ (879,048)**	**$ (901,024)**	**$ (923,549)**	**$ (946,638)**	**$ (970,304)**	**$ (994,562)**	**$ (1,019,426)**	**$ (1,044,911)**
Total Operations Costs	**$ (1,686,525)**	**$ (1,724,360)**	**$ (1,763,146)**	**$ (1,802,908)**	**$ (1,843,671)**	**$ (1,885,463)**	**$ (1,928,311)**	**$ (1,972,243)**	**$ (2,017,287)**	**$ (2,063,474)**	**$ (2,110,835)**	**$ (2,159,399)**	**$ (2,209,200)**	**$ (2,260,271)**
Total CIP Costs	**$ (250,000)**	**$ (205,000)**	**$ (2,889,230)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (3,631,220)**	**$ -**
Total Revenue	**$ 2,688,000**	**$ 2,714,880**	**$ 2,742,029**	**$ 2,769,449**	**$ 2,797,144**	**$ 2,825,115**	**$ 2,853,366**	**$ 2,881,900**	**$ 2,910,719**	**$ 2,939,826**	**$ 2,969,224**	**$ 2,998,917**	**$ 3,028,906**	**$ 3,059,195**
Beginning Balance	**$ 7,000,000**	**$ 7,891,475**	**$ 8,832,024**	**$ 7,095,217**	**$ 8,200,192**	**$ 9,314,899**	**$ 10,437,624**	**$ 11,567,770**	**$ 12,704,681**	**$ 13,847,661**	**$ 14,995,975**	**$ 16,148,845**	**$ 17,305,449**	**$ 14,833,702**
Annual Change	**$ 751,475**	**$ 785,520**	**$ (1,910,347)**	**$ 966,541**	**$ 953,472**	**$ 939,652**	**$ 925,055**	**$ 909,657**	**$ 893,431**	**$ 876,352**	**$ 858,390**	**$ 839,517**	**$ (2,811,514)**	**$ 798,924**
Change From Investments	**$ 140,000**	**$ 155,030**	**$ 173,540**	**$ 138,434**	**$ 161,235**	**$ 183,073**	**$ 205,091**	**$ 227,254**	**$ 249,549**	**$ 271,962**	**$ 294,480**	**$ 317,087**	**$ 339,767**	**$ 289,879**
Ending Balance (Cash Balance)	**$ 7,891,475**	**$ 8,832,024**	**$ 7,095,217**	**$ 8,200,192**	**$ 9,314,899**	**$ 10,437,624**	**$ 11,567,770**	**$ 12,704,681**	**$ 13,847,661**	**$ 14,995,975**	**$ 16,148,845**	**$ 17,305,449**	**$ 14,833,702**	**$ 15,922,505**

2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
128,741	130,029	131,329	132,642	133,969	135,308	136,661	138,028	139,408	140,802	142,210	143,632	145,069	146,519	147,985	149,464
$ 726,043	$ 747,824	$ 770,259	$ 793,367	$ 817,168	$ 841,683	$ 866,933	$ 892,941	$ 919,730	$ 947,322	$ 975,741	$ 1,005,013	$ 1,035,164	$ 1,066,219	$ 1,098,205	$ 1,131,151
$ 514,964	$ 520,114	$ 525,315	$ 530,568	$ 535,874	$ 541,233	$ 546,645	$ 552,112	$ 557,633	$ 563,209	$ 568,841	$ 574,530	$ 580,275	$ 586,078	$ 591,938	$ 597,858
$ 603	$ 610	$ 616	$ 622	$ 628	$ 634	$ 641	$ 647	$ 653	$ 660	$ 667	$ 673	$ 680	$ 687	$ 694	$ 701
$ (1,241,611)	**$ (1,268,548)**	**$ (1,296,190)**	**$ (1,324,557)**	**$ (1,353,670)**	**$ (1,383,550)**	**$ (1,414,219)**	**$ (1,445,700)**	**$ (1,478,016)**	**$ (1,511,191)**	**$ (1,545,249)**	**$ (1,580,216)**	**$ (1,616,119)**	**$ (1,652,983)**	**$ (1,690,837)**	**$ (1,729,710)**
$ (1,071,034)	**$ (1,097,810)**	**$ (1,125,255)**	**$ (1,153,387)**	**$ (1,182,221)**	**$ (1,211,777)**	**$ (1,242,071)**	**$ (1,273,123)**	**$ (1,304,951)**	**$ (1,337,575)**	**$ (1,371,014)**	**$ (1,405,290)**	**$ (1,440,422)**	**$ (1,476,432)**	**$ (1,513,343)**	**$ (1,551,177)**
$ (2,312,645)	**$ (2,366,358)**	**$ (2,421,445)**	**$ (2,477,944)**	**$ (2,535,891)**	**$ (2,595,327)**	**$ (2,656,290)**	**$ (2,718,823)**	**$ (2,782,967)**	**$ (2,848,765)**	**$ (2,916,263)**	**$ (2,985,506)**	**$ (3,056,541)**	**$ (3,129,416)**	**$ (3,204,181)**	**$ (3,280,887)**
$ -	**$ -**	**$ (1,484,510)**	**$ -**	**$ -**	**$ -**	**$ (327,730)**	**$ (8,935,400)**	**$ -**	**$ -**	**$ -**	**$ (1,853,950)**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,089,787	**$ 3,120,685**	**$ 3,151,891**	**$ 3,183,410**	**$ 3,215,244**	**$ 3,247,397**	**$ 3,279,871**	**$ 3,312,670**	**$ 3,345,796**	**$ 3,379,254**	**$ 3,413,047**	**$ 3,447,177**	**$ 3,481,649**	**$ 3,516,465**	**$ 3,551,630**	**$ 3,587,146**
$ 15,922,505	**$ 17,012,299**	**$ 18,100,618**	**$ 17,701,887**	**$ 18,754,285**	**$ 19,801,785**	**$ 20,842,528**	**$ 21,547,455**	**$ 13,628,669**	**$ 14,455,617**	**$ 15,269,936**	**$ 16,066,441**	**$ 14,989,497**	**$ 15,708,089**	**$ 16,403,431**	**$ 17,072,783**
$ 777,142	**$ 754,327**	**$ (754,064)**	**$ 705,467**	**$ 679,353**	**$ 652,070**	**$ 295,850**	**$ (8,341,553)**	**$ 562,829**	**$ 530,489**	**$ 496,784**	**$ (1,392,279)**	**$ 425,108**	**$ 387,050**	**$ 347,450**	**$ 306,260**
$ 312,653	**$ 333,993**	**$ 355,333**	**$ 346,931**	**$ 368,147**	**$ 388,673**	**$ 409,077**	**$ 422,768**	**$ 264,118**	**$ 283,830**	**$ 299,722**	**$ 315,334**	**$ 293,483**	**$ 308,292**	**$ 321,903**	**$ 335,018**
$ 17,012,299	**$ 18,100,618**	**$ 17,701,887**	**$ 18,754,285**	**$ 19,801,785**	**$ 20,842,528**	**$ 21,547,455**	**$ 13,628,669**	**$ 14,455,617**	**$ 15,269,936**	**$ 16,066,441**	**$ 14,989,497**	**$ 15,708,089**	**$ 16,403,431**	**$ 17,072,783**	**$ 17,714,060**

2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
150,959	152,469	153,993	155,533	157,089	158,660	160,246	161,849	163,467	165,102	166,753	168,420	170,104	171,806	173,524
$ 1,165,086	$ 1,200,039	$ 1,236,040	$ 1,273,121	$ 1,311,315	$ 1,350,654	$ 1,391,174	$ 1,432,909	$ 1,475,896	$ 1,520,173	$ 1,565,778	$ 1,612,751	$ 1,661,134	$ 1,710,968	$ 1,762,297
$ 603,836	$ 609,875	$ 615,973	$ 622,133	$ 628,354	$ 634,638	$ 640,984	$ 647,394	$ 653,868	$ 660,407	$ 667,011	$ 673,681	$ 680,418	$ 687,222	$ 694,094
$ 708	$ 715	$ 722	$ 729	$ 736	$ 744	$ 751	$ 759	$ 766	$ 774	$ 782	$ 789	$ 797	$ 805	$ 813
$ (1,769,630)	**$ (1,810,628)**	**$ (1,852,735)**	**$ (1,895,983)**	**$ (1,940,405)**	**$ (1,986,036)**	**$ (2,032,909)**	**$ (2,081,062)**	**$ (2,130,531)**	**$ (2,181,354)**	**$ (2,233,571)**	**$ (2,287,222)**	**$ (2,342,349)**	**$ (2,398,995)**	**$ (2,457,205)**
$ (1,589,956)	**$ (1,629,705)**	**$ (1,670,448)**	**$ (1,712,209)**	**$ (1,755,014)**	**$ (1,798,890)**	**$ (1,843,862)**	**$ (1,889,958)**	**$ (1,937,207)**	**$ (1,985,637)**	**$ (2,035,278)**	**$ (2,086,160)**	**$ (2,138,314)**	**$ (2,191,772)**	**$ (2,246,567)**
$ (3,359,586)	**$ (3,440,333)**	**$ (3,523,183)**	**$ (3,608,192)**	**$ (3,695,420)**	**$ (3,784,925)**	**$ (3,876,771)**	**$ (3,971,020)**	**$ (4,067,738)**	**$ (4,166,991)**	**$ (4,268,849)**	**$ (4,373,382)**	**$ (4,480,664)**	**$ (4,590,768)**	**$ (4,703,771)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (511,140)**	**$ (7,780,150)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,623,018	**$ 3,659,248**	**$ 3,695,841**	**$ 3,732,799**	**$ 3,770,127**	**$ 3,807,828**	**$ 3,845,906**	**$ 3,884,366**	**$ 3,923,209**	**$ 3,962,441**	**$ 4,002,066**	**$ 4,042,086**	**$ 4,082,507**	**$ 4,123,332**	**$ 4,164,566**
$ 17,714,060	**$ 18,325,073**	**$ 18,903,538**	**$ 19,447,075**	**$ 19,953,206**	**$ 20,419,347**	**$ 20,842,808**	**$ 21,220,789**	**$ 21,550,373**	**$ 21,317,388**	**$ 13,750,582**	**$ 13,750,452**	**$ 13,688,832**	**$ 13,559,059**	**$ 13,357,437**
$ 263,432	**$ 218,915**	**$ 172,658**	**$ 124,607**	**$ 74,707**	**$ 22,903**	**$ (30,864)**	**$ (86,654)**	**$ (655,669)**	**$ (7,984,700)**	**$ (266,783)**	**$ (331,296)**	**$ (398,156)**	**$ (467,435)**	**$ (539,206)**
$ 347,581	**$ 359,550**	**$ 370,880**	**$ 381,524**	**$ 391,434**	**$ 400,558**	**$ 408,845**	**$ 416,239**	**$ 422,683**	**$ 417,894**	**$ 266,654**	**$ 269,676**	**$ 268,383**	**$ 265,814**	**$ 261,832**
$ 18,325,073	**$ 18,903,538**	**$ 19,447,075**	**$ 19,953,206**	**$ 20,419,347**	**$ 20,842,808**	**$ 21,220,789**	**$ 21,550,373**	**$ 21,317,388**	**$ 13,750,582**	**$ 13,750,452**	**$ 13,688,832**	**$ 13,559,059**	**$ 13,357,437**	**$ 13,080,064**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
175,259	177,011	178,782	180,569	182,375	184,199	186,041	187,901	189,780	191,678	193,595	195,531	197,486
$ 1,815,166	$ 1,869,621	$ 1,925,710	$ 1,983,481	$ 2,042,985	$ 2,104,275	$ 2,167,403	$ 2,232,425	$ 2,299,398	$ 2,368,380	$ 2,439,431	$ 2,512,614	$ 2,587,993
$ 701,035	$ 708,046	$ 715,126	$ 722,277	$ 729,500	$ 736,795	$ 744,163	$ 751,605	$ 759,121	$ 766,712	$ 774,379	$ 782,123	$ 789,944
$ 822	$ 830	$ 838	$ 846	$ 855	$ 863	$ 872	$ 881	$ 890	$ 898	$ 907	$ 917	$ 926
$ (2,517,023)	**$ (2,578,496)**	**$ (2,641,674)**	**$ (2,706,605)**	**$ (2,773,340)**	**$ (2,841,933)**	**$ (2,912,438)**	**$ (2,984,911)**	**$ (3,059,408)**	**$ (3,135,990)**	**$ (3,214,718)**	**$ (3,295,654)**	**$ (3,378,862)**
$ (2,302,731)	**$ (2,360,299)**	**$ (2,419,306)**	**$ (2,479,789)**	**$ (2,541,784)**	**$ (2,605,328)**	**$ (2,670,462)**	**$ (2,737,223)**	**$ (2,805,654)**	**$ (2,875,795)**	**$ (2,947,690)**	**$ (3,021,382)**	**$ (3,096,917)**
$ (4,819,753)	**$ (4,938,795)**	**$ (5,060,980)**	**$ (5,186,394)**	**$ (5,315,124)**	**$ (5,447,262)**	**$ (5,582,900)**	**$ (5,722,134)**	**$ (5,865,062)**	**$ (6,011,785)**	**$ (6,162,408)**	**$ (6,317,036)**	**$ (6,475,779)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (722,230)**	**$ (6,292,370)**	**$ -**	**$ -**	**$ -**	**$ -**
$ 4,206,211	**$ 4,248,273**	**$ 4,290,756**	**$ 4,333,664**	**$ 4,377,000**	**$ 4,420,770**	**$ 4,464,978**	**$ 4,509,628**	**$ 4,554,724**	**$ 4,600,271**	**$ 4,646,274**	**$ 4,692,737**	**$ 4,739,664**
$ 13,080,064	**$ 12,722,886**	**$ 12,281,695**	**$ 11,752,118**	**$ 11,129,618**	**$ 10,409,482**	**$ 9,586,820**	**$ 8,656,558**	**$ 6,891,200**	**$ (577,071)**	**$ (2,002,816)**	**$ (3,558,721)**	**$ (5,253,399)**
$ (613,542)	**$ (690,522)**	**$ (770,224)**	**$ (852,730)**	**$ (938,124)**	**$ (1,026,491)**	**$ (1,117,922)**	**$ (1,934,736)**	**$ (7,602,708)**	**$ (1,411,514)**	**$ (1,516,134)**	**$ (1,624,299)**	**$ (1,736,115)**
$ 256,365	**$ 249,330**	**$ 240,647**	**$ 230,229**	**$ 217,988**	**$ 203,830**	**$ 187,660**	**$ 169,378**	**$ 134,436**	**$ (14,230)**	**$ (39,772)**	**$ (70,379)**	**$ (103,660)**
$ 12,722,886	**$ 12,281,695**	**$ 11,752,118**	**$ 11,129,618**	**$ 10,409,482**	**$ 9,586,820**	**$ 8,656,558**	**$ 6,891,200**	**$ (577,071)**	**$ (2,002,816)**	**$ (3,558,721)**	**$ (5,253,399)**	**$ (7,093,175)**


NNSWC Revenue Analysis - Baseline
Ending Cash Balance
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Total Operations Costs
Total CIP Costs
Total Revenue
Ending Balance (Cash Balance)

NNSWC Revenue Analysis - Tonnage Increase

Interest:	3.50%		[input from "operation inputs"]
Inflation:	2.50%		[input from "operation inputs"]
Current Year:	2021		[input from "operation inputs"]

WCI Operation Costs			
WCI Fixed Fee:	$ 480,000	annually	[input from "operation inputs"]
Annual Increase in Fixed Fee:	3.0%		[input from "operation inputs"]
WCI Tonnage Fee:	$4	per ton	[input from "operation inputs"]
Annual Increase in Tonnage Fee:	0%		[input from "operation inputs"]
WCI Special Waste Fee:	$10.50	per ton	[input from "operation inputs"]
Annual Increase in Special Waste Fee:	0%		[input from "operation inputs"]
2020 Annual Tonnage (assumed):	134,400	tons	[input from "operation inputs"]
2020 Special Waste Tonnage (assumed):	50	tons	[input from "operation inputs"]
Annual Tonnage Increase:	1%	per year	[input from "operation inputs"]
Starting Year:	2021		[input from "operation inputs"]

Coalition Operating Costs		
Personnel Costs	$ 94,734	[input from "operation inputs"]
Operating & Maintenance Costs	$ 30,577	[input from "operation inputs"]
Other Admin. and Overhead	$ 22,455	[input from "operation inputs"]
Other Misc.	$ 10,000	[input from "operation inputs"]
FA Fund Transfers	$ 350,000	[input from "operation inputs"]
Professional Services	$ 250,000	[input from "operation inputs"]
Total Coalition Costs:	**$ (758,000)**	

Capital Costs

	PV Cost	Execution Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Cell 6 Ph 1 Engineering	$ 200,000	2022	$ 250,000	$ 205,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 Construction	$ 2,500,000	2023	$ -	$ -	$ 2,626,570	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 CA	$ 250,000	2023	$ -	$ -	$ 262,660	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scales	$ 300,000	2031	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 384,030
Facility Improvement - Scale House	$ 400,000	2031	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 512,040
Facility Improvement - Equipment Building	$ 1,200,000	2031	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,536,110
Facility Improvement - Drop-Off Area	$ 200,000	2031	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 256,020
Facility Improvement - Asphalt Pavement	$ 600,000	2031	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 768,060
Facility Improvement - Land Acquisition	$ 1,000,000	2033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Engineering	$ 200,000	2037	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Construction	$ 3,700,000	2038	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 CA	$ 370,000	2038	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 1-6 Ph 1 Closure*	$ 3,100,000	2038	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Sedimentation Basin	$ 250,000	2038	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Leachate Pond	$ 1,000,000	2038	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Landfill Gas Flare	$ 1,000,000	2046	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Engineering	$ 200,000	2053	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Construction	$ 2,700,000	2054	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 CA	$ 270,000	2054	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Closure*	$ 2,700,000	2054	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Engineering	$ 200,000	2066	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Construction	$ 1,500,000	2067	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 CA	$ 200,000	2067	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Closure*	$ 4,000,000	2067	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Ph 2 Closure*	$ 2,300,000	2070	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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Insert Row Above Here			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Total CIP	**$ 250,000**	**$ 205,000**	**$ 2,889,230**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 3,456,260**

Revenues

	2020 Rates	% Increase/ Decrease	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annual Tonnage	134,400	1%	134,400	135,744	137,101	138,472	139,857	141,256	142,668	144,095	145,536	146,991	148,461
Tipping Fee	$ 24.00	0%	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
		Total Revenues	**$ 3,225,600**	**$ 3,257,856**	**$ 3,290,435**	**$ 3,323,339**	**$ 3,356,572**	**$ 3,390,138**	**$ 3,424,039**	**$ 3,458,280**	**$ 3,492,863**	**$ 3,527,791**	**$ 3,563,069**

*Closure cost to be funded via FA funds

2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ -	$ 1,344,890	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ 296,910	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ 5,629,990	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
149,946	151,445	152,960	154,489	156,034	157,595	159,171	160,762	162,370	163,994	165,633	167,290	168,963	170,652	172,359	174,082	175,823
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 3,598,700	**$ 3,634,687**	**$ 3,671,034**	**$ 3,707,744**	**$ 3,744,821**	**$ 3,782,270**	**$ 3,820,092**	**$ 3,858,293**	**$ 3,896,876**	**$ 3,935,845**	**$ 3,975,203**	**$ 4,014,955**	**$ 4,055,105**	**$ 4,095,656**	**$ 4,136,613**	**$ 4,177,979**	**$ 4,219,759**

2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
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$ -	**$ -**	**$ -**	**$ -**	**$ 440,760**	**$ 6,708,790**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
177,582	179,357	181,151	182,962	184,792	186,640	188,506	190,391	192,295	194,218	196,160	198,122	200,103	202,104	204,125	206,167	208,228
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 4,261,956	**$ 4,304,576**	**$ 4,347,621**	**$ 4,391,098**	**$ 4,435,009**	**$ 4,479,359**	**$ 4,524,152**	**$ 4,569,394**	**$ 4,615,088**	**$ 4,661,239**	**$ 4,707,851**	**$ 4,754,930**	**$ 4,802,479**	**$ 4,850,504**	**$ 4,899,009**	**$ 4,947,999**	**$ 4,997,479**

2066	2067	2068	2069	2070
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$ -	$ -	$ -	$ -	$ -
$ 607,590	$ -	$ -	$ -	$ -
$ -	$ 4,670,780	$ -	$ -	$ -
$ -	$ 622,780	$ -	$ -	$ -
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$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -
$ 607,590	**$ 5,293,560**	**$ -**	**$ -**	**$ -**

2066	2067	2068	2069	2070
210,311	212,414	214,538	216,683	218,850
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 5,047,454	**$ 5,097,928**	**$ 5,148,907**	**$ 5,200,396**	**$ 5,252,400**

NNSWC Revenue Analysis - Tonnage Increase

Beginning Balance:	$ 7,000,000.00
Interest:	3.50%
Inflation:	2.50%
Investment APR:	2.00%
Starting Year:	2021

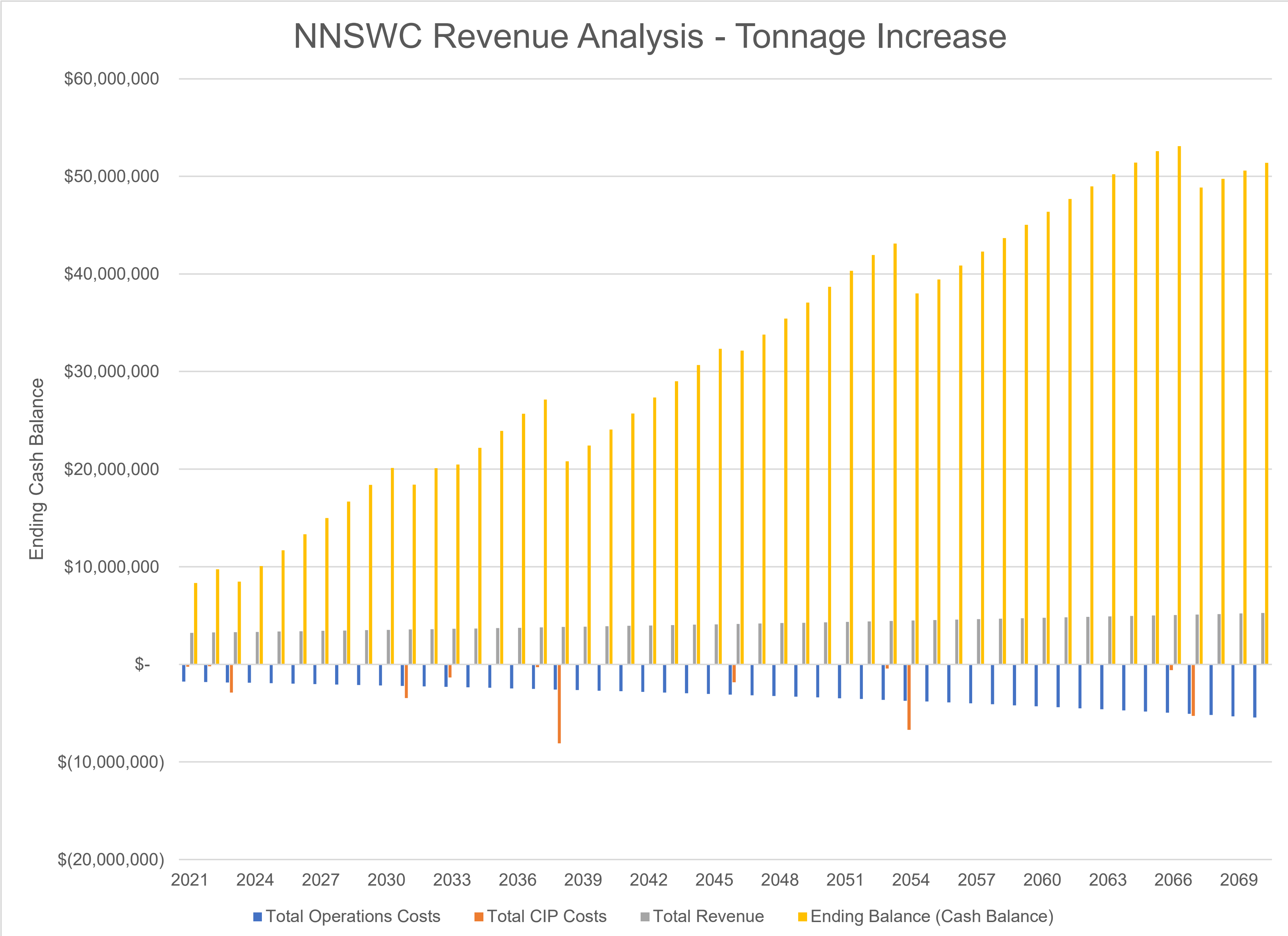
ProForma

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Annual Tonnages	134,400	135,744	137,101	138,472	139,857	141,256	142,668	144,095	145,536	146,991	148,461	149,946	151,445
Fixed Fee	$ 480,000	$ 494,400	$ 509,232	$ 524,509	$ 540,244	$ 556,452	$ 573,145	$ 590,339	$ 608,050	$ 626,291	$ 645,080	$ 664,432	$ 684,365
Tonnage Fee	$ 537,600	$ 542,976	$ 548,406	$ 553,890	$ 559,429	$ 565,023	$ 570,673	$ 576,380	$ 582,144	$ 587,965	$ 593,845	$ 599,783	$ 605,781
Special Waste Fee	$ 525	$ 530	$ 536	$ 541	$ 546	$ 552	$ 557	$ 563	$ 568	$ 574	$ 580	$ 586	$ 592
Total WCI Operations Costs	**$ (1,018,125)**	**$ (1,037,906)**	**$ (1,058,173)**	**$ (1,078,940)**	**$ (1,100,219)**	**$ (1,122,026)**	**$ (1,144,376)**	**$ (1,167,282)**	**$ (1,190,762)**	**$ (1,214,831)**	**$ (1,239,505)**	**$ (1,264,801)**	**$ (1,290,738)**
Total Coalition Operating Costs	**$ (758,000)**	**$ (776,950)**	**$ (796,374)**	**$ (816,283)**	**$ (836,690)**	**$ (857,607)**	**$ (879,048)**	**$ (901,024)**	**$ (923,549)**	**$ (946,638)**	**$ (970,304)**	**$ (994,562)**	**$ (1,019,426)**
Total Operations Costs	**$ (1,776,125)**	**$ (1,814,856)**	**$ (1,854,547)**	**$ (1,895,223)**	**$ (1,936,909)**	**$ (1,979,634)**	**$ (2,023,423)**	**$ (2,068,306)**	**$ (2,114,311)**	**$ (2,161,469)**	**$ (2,209,809)**	**$ (2,259,363)**	**$ (2,310,164)**
Total CIP Costs	**$ (250,000)**	**$ (205,000)**	**$ (2,889,230)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (3,456,260)**	**$ -**	**$ (1,344,890)**
Total Revenue	**$ 3,225,600**	**$ 3,257,856**	**$ 3,290,435**	**$ 3,323,339**	**$ 3,356,572**	**$ 3,390,138**	**$ 3,424,039**	**$ 3,458,280**	**$ 3,492,863**	**$ 3,527,791**	**$ 3,563,069**	**$ 3,598,700**	**$ 3,634,687**
Beginning Balance	**$ 7,000,000**	**$ 8,339,475**	**$ 9,741,464**	**$ 8,479,671**	**$ 10,073,550**	**$ 11,691,368**	**$ 13,331,737**	**$ 14,994,391**	**$ 16,679,011**	**$ 18,385,250**	**$ 20,112,724**	**$ 18,404,756**	**$ 20,104,287**
Annual Change	**$ 1,199,475**	**$ 1,238,000**	**$ (1,453,343)**	**$ 1,428,116**	**$ 1,419,663**	**$ 1,410,504**	**$ 1,400,616**	**$ 1,389,974**	**$ 1,378,551**	**$ 1,366,323**	**$ (2,103,000)**	**$ 1,339,337**	**$ (20,367)**
Change from Investments	**$ 140,000**	**$ 163,990**	**$ 191,549**	**$ 165,762**	**$ 198,156**	**$ 229,864**	**$ 262,037**	**$ 294,647**	**$ 327,687**	**$ 361,151**	**$ 395,031**	**$ 360,194**	**$ 394,882**
Ending Balance (Cash Balance)	**$ 8,339,475**	**$ 9,741,464**	**$ 8,479,671**	**$ 10,073,550**	**$ 11,691,368**	**$ 13,331,737**	**$ 14,994,391**	**$ 16,679,011**	**$ 18,385,250**	**$ 20,112,724**	**$ 18,404,756**	**$ 20,104,287**	**$ 20,478,802**

2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
152,960	154,489	156,034	157,595	159,171	160,762	162,370	163,994	165,633	167,290	168,963	170,652	172,359	174,082	175,823
$ 704,896	$ 726,043	$ 747,824	$ 770,259	$ 793,367	$ 817,168	$ 841,683	$ 866,933	$ 892,941	$ 919,730	$ 947,322	$ 975,741	$ 1,005,013	$ 1,035,164	$ 1,066,219
$ 611,839	$ 617,957	$ 624,137	$ 630,378	$ 636,682	$ 643,049	$ 649,479	$ 655,974	$ 662,534	$ 669,159	$ 675,851	$ 682,609	$ 689,435	$ 696,330	$ 703,293
$ 597	$ 603	$ 610	$ 616	$ 622	$ 628	$ 634	$ 641	$ 647	$ 653	$ 660	$ 667	$ 673	$ 680	$ 687
$ (1,317,333)	**$ (1,344,604)**	**$ (1,372,571)**	**$ (1,401,253)**	**$ (1,430,671)**	**$ (1,460,845)**	**$ (1,491,797)**	**$ (1,523,548)**	**$ (1,556,122)**	**$ (1,589,542)**	**$ (1,623,832)**	**$ (1,659,017)**	**$ (1,695,122)**	**$ (1,732,174)**	**$ (1,770,199)**
$ (1,044,911)	**$ (1,071,034)**	**$ (1,097,810)**	**$ (1,125,255)**	**$ (1,153,387)**	**$ (1,182,221)**	**$ (1,211,777)**	**$ (1,242,071)**	**$ (1,273,123)**	**$ (1,304,951)**	**$ (1,337,575)**	**$ (1,371,014)**	**$ (1,405,290)**	**$ (1,440,422)**	**$ (1,476,432)**
$ (2,362,244)	**$ (2,415,638)**	**$ (2,470,381)**	**$ (2,526,508)**	**$ (2,584,057)**	**$ (2,643,066)**	**$ (2,703,573)**	**$ (2,765,619)**	**$ (2,829,245)**	**$ (2,894,493)**	**$ (2,961,407)**	**$ (3,030,031)**	**$ (3,100,412)**	**$ (3,172,595)**	**$ (3,246,631)**
$ -	**$ -**	**$ -**	**$ (296,910)**	**$ (8,095,020)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (1,853,950)**	**$ -**	**$ -**
$ 3,671,034	**$ 3,707,744**	**$ 3,744,821**	**$ 3,782,270**	**$ 3,820,092**	**$ 3,858,293**	**$ 3,896,876**	**$ 3,935,845**	**$ 3,975,203**	**$ 4,014,955**	**$ 4,055,105**	**$ 4,095,656**	**$ 4,136,613**	**$ 4,177,979**	**$ 4,219,759**
$ 20,478,802	**$ 22,189,270**	**$ 23,917,128**	**$ 25,661,196**	**$ 27,123,879**	**$ 20,797,295**	**$ 22,417,820**	**$ 24,051,373**	**$ 25,693,821**	**$ 27,344,211**	**$ 29,001,469**	**$ 30,664,460**	**$ 32,331,988**	**$ 32,148,841**	**$ 33,784,509**
$ 1,308,790	**$ 1,292,106**	**$ 1,274,441**	**$ 958,851**	**$ (6,858,985)**	**$ 1,215,227**	**$ 1,193,303**	**$ 1,170,226**	**$ 1,145,958**	**$ 1,120,462**	**$ 1,093,698**	**$ 1,065,625**	**$ (817,749)**	**$ 1,005,383**	**$ 973,128**
$ 401,678	**$ 435,752**	**$ 469,628**	**$ 503,831**	**$ 532,401**	**$ 405,298**	**$ 440,250**	**$ 472,222**	**$ 504,432**	**$ 536,796**	**$ 569,293**	**$ 601,903**	**$ 634,602**	**$ 630,285**	**$ 663,084**
$ 22,189,270	**$ 23,917,128**	**$ 25,661,196**	**$ 27,123,879**	**$ 20,797,295**	**$ 22,417,820**	**$ 24,051,373**	**$ 25,693,821**	**$ 27,344,211**	**$ 29,001,469**	**$ 30,664,460**	**$ 32,331,988**	**$ 32,148,841**	**$ 33,784,509**	**$ 35,420,721**

2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062
177,582	179,357	181,151	182,962	184,792	186,640	188,506	190,391	192,295	194,218	196,160	198,122	200,103	202,104
$ 1,098,205	$ 1,131,151	$ 1,165,086	$ 1,200,039	$ 1,236,040	$ 1,273,121	$ 1,311,315	$ 1,350,654	$ 1,391,174	$ 1,432,909	$ 1,475,896	$ 1,520,173	$ 1,565,778	$ 1,612,751
$ 710,326	$ 717,429	$ 724,604	$ 731,850	$ 739,168	$ 746,560	$ 754,025	$ 761,566	$ 769,181	$ 776,873	$ 784,642	$ 792,488	$ 800,413	$ 808,417
$ 694	$ 701	$ 708	$ 715	$ 722	$ 729	$ 736	$ 744	$ 751	$ 759	$ 766	$ 774	$ 782	$ 789
$ (1,809,225)	**$ (1,849,281)**	**$ (1,890,397)**	**$ (1,932,603)**	**$ (1,975,930)**	**$ (2,020,410)**	**$ (2,066,076)**	**$ (2,112,963)**	**$ (2,161,106)**	**$ (2,210,541)**	**$ (2,261,304)**	**$ (2,313,435)**	**$ (2,366,973)**	**$ (2,421,958)**
$ (1,513,343)	**$ (1,551,177)**	**$ (1,589,956)**	**$ (1,629,705)**	**$ (1,670,448)**	**$ (1,712,209)**	**$ (1,755,014)**	**$ (1,798,890)**	**$ (1,843,862)**	**$ (1,889,958)**	**$ (1,937,207)**	**$ (1,985,637)**	**$ (2,035,278)**	**$ (2,086,160)**
$ (3,322,568)	**$ (3,400,458)**	**$ (3,480,353)**	**$ (3,562,308)**	**$ (3,646,377)**	**$ (3,732,619)**	**$ (3,821,090)**	**$ (3,911,853)**	**$ (4,004,968)**	**$ (4,100,499)**	**$ (4,198,511)**	**$ (4,299,073)**	**$ (4,402,251)**	**$ (4,508,119)**
$ -	**$ -**	**$ -**	**$ -**	**$ (440,760)**	**$ (6,708,790)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
$ 4,261,956	**$ 4,304,576**	**$ 4,347,621**	**$ 4,391,098**	**$ 4,435,009**	**$ 4,479,359**	**$ 4,524,152**	**$ 4,569,394**	**$ 4,615,088**	**$ 4,661,239**	**$ 4,707,851**	**$ 4,754,930**	**$ 4,802,479**	**$ 4,850,504**
$ 35,420,721	**$ 37,055,261**	**$ 38,686,581**	**$ 40,313,037**	**$ 41,932,903**	**$ 43,103,611**	**$ 37,987,177**	**$ 39,433,070**	**$ 40,864,416**	**$ 42,276,348**	**$ 43,666,578**	**$ 45,032,660**	**$ 46,372,035**	**$ 47,682,033**
$ 939,388	**$ 904,118**	**$ 867,268**	**$ 828,790**	**$ 347,871**	**$ (5,962,050)**	**$ 703,062**	**$ 657,541**	**$ 610,120**	**$ 560,740**	**$ 509,340**	**$ 455,857**	**$ 400,228**	**$ 342,385**
$ 695,153	**$ 727,202**	**$ 759,188**	**$ 791,077**	**$ 822,837**	**$ 845,615**	**$ 742,831**	**$ 773,805**	**$ 801,812**	**$ 829,491**	**$ 856,742**	**$ 883,518**	**$ 909,770**	**$ 935,445**
$ 37,055,261	**$ 38,686,581**	**$ 40,313,037**	**$ 41,932,903**	**$ 43,103,611**	**$ 37,987,177**	**$ 39,433,070**	**$ 40,864,416**	**$ 42,276,348**	**$ 43,666,578**	**$ 45,032,660**	**$ 46,372,035**	**$ 47,682,033**	**$ 48,959,863**

2063	2064	2065	2066	2067	2068	2069	2070
204,125	206,167	208,228	210,311	212,414	214,538	216,683	218,850
$ 1,661,134	$ 1,710,968	$ 1,762,297	$ 1,815,166	$ 1,869,621	$ 1,925,710	$ 1,983,481	$ 2,042,985
$ 816,501	$ 824,666	$ 832,913	$ 841,242	$ 849,655	$ 858,151	$ 866,733	$ 875,400
$ 797	$ 805	$ 813	$ 822	$ 830	$ 838	$ 846	$ 855
$ (2,478,433)	**$ (2,536,440)**	**$ (2,596,024)**	**$ (2,657,230)**	**$ (2,720,105)**	**$ (2,784,699)**	**$ (2,851,060)**	**$ (2,919,240)**
$ (2,138,314)	**$ (2,191,772)**	**$ (2,246,567)**	**$ (2,302,731)**	**$ (2,360,299)**	**$ (2,419,306)**	**$ (2,479,789)**	**$ (2,541,784)**
$ (4,616,747)	**$ (4,728,212)**	**$ (4,842,590)**	**$ (4,959,960)**	**$ (5,080,404)**	**$ (5,204,005)**	**$ (5,330,849)**	**$ (5,461,024)**
$ -	**$ -**	**$ -**	**$ (607,590)**	**$ (5,293,560)**	**$ -**	**$ -**	**$ -**
$ 4,899,009	**$ 4,947,999**	**$ 4,997,479**	**$ 5,047,454**	**$ 5,097,928**	**$ 5,148,907**	**$ 5,200,396**	**$ 5,252,400**
$ 48,959,863	**$ 50,202,613**	**$ 51,407,242**	**$ 52,570,579**	**$ 53,081,724**	**$ 48,846,698**	**$ 49,747,714**	**$ 50,593,093**
$ 282,261	**$ 219,787**	**$ 154,889**	**$ (520,097)**	**$ (5,276,036)**	**$ (55,098)**	**$ (130,453)**	**$ (208,624)**
$ 960,488	**$ 984,842**	**$ 1,008,448**	**$ 1,031,243**	**$ 1,041,010**	**$ 956,114**	**$ 975,832**	**$ 992,345**
$ 50,202,613	**$ 51,407,242**	**$ 52,570,579**	**$ 53,081,724**	**$ 48,846,698**	**$ 49,747,714**	**$ 50,593,093**	**$ 51,376,814**


NNSWC Revenue Analysis - Tonnage Increase
Ending Cash Balance
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$-
$(10,000,000)
$(20,000,000)
2021
2024
2027
2030
2033
2036
2039
2042
2045
2048
2051
2054
2057
2060
2063
2066
2069
Total Operations Costs
Total CIP Costs
Total Revenue
Ending Balance (Cash Balance)

NNSWC Revenue Analysis - Tonnage Decrease

Interest:	3.50%		[input from "operation inputs"]
Inflation:	2.50%		[input from "operation inputs"]
Current Year:	2021		[input from "operation inputs"]
WCI Operation Costs			
WCI Fixed Fee:	$ 480,000	annually	[input from "operation inputs"]
Annual Increase in Fixed Fee:	3.0%		[input from "operation inputs"]
WCI Tonnage Fee:	$4	per ton	[input from "operation inputs"]
Annual Increase in Tonnage Fee:	0%		[input from "operation inputs"]
WCI Special Waste Fee:	$10.50	per ton	[input from "operation inputs"]
Annual Increase in Special Waste Fee:	0%		[input from "operation inputs"]
2020 Annual Tonnage (assumed):	89,600	tons	[input from "operation inputs"]
2020 Special Waste Tonnage (assumed):	50	tons	[input from "operation inputs"]
Annual Tonnage Increase:	1%	per year	[input from "operation inputs"]
Starting Year:	2021		[input from "operation inputs"]
Coalition Operating Costs			
Personnel Costs	$ 94,734		[input from "operation inputs"]
Operating & Maintenance Costs	$ 30,577		[input from "operation inputs"]
Other Admin. and Overhead	$ 22,455		[input from "operation inputs"]
Other Misc.	$ 10,000		[input from "operation inputs"]
FA Fund Transfers	$ 350,000		[input from "operation inputs"]
Professional Services	$ 250,000		[input from "operation inputs"]
Total Coalition Costs:	**$ (758,000)**		

Capital Costs

	PV Cost	Execution Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Cell 6 Ph 1 Engineering	$ 200,000	2023	$ 250,000	$ -	$ 210,130	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 Construction	$ 2,500,000	2024	$ -	$ -	$ -	$ 2,692,230	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 1 CA	$ 250,000	2024	$ -	$ -	$ -	$ 269,230	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scales	$ 300,000	2036	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Scale House	$ 400,000	2036	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Equipment Building	$ 1,200,000	2036	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Drop-Off Area	$ 200,000	2036	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Asphalt Pavement	$ 600,000	2036	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Land Acquisition	$ 1,000,000	2042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Engineering	$ 200,000	2046	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Construction	$ 3,700,000	2047	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 CA	$ 370,000	2047	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 1-6 Ph 1 Closure*	$ 3,100,000	2047	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Sedimentation Basin	$ 250,000	2047	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Leachate Pond	$ 1,000,000	2047	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facility Improvement - Landfill Gas Flare	$ 1,000,000	2048	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Engineering	$ 200,000	2066	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Construction	$ 2,700,000	2067	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 CA	$ 270,000	2067	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 6 Ph 2 Closure*	$ 2,700,000	2067	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Engineering	$ 200,000	2083	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Construction	$ 1,500,000	2084	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 CA	$ 200,000	2084	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 7 Closure*	$ 4,000,000	2084	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cell 8 Ph 2 Closure*	$ 2,300,000	2088	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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		Total CIP	**$ 250,000**	**$ -**	**$ 210,130**	**$ 2,961,460**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Revenues

	2020 Rates	% Increase/ Decrease	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annual Tonnage	89,600	1%	89,600	90,496	91,401	92,315	93,238	94,171	95,112	96,063	97,024	97,994	98,974
Tipping Fee	$ 24.00	0%	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
		Total Revenues	**$ 2,150,400**	**$ 2,171,904**	**$ 2,193,623**	**$ 2,215,559**	**$ 2,237,715**	**$ 2,260,092**	**$ 2,282,693**	**$ 2,305,520**	**$ 2,328,575**	**$ 2,351,861**	**$ 2,375,379**

2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
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2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
99,964	100,964	101,973	102,993	104,023	105,063	106,114	107,175	108,247	109,329	110,422	111,527	112,642	113,768	114,906	116,055	117,216
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$ 2,399,133	**$ 2,423,125**	**$ 2,447,356**	**$ 2,471,829**	**$ 2,496,548**	**$ 2,521,513**	**$ 2,546,728**	**$ 2,572,196**	**$ 2,597,917**	**$ 2,623,897**	**$ 2,650,136**	**$ 2,676,637**	**$ 2,703,403**	**$ 2,730,437**	**$ 2,757,742**	**$ 2,785,319**	**$ 2,813,172**

2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
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2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
118,388	119,572	120,767	121,975	123,195	124,427	125,671	126,928	128,197	129,479	130,774	132,081	133,402	134,736	136,084	137,444	138,819
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$ 2,841,304	**$ 2,869,717**	**$ 2,898,414**	**$ 2,927,398**	**$ 2,956,672**	**$ 2,986,239**	**$ 3,016,102**	**$ 3,046,263**	**$ 3,076,725**	**$ 3,107,492**	**$ 3,138,567**	**$ 3,169,953**	**$ 3,201,653**	**$ 3,233,669**	**$ 3,266,006**	**$ 3,298,666**	**$ 3,331,653**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082
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$ 607,590	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 8,407,400	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ 840,740	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ 607,590	**$ 9,248,140**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082
140,207	141,609	143,025	144,455	145,900	147,359	148,833	150,321	151,824	153,342	154,876	156,425	157,989	159,569	161,164	162,776	164,404
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 3,364,969	**$ 3,398,619**	**$ 3,432,605**	**$ 3,466,931**	**$ 3,501,600**	**$ 3,536,616**	**$ 3,571,982**	**$ 3,607,702**	**$ 3,643,779**	**$ 3,680,217**	**$ 3,717,019**	**$ 3,754,189**	**$ 3,791,731**	**$ 3,829,649**	**$ 3,867,945**	**$ 3,906,625**	**$ 3,945,691**

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$ 924,510	**$ 8,054,760**	**$ -**	**$ -**	**$ -**	**$ -**

2083	2084	2085	2086	2087	2088
166,048	167,708	169,385	171,079	172,790	174,518
$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00	$ 24.00
$ 3,985,148	**$ 4,024,999**	**$ 4,065,249**	**$ 4,105,902**	**$ 4,146,961**	**$ 4,188,430**

NNSWC Revenue Analysis - Tonnage Decrease

Beginning Balance:	$ 7,000,000.00
Interest:	3.50%
Inflation:	2.50%
Investment APR:	2.00%
Starting Year:	2021

ProForma

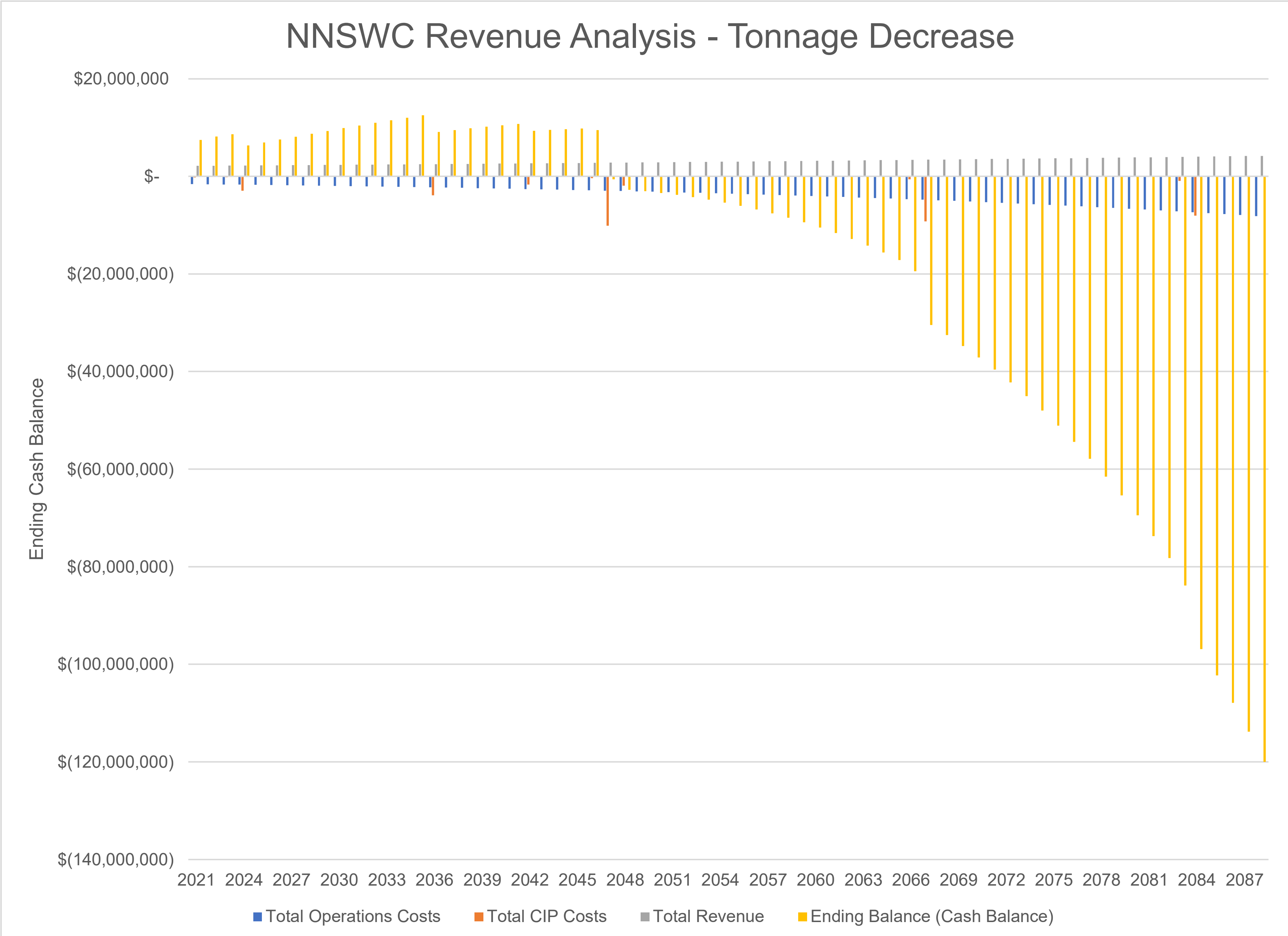
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Annual Tonnages	89,600	90,496	91,401	92,315	93,238	94,171	95,112	96,063	97,024	97,994	98,974	99,964	100,964
Fixed Fee	$ 480,000	$ 494,400	$ 509,232	$ 524,509	$ 540,244	$ 556,452	$ 573,145	$ 590,339	$ 608,050	$ 626,291	$ 645,080	$ 664,432	$ 684,365
Tonnage Fee	$ 358,400	$ 361,984	$ 365,604	$ 369,260	$ 372,952	$ 376,682	$ 380,449	$ 384,253	$ 388,096	$ 391,977	$ 395,897	$ 399,856	$ 403,854
Special Waste Fee	$ 525	$ 530	$ 536	$ 541	$ 546	$ 552	$ 557	$ 563	$ 568	$ 574	$ 580	$ 586	$ 592
Total WCI Operations Costs	**$ (838,925)**	**$ (856,914)**	**$ (875,371)**	**$ (894,310)**	**$ (913,743)**	**$ (933,685)**	**$ (954,151)**	**$ (975,156)**	**$ (996,714)**	**$ (1,018,842)**	**$ (1,041,556)**	**$ (1,064,874)**	**$ (1,088,811)**
Total Coalition Operating Costs	**$ (758,000)**	**$ (776,950)**	**$ (796,374)**	**$ (816,283)**	**$ (836,690)**	**$ (857,607)**	**$ (879,048)**	**$ (901,024)**	**$ (923,549)**	**$ (946,638)**	**$ (970,304)**	**$ (994,562)**	**$ (1,019,426)**
Total Operations Costs	**$ (1,596,925)**	**$ (1,633,864)**	**$ (1,671,745)**	**$ (1,710,593)**	**$ (1,750,433)**	**$ (1,791,293)**	**$ (1,833,199)**	**$ (1,876,179)**	**$ (1,920,263)**	**$ (1,965,480)**	**$ (2,011,860)**	**$ (2,059,435)**	**$ (2,108,237)**
Total CIP Costs	**$ (250,000)**	**$ -**	**$ (210,130)**	**$ (2,961,460)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Revenue	**$ 2,150,400**	**$ 2,171,904**	**$ 2,193,623**	**$ 2,215,559**	**$ 2,237,715**	**$ 2,260,092**	**$ 2,282,693**	**$ 2,305,520**	**$ 2,328,575**	**$ 2,351,861**	**$ 2,375,379**	**$ 2,399,133**	**$ 2,423,125**
Beginning Balance	**$ 7,000,000**	**$ 7,443,475**	**$ 8,127,584**	**$ 8,598,962**	**$ 6,311,256**	**$ 6,921,387**	**$ 7,526,157**	**$ 8,123,454**	**$ 8,712,308**	**$ 9,291,675**	**$ 9,860,468**	**$ 10,417,548**	**$ 10,961,726**
Annual Change	**$ 303,475**	**$ 538,040**	**$ 311,748**	**$ (2,456,494)**	**$ 487,282**	**$ 468,799**	**$ 449,494**	**$ 429,340**	**$ 408,312**	**$ 386,381**	**$ 363,519**	**$ 339,698**	**$ 314,888**
Change from Investments	**$ 140,000**	**$ 146,070**	**$ 159,630**	**$ 168,787**	**$ 122,849**	**$ 135,971**	**$ 147,804**	**$ 159,513**	**$ 171,056**	**$ 182,412**	**$ 193,561**	**$ 204,480**	**$ 215,145**
Ending Balance (Cash Balance)	**$ 7,443,475**	**$ 8,127,584**	**$ 8,598,962**	**$ 6,311,256**	**$ 6,921,387**	**$ 7,526,157**	**$ 8,123,454**	**$ 8,712,308**	**$ 9,291,675**	**$ 9,860,468**	**$ 10,417,548**	**$ 10,961,726**	**$ 11,491,759**

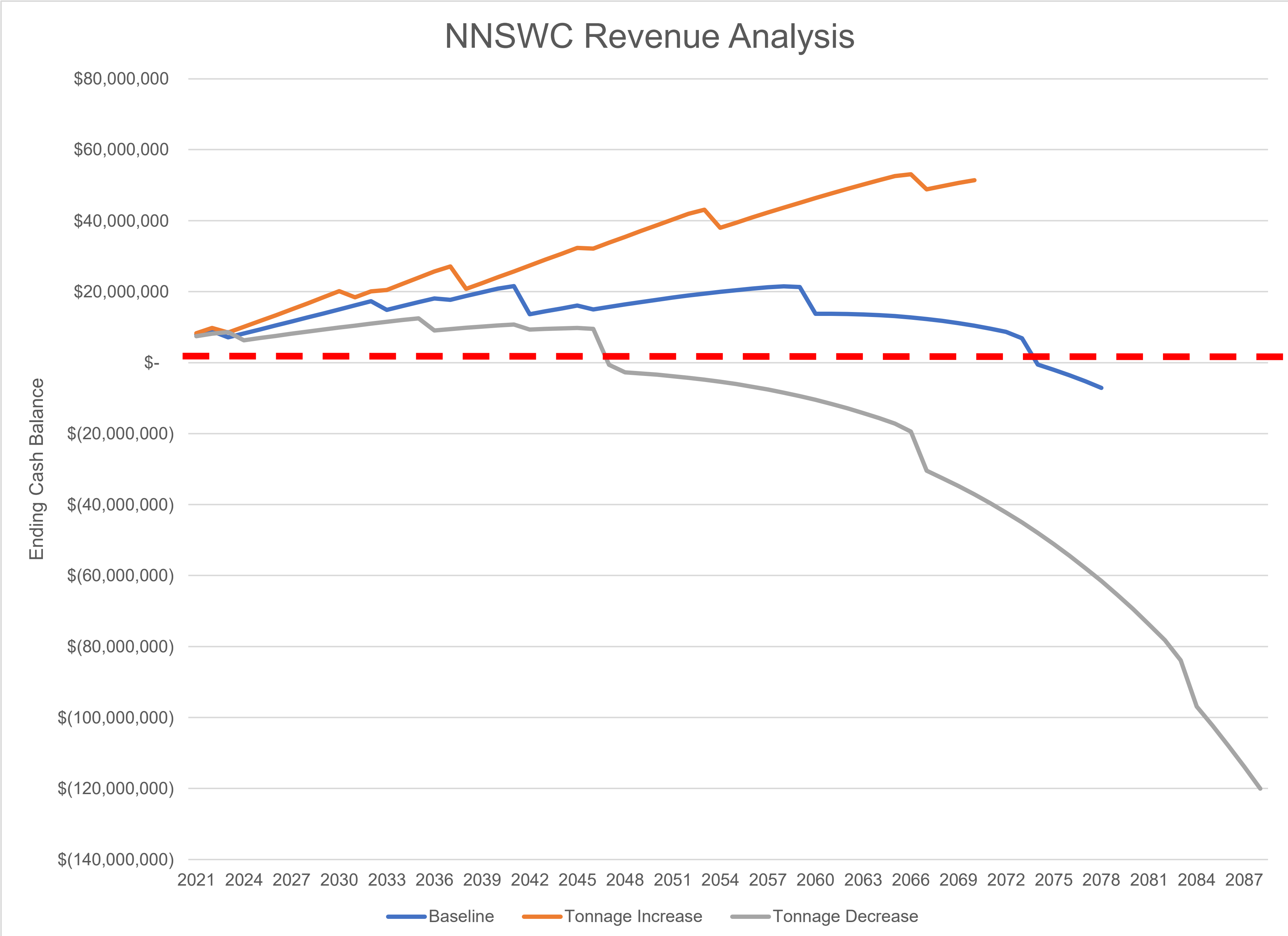
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
101,973	102,993	104,023	105,063	106,114	107,175	108,247	109,329	110,422	111,527	112,642	113,768	114,906	116,055	117,216
$ 704,896	$ 726,043	$ 747,824	$ 770,259	$ 793,367	$ 817,168	$ 841,683	$ 866,933	$ 892,941	$ 919,730	$ 947,322	$ 975,741	$ 1,005,013	$ 1,035,164	$ 1,066,219
$ 407,893	$ 411,972	$ 416,091	$ 420,252	$ 424,455	$ 428,699	$ 432,986	$ 437,316	$ 441,689	$ 446,106	$ 450,567	$ 455,073	$ 459,624	$ 464,220	$ 468,862
$ 597	$ 603	$ 610	$ 616	$ 622	$ 628	$ 634	$ 641	$ 647	$ 653	$ 660	$ 667	$ 673	$ 680	$ 687
$ (1,113,386)	**$ (1,138,618)**	**$ (1,164,525)**	**$ (1,191,127)**	**$ (1,218,443)**	**$ (1,246,495)**	**$ (1,275,303)**	**$ (1,304,890)**	**$ (1,335,278)**	**$ (1,366,489)**	**$ (1,398,549)**	**$ (1,431,481)**	**$ (1,465,310)**	**$ (1,500,064)**	**$ (1,535,768)**
$ (1,044,911)	**$ (1,071,034)**	**$ (1,097,810)**	**$ (1,125,255)**	**$ (1,153,387)**	**$ (1,182,221)**	**$ (1,211,777)**	**$ (1,242,071)**	**$ (1,273,123)**	**$ (1,304,951)**	**$ (1,337,575)**	**$ (1,371,014)**	**$ (1,405,290)**	**$ (1,440,422)**	**$ (1,476,432)**
$ (2,158,298)	**$ (2,209,652)**	**$ (2,262,335)**	**$ (2,316,382)**	**$ (2,371,830)**	**$ (2,428,716)**	**$ (2,487,080)**	**$ (2,546,961)**	**$ (2,608,401)**	**$ (2,671,440)**	**$ (2,736,124)**	**$ (2,802,495)**	**$ (2,870,600)**	**$ (2,940,486)**	**$ (3,012,200)**
$ -	**$ -**	**$ (3,910,410)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (1,679,590)**	**$ -**	**$ -**	**$ -**	**$ (370,790)**	**$ (10,109,580)**	**$ (1,947,810)**
$ 2,447,356	**$ 2,471,829**	**$ 2,496,548**	**$ 2,521,513**	**$ 2,546,728**	**$ 2,572,196**	**$ 2,597,917**	**$ 2,623,897**	**$ 2,650,136**	**$ 2,676,637**	**$ 2,703,403**	**$ 2,730,437**	**$ 2,757,742**	**$ 2,785,319**	**$ 2,813,172**
$ 11,491,759	**$ 12,006,349**	**$ 12,504,143**	**$ 9,073,316**	**$ 9,455,006**	**$ 9,815,473**	**$ 10,151,550**	**$ 10,461,566**	**$ 10,743,749**	**$ 9,316,664**	**$ 9,503,979**	**$ 9,657,696**	**$ 9,775,063**	**$ 9,483,128**	**$ (595,790)**
$ 289,058	**$ 262,177**	**$ (3,676,198)**	**$ 205,131**	**$ 174,898**	**$ 143,479**	**$ 110,837**	**$ 76,935**	**$ (1,637,855)**	**$ 5,197**	**$ (32,720)**	**$ (72,058)**	**$ (483,648)**	**$ (10,264,746)**	**$ (2,146,838)**
$ 225,532	**$ 235,616**	**$ 245,371**	**$ 176,559**	**$ 185,569**	**$ 192,598**	**$ 199,179**	**$ 205,248**	**$ 210,770**	**$ 182,118**	**$ 186,437**	**$ 189,425**	**$ 191,713**	**$ 185,828**	**$ (15,632)**
$ 12,006,349	**$ 12,504,143**	**$ 9,073,316**	**$ 9,455,006**	**$ 9,815,473**	**$ 10,151,550**	**$ 10,461,566**	**$ 10,743,749**	**$ 9,316,664**	**$ 9,503,979**	**$ 9,657,696**	**$ 9,775,063**	**$ 9,483,128**	**$ (595,790)**	**$ (2,758,260)**

2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062
118,388	119,572	120,767	121,975	123,195	124,427	125,671	126,928	128,197	129,479	130,774	132,081	133,402	134,736
$ 1,098,205	$ 1,131,151	$ 1,165,086	$ 1,200,039	$ 1,236,040	$ 1,273,121	$ 1,311,315	$ 1,350,654	$ 1,391,174	$ 1,432,909	$ 1,475,896	$ 1,520,173	$ 1,565,778	$ 1,612,751
$ 473,551	$ 478,286	$ 483,069	$ 487,900	$ 492,779	$ 497,707	$ 502,684	$ 507,710	$ 512,788	$ 517,915	$ 523,095	$ 528,326	$ 533,609	$ 538,945
$ 694	$ 701	$ 708	$ 715	$ 722	$ 729	$ 736	$ 744	$ 751	$ 759	$ 766	$ 774	$ 782	$ 789
$ (1,572,450)	**$ (1,610,138)**	**$ (1,648,863)**	**$ (1,688,653)**	**$ (1,729,540)**	**$ (1,771,557)**	**$ (1,814,734)**	**$ (1,859,108)**	**$ (1,904,712)**	**$ (1,951,583)**	**$ (1,999,757)**	**$ (2,049,272)**	**$ (2,100,169)**	**$ (2,152,486)**
$ (1,513,343)	**$ (1,551,177)**	**$ (1,589,956)**	**$ (1,629,705)**	**$ (1,670,448)**	**$ (1,712,209)**	**$ (1,755,014)**	**$ (1,798,890)**	**$ (1,843,862)**	**$ (1,889,958)**	**$ (1,937,207)**	**$ (1,985,637)**	**$ (2,035,278)**	**$ (2,086,160)**
$ (3,085,793)	**$ (3,161,315)**	**$ (3,238,819)**	**$ (3,318,358)**	**$ (3,399,988)**	**$ (3,483,765)**	**$ (3,569,749)**	**$ (3,657,998)**	**$ (3,748,574)**	**$ (3,841,541)**	**$ (3,936,964)**	**$ (4,034,910)**	**$ (4,135,447)**	**$ (4,238,646)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
$ 2,841,304	**$ 2,869,717**	**$ 2,898,414**	**$ 2,927,398**	**$ 2,956,672**	**$ 2,986,239**	**$ 3,016,102**	**$ 3,046,263**	**$ 3,076,725**	**$ 3,107,492**	**$ 3,138,567**	**$ 3,169,953**	**$ 3,201,653**	**$ 3,233,669**
$ (2,758,260)	**$ (3,057,601)**	**$ (3,409,254)**	**$ (3,816,643)**	**$ (4,282,596)**	**$ (4,810,063)**	**$ (5,402,108)**	**$ (6,061,907)**	**$ (6,792,757)**	**$ (7,598,079)**	**$ (8,481,420)**	**$ (9,446,459)**	**$ (10,497,012)**	**$ (11,637,035)**
$ (244,489)	**$ (291,598)**	**$ (340,405)**	**$ (390,960)**	**$ (443,316)**	**$ (497,526)**	**$ (553,647)**	**$ (611,735)**	**$ (671,849)**	**$ (734,049)**	**$ (798,397)**	**$ (864,957)**	**$ (933,794)**	**$ (1,004,977)**
$ (54,853)	**$ (60,055)**	**$ (66,984)**	**$ (74,993)**	**$ (84,152)**	**$ (94,518)**	**$ (106,152)**	**$ (119,115)**	**$ (133,473)**	**$ (149,292)**	**$ (166,643)**	**$ (185,596)**	**$ (206,228)**	**$ (228,616)**
$ (3,057,601)	**$ (3,409,254)**	**$ (3,816,643)**	**$ (4,282,596)**	**$ (4,810,063)**	**$ (5,402,108)**	**$ (6,061,907)**	**$ (6,792,757)**	**$ (7,598,079)**	**$ (8,481,420)**	**$ (9,446,459)**	**$ (10,497,012)**	**$ (11,637,035)**	**$ (12,870,628)**

2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076
136,084	137,444	138,819	140,207	141,609	143,025	144,455	145,900	147,359	148,833	150,321	151,824	153,342	154,876
$ 1,661,134	$ 1,710,968	$ 1,762,297	$ 1,815,166	$ 1,869,621	$ 1,925,710	$ 1,983,481	$ 2,042,985	$ 2,104,275	$ 2,167,403	$ 2,232,425	$ 2,299,398	$ 2,368,380	$ 2,439,431
$ 544,334	$ 549,778	$ 555,275	$ 560,828	$ 566,436	$ 572,101	$ 577,822	$ 583,600	$ 589,436	$ 595,330	$ 601,284	$ 607,297	$ 613,370	$ 619,503
$ 797	$ 805	$ 813	$ 822	$ 830	$ 838	$ 846	$ 855	$ 863	$ 872	$ 881	$ 890	$ 898	$ 907
$ (2,206,266)	**$ (2,261,551)**	**$ (2,318,386)**	**$ (2,376,816)**	**$ (2,436,887)**	**$ (2,498,648)**	**$ (2,562,149)**	**$ (2,627,440)**	**$ (2,694,574)**	**$ (2,763,606)**	**$ (2,834,590)**	**$ (2,907,584)**	**$ (2,982,648)**	**$ (3,059,842)**
$ (2,138,314)	**$ (2,191,772)**	**$ (2,246,567)**	**$ (2,302,731)**	**$ (2,360,299)**	**$ (2,419,306)**	**$ (2,479,789)**	**$ (2,541,784)**	**$ (2,605,328)**	**$ (2,670,462)**	**$ (2,737,223)**	**$ (2,805,654)**	**$ (2,875,795)**	**$ (2,947,690)**
$ (4,344,580)	**$ (4,453,323)**	**$ (4,564,952)**	**$ (4,679,546)**	**$ (4,797,186)**	**$ (4,917,955)**	**$ (5,041,938)**	**$ (5,169,224)**	**$ (5,299,903)**	**$ (5,434,067)**	**$ (5,571,813)**	**$ (5,713,238)**	**$ (5,858,443)**	**$ (6,007,532)**
$ -	**$ -**	**$ -**	**$ (607,590)**	**$ (9,248,140)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,266,006	**$ 3,298,666**	**$ 3,331,653**	**$ 3,364,969**	**$ 3,398,619**	**$ 3,432,605**	**$ 3,466,931**	**$ 3,501,600**	**$ 3,536,616**	**$ 3,571,982**	**$ 3,607,702**	**$ 3,643,779**	**$ 3,680,217**	**$ 3,717,019**
$ (12,870,628)	**$ (14,202,042)**	**$ (15,635,684)**	**$ (17,176,118)**	**$ (19,435,665)**	**$ (30,464,338)**	**$ (32,551,335)**	**$ (34,765,336)**	**$ (37,115,487)**	**$ (39,607,433)**	**$ (42,247,093)**	**$ (45,040,594)**	**$ (47,994,277)**	**$ (51,114,704)**
$ (1,078,574)	**$ (1,154,657)**	**$ (1,233,300)**	**$ (1,922,167)**	**$ (10,646,707)**	**$ (1,485,350)**	**$ (1,575,007)**	**$ (1,667,624)**	**$ (1,763,287)**	**$ (1,862,085)**	**$ (1,964,111)**	**$ (2,069,459)**	**$ (2,178,226)**	**$ (2,290,513)**
$ (252,840)	**$ (278,984)**	**$ (307,134)**	**$ (337,380)**	**$ (381,966)**	**$ (601,647)**	**$ (638,994)**	**$ (682,527)**	**$ (728,659)**	**$ (777,575)**	**$ (829,390)**	**$ (884,224)**	**$ (942,201)**	**$ (1,003,450)**
$ (14,202,042)	**$ (15,635,684)**	**$ (17,176,118)**	**$ (19,435,665)**	**$ (30,464,338)**	**$ (32,551,335)**	**$ (34,765,336)**	**$ (37,115,487)**	**$ (39,607,433)**	**$ (42,247,093)**	**$ (45,040,594)**	**$ (47,994,277)**	**$ (51,114,704)**	**$ (54,408,666)**

2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088
156,425	157,989	159,569	161,164	162,776	164,404	166,048	167,708	169,385	171,079	172,790	174,518
$ 2,512,614	$ 2,587,993	$ 2,665,632	$ 2,745,601	$ 2,827,969	$ 2,912,809	$ 3,000,193	$ 3,090,199	$ 3,182,905	$ 3,278,392	$ 3,376,743	$ 3,478,046
$ 625,698	$ 631,955	$ 638,275	$ 644,658	$ 651,104	$ 657,615	$ 664,191	$ 670,833	$ 677,542	$ 684,317	$ 691,160	$ 698,072
$ 917	$ 926	$ 935	$ 944	$ 954	$ 963	$ 973	$ 983	$ 992	$ 1,002	$ 1,012	$ 1,023
$ (3,139,229)	**$ (3,220,874)**	**$ (3,304,842)**	**$ (3,391,203)**	**$ (3,480,027)**	**$ (3,571,387)**	**$ (3,665,357)**	**$ (3,762,014)**	**$ (3,861,439)**	**$ (3,963,711)**	**$ (4,068,916)**	**$ (4,177,140)**
$ (3,021,382)	**$ (3,096,917)**	**$ (3,174,340)**	**$ (3,253,698)**	**$ (3,335,041)**	**$ (3,418,417)**	**$ (3,503,877)**	**$ (3,591,474)**	**$ (3,681,261)**	**$ (3,773,292)**	**$ (3,867,625)**	**$ (3,964,315)**
$ (6,160,611)	**$ (6,317,790)**	**$ (6,479,182)**	**$ (6,644,901)**	**$ (6,815,068)**	**$ (6,989,804)**	**$ (7,169,234)**	**$ (7,353,488)**	**$ (7,542,699)**	**$ (7,737,003)**	**$ (7,936,541)**	**$ (8,141,455)**
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (924,510)**	**$ (8,054,760)**	**$ -**	**$ -**	**$ -**	**$ -**
$ 3,754,189	**$ 3,791,731**	**$ 3,829,649**	**$ 3,867,945**	**$ 3,906,625**	**$ 3,945,691**	**$ 3,985,148**	**$ 4,024,999**	**$ 4,065,249**	**$ 4,105,902**	**$ 4,146,961**	**$ 4,188,430**
$ (54,408,666)	**$ (57,883,192)**	**$ (61,545,553)**	**$ (65,403,272)**	**$ (69,464,130)**	**$ (73,736,178)**	**$ (78,227,742)**	**$ (83,871,944)**	**$ (96,901,920)**	**$ (102,284,474)**	**$ (107,923,163)**	**$ (113,831,055)**
$ (2,406,422)	**$ (2,526,059)**	**$ (2,649,533)**	**$ (2,776,956)**	**$ (2,908,443)**	**$ (3,044,113)**	**$ (4,108,596)**	**$ (11,383,249)**	**$ (3,477,450)**	**$ (3,631,102)**	**$ (3,789,580)**	**$ (3,953,025)**
$ (1,068,104)	**$ (1,136,302)**	**$ (1,208,185)**	**$ (1,283,902)**	**$ (1,363,605)**	**$ (1,447,451)**	**$ (1,535,606)**	**$ (1,646,727)**	**$ (1,905,104)**	**$ (2,007,587)**	**$ (2,118,312)**	**$ (2,234,255)**
$ (57,883,192)	**$ (61,545,553)**	**$ (65,403,272)**	**$ (69,464,130)**	**$ (73,736,178)**	**$ (78,227,742)**	**$ (83,871,944)**	**$ (96,901,920)**	**$ (102,284,474)**	**$ (107,923,163)**	**$ (113,831,055)**	**$ (120,018,335)**


NNSWC Revenue Analysis - Tonnage Decrease
$20,000,000
$-
$(20,000,000)
$(40,000,000)
$(60,000,000)
$(80,000,000)
$(100,000,000)
$(120,000,000)
$(140,000,000)
Ending Cash Balance
2021 2024 2027 2030 2033 2036 2039 2042 2045 2048 2051 2054 2057 2060 2063 2066 2069 2072 2075 2078 2081 2084 2087
Total Operations Costs
Total CIP Costs
Total Revenue
Ending Balance (Cash Balance)


NNSWC Revenue Analysis
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$-
$(20,000,000)
$(40,000,000)
$(60,000,000)
$(80,000,000)
$(100,000,000)
$(120,000,000)
$(140,000,000)
Ending Cash Balance
2021 2024 2027 2030 2033 2036 2039 2042 2045 2048 2051 2054 2057 2060 2063 2066 2069 2072 2075 2078 2081 2084 2087
Baseline
Tonnage Increase
Tonnage Decrease

APPENDIX D – CONCEPTUAL EXPANSION ALTERNATIVES FIGURES

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS AND PROPOSED CONTOURS SHOWN ARE TOP OF LINER. CONTOUR INTERVAL IS 2-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- AREA BOUNDARY
- PROPOSED ROAD

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure A
NNSWC Regional Landfill
Conceptual Expansion Opt. 1
Base Grades Plan

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 2 FEET.
3. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- AREA BOUNDARY
- PROPOSED ROAD

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure B
NNSWC Regional Landfill

Conceptual Expansion Opt. 1
Final Grades Plan

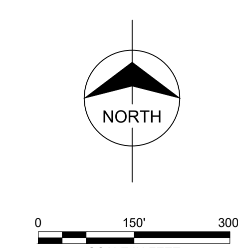
\\BMCD\DFS\CLIENTS\ENS\NNSWC\124922_LFMASTERPLAN\STUDIES\BUSINESS_CONSULT\DELIVERABLES\03_INCREASE LANDFILL DISPOSAL CAPACITY\CAD\FIGURE B - PRELIM EXPANSION BASE GRADES PLAN_OPTION 1.DWG 6/3/2021 10:35 AM BABANCO

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS AND PROPOSED CONTOURS SHOWN ARE TOP OF LINER. CONTOUR INTERVAL IS 2-FEET.

LEGEND

(black lines)	EXISTING PERMITTED CONTOURS
(blue lines)	PROPOSED EXPANSION CONTOURS
(dashed line)	AREA BOUNDARY
(grey bar)	PROPOSED ROAD



BURNS McDONNELL

Figure C
NNSWC Regional Landfill

Conceptual Expansion Opt. 2
Base Grades Plan

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 2 FEET.
3. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- AREA BOUNDARY
- PROPOSED ROAD

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure D
NNSWC Regional Landfill

Conceptual Expansion Opt. 2
Final Grades Plan

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS AND PROPOSED CONTOURS SHOWN ARE TOP OF LINER. CONTOUR INTERVAL IS 2-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- AREA BOUNDARY
- PROPOSED ROAD

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure E
NNSWC Regional Landfill

Conceptual Expansion Opt. 3A
Base Grades Plan

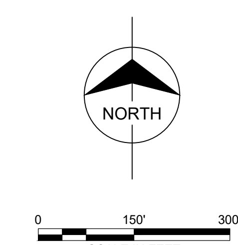
\\BMCD\DFS\CLIENTS\ENS\NNSWC\124922_LFMASTERPLAN\STUDIES\BUSINESS_CONSULT\DELIVERABLES\03_INCREASE LANDFILL DISPOSAL CAPACITY\CAD\FIGURE E - PRELIM EXPANSION BASE GRADES PLAN_OPTION 3A.DWG 6/3/2021 11:15 AM BABANCO

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 2 FEET.
3. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- AREA BOUNDARY
- PROPOSED ROAD



BURNS McDONNELL

Figure F
NNSWC Regional Landfill

Conceptual Expansion Opt. 3A
Final Grades Plan

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS AND PROPOSED CONTOURS SHOWN ARE TOP OF LINER. CONTOUR INTERVAL IS 2-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- AREA BOUNDARY
- PROPOSED ROAD

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure G
NNSWC Regional Landfill

Conceptual Expansion Opt. 3B
Base Grades Plan

\\BMCD\DFS\CLIENTS\ENS\NNSWC\124922_LFMASTERPLAN\STUDIES\BUSINESS_CONSULT\DELIVERABLES\03_INCREASE LANDFILL DISPOSAL CAPACITY\CAD\FIGURE G - PRELIM EXPANSION BASE GRADES PLAN_OPTION 3B.DWG 6/2/2021 5:21 PM BABANCO

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 2 FEET.
3. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL. CONTOUR INTERVAL IS 10-FEET.

LEGEND

EXISTING PERMITTED CONTOURS
PROPOSED EXPANSION CONTOURS
AREA BOUNDARY
PROPOSED ROAD

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure H
NNSWC Regional Landfill

Conceptual Expansion Opt. 3B
Final Grades Plan

APPENDIX E – PREFERRED EXPANSION OPTION FIGURES

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS AND PROPOSED CONTOURS SHOWN ARE TOP OF LINER. CONTOUR INTERVAL IS 2-FEET.

LEGEND

EXISTING PERMITTED CONTOURS
PROPOSED EXPANSION CONTOURS
AREA BOUNDARY
PROPOSED ROAD

NORTH

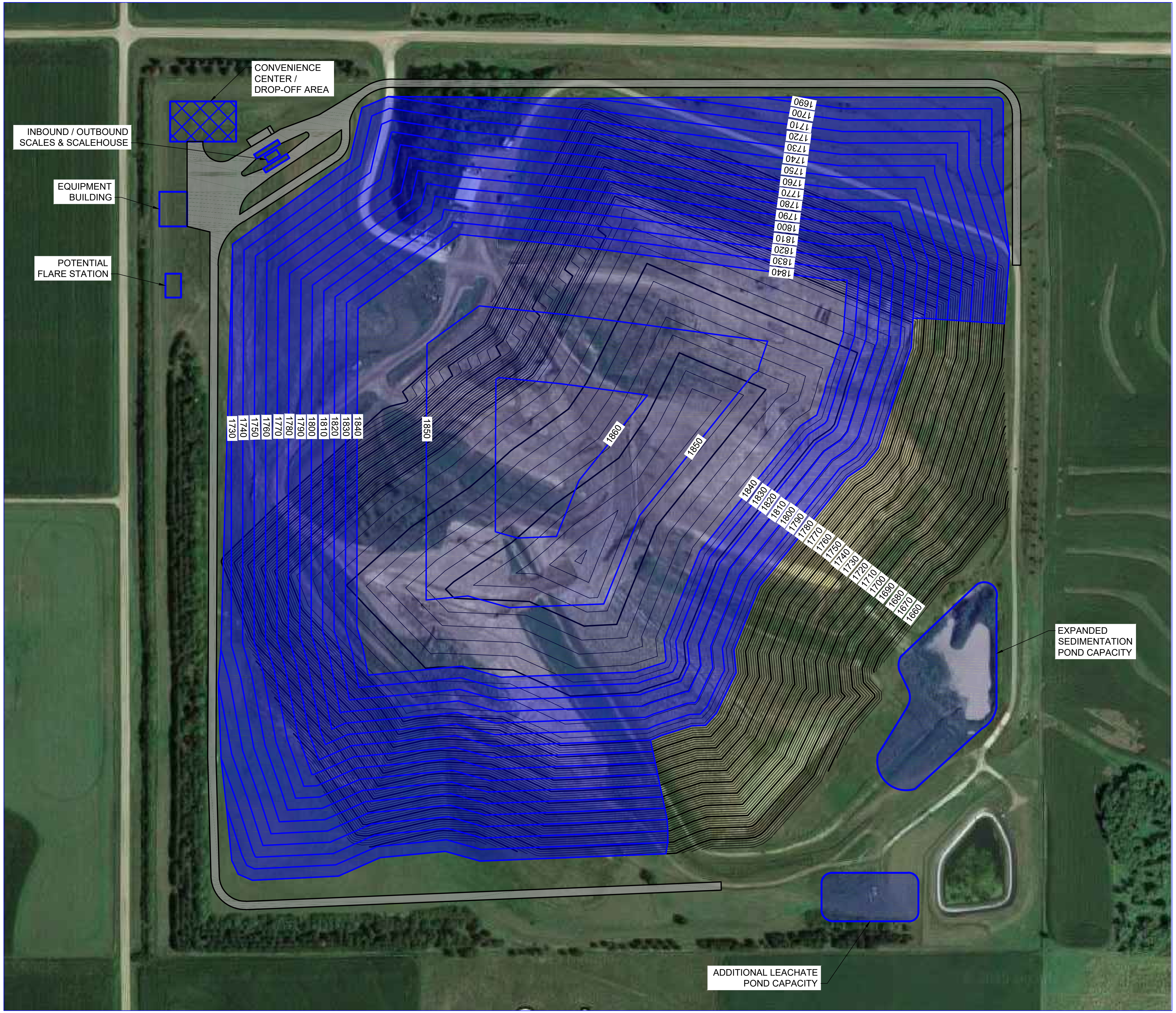
0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 1
NNSWC Regional Landfill

Final Expansion Option
Base Grades Plan

\\BMCD\DFS\CLIENTS\ENS\NNSWC\124922_LFMASTERPLAN\STUDIES\BUSINESS_CONSULT\DELIVERABLES\03_INCREASE LANDFILL DISPOSAL CAPACITY\CAD\FIGURE 1 - EXPANSION BASE GRADES PLAN.DWG 6/3/2021 9:24 AM BABANCO



NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 2 FEET.
3. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- PROPOSED ROAD

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 2
NNSWC Regional Landfill

Final Expansion Option
Final Grades Plan

\\BMCD\DFS\CLIENTS\ENS\NNSWC\124922_LFMASTERPLAN\STUDIES\BUSINESS_CONSULT\DELIVERABLES\03_INCREASE LANDFILL DISPOSAL CAPACITY\CAD\FIGURE 2 - EXPANSION FINAL GRADES PLAN.DWG 6/2/2021 5:59 PM BABANCO

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS AND PROPOSED CONTOURS SHOWN ARE TOP OF LINER. CONTOUR INTERVAL IS 2-FEET.

LEGEND

(black line)	EXISTING PERMITTED CONTOURS
(blue line)	PROPOSED EXPANSION CONTOURS
(grey band)	PROPOSED ROAD
LDT	LEACHATE DRAINAGE TRENCH
HLD	HIGH CAPACITY LEACHATE DRAIN

NORTH

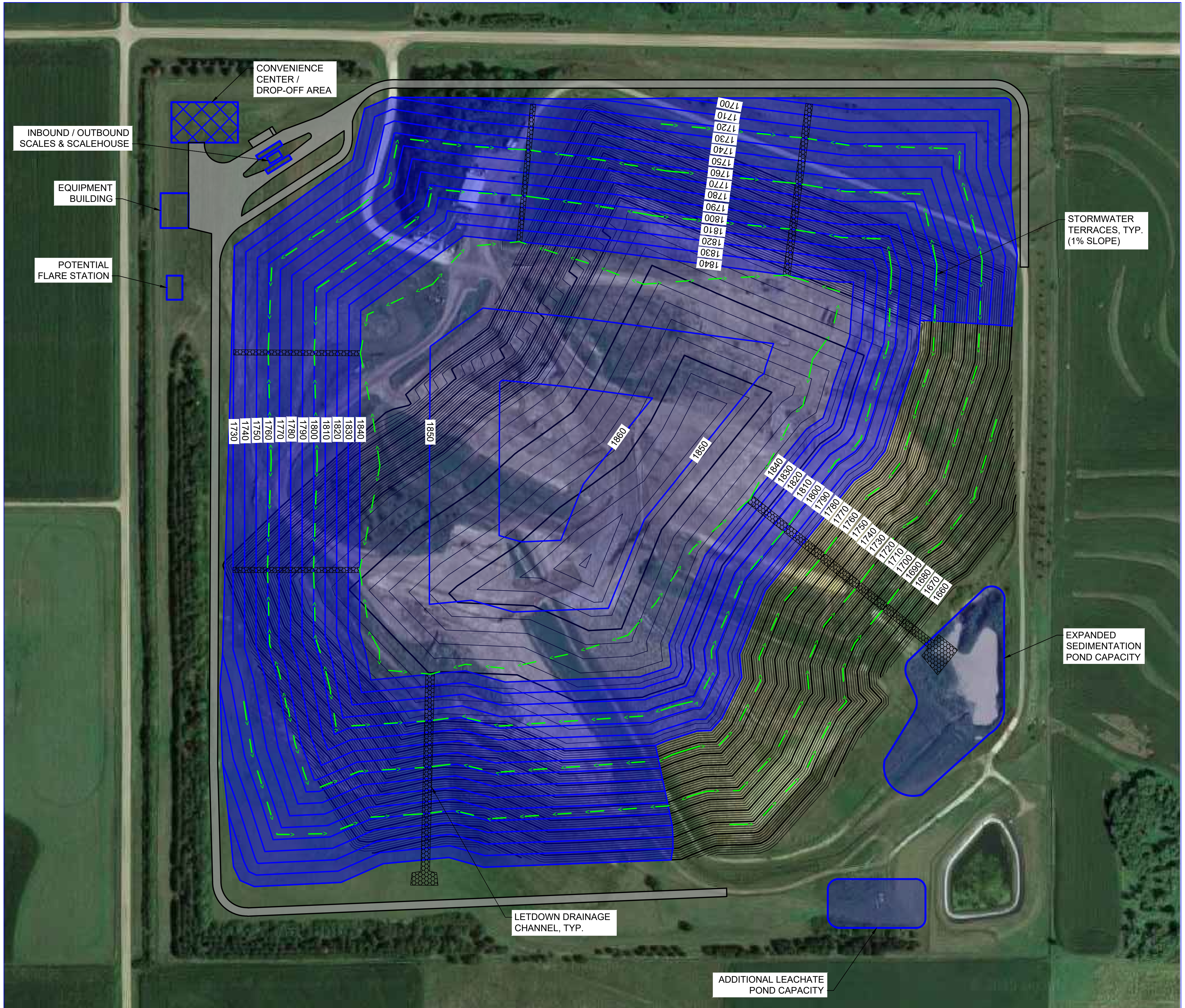
0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 3
NNSWC Regional Landfill

Final Expansion Option
Leachate Collection Plan

\\BMCD\DFS\CLIENTS\ENS\NNSWC\124922_LFMASTERPLAN\STUDIES\BUSINESS_CONSULT\DELIVERABLES\03_INCREASE LANDFILL DISPOSAL CAPACITY\CAD\FIGURE 3 - EXPANSION LEACHATE COLLECTION PLAN.DWG 6/2/2021 5:59 PM BABANCO



NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 2 FEET.
3. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- PROPOSED ROAD
- STORMWATER TERRACES

NORTH

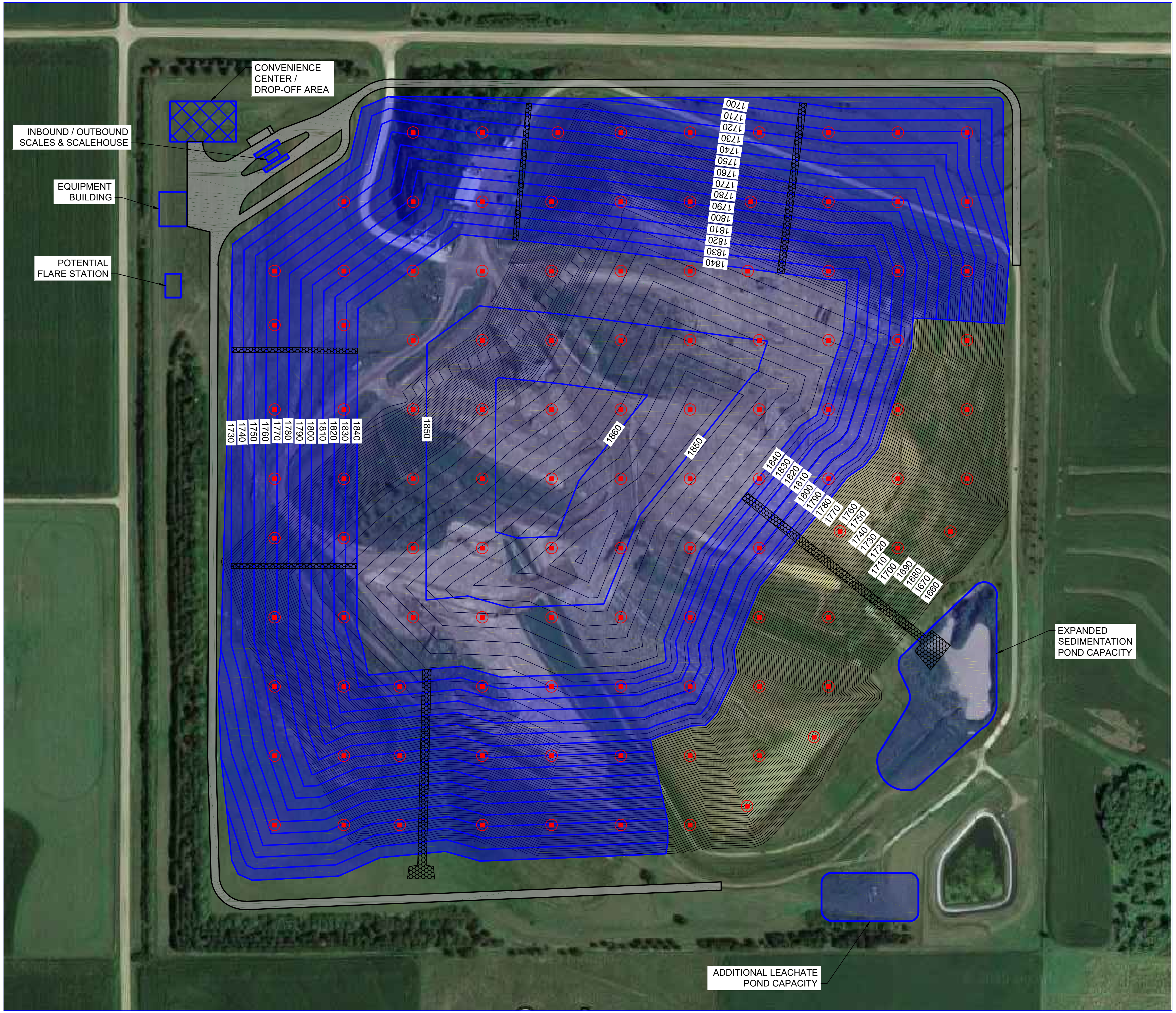
0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 4
NNSWC Regional Landfill

Final Expansion Option
Stormwater Plan

\\BMCD\DFS\CLIENTS\ENS\NNSWC\124922_LFMASTERPLAN\STUDIES\BUSINESS_CONSULT\DELIVERABLES\03_INCREASE LANDFILL DISPOSAL CAPACITY\CAD\FIGURE 4 - EXPANSION STORMWATER PLAN.DWG 6/3/2021 10:19 AM PRUIZFABIAN



NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. EXISTING PERMITTED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 2 FEET.
3. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- EXISTING PERMITTED CONTOURS
- PROPOSED EXPANSION CONTOURS
- PROPOSED ROAD
- GAS VENT

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 5
NNSWC Regional Landfill

Final Expansion Option
Landfill Gas Vent Plan

APPENDIX F – LANDFILL STABILITY CALCULATIONS

Introduction
This project involves the evaluation of existing conditions as well as design of a new expansion at the Northeast Nebraska Solid Waste Coalition (NNSWC) MSW landfill near Clarkson, Nebraska. For evaluation of existing conditions, previous design had stipulated a maximum side slope of 4H:1V for placed MSW. Survey information has confirmed that slopes have been placed at steeper slopes than this in some areas of the landfill. For the new expansion, MSW is to be placed to a higher elevation then currently permitted. For both of these conditions, slope stability and settlement calculations were performed to confirm minimum factors of safety are met for the existing and future conditions.

As part of previous design and permitting of the landfill, slope stability and settlement calculations were performed. These previous calculations and subsurface information were considered as part of the current evaluations. New geotechnical information was also obtained that was also considered.

Subsurface Information
As part of previous work at the site, 23 borings were drilled. These borings covered the footprint of the permitted landfill area and included borings (sampled and not sampled) and piezometers. Field and laboratory testing on a limited number of these borings was performed. Field testing included SPT sampling and vane shear tests. Laboratory testing included index testing, unconfined compression, consolidation and consolidated-undrained triaxial testing with pore pressure measurements.

For the current evaluation, additional field investigation and laboratory testing were performed. For the field investigation, geotechnical borings were performed, one on the east side and one on the west. The east boring was to coincide with a controlling section based on the higher slopes and liner configuration. The west boring was in an area where the landfill was going to be expanded to. Additionally, gas vent wells were installed to the north of the landfill. Samples were obtained during installation of two of these gas wells. Laboratory testing included index testing, unconsolidated-undrained triaxial tests, direct shear tests and consolidation tests.

General subsurface conditions at the site are made up of Loess soil over Glacial Till. Both soil types are generally classified as a Lean Clay based on Atterberg Limits results, with the Glacial Till being slightly more plastic than the Loess and containing more sand. The Loess soil layer has lower blow counts, higher moisture content and lower dry density compared to the Glacial Till. Based on this, the Loess soil was the controlling soil layer in terms of strength and consolidation.

The thickness of the Loess layer varied throughout the site. Original ground surface at the site varied significant, upwards of 100 feet between the highest and lowest ground surface elevation borings. Borings at higher ground elevations had thicker Loess deposits than borings at lower ground elevations. During development of the currently constructed landfill phases, civil grading was performed. This led to Loess thicknesses beneath the landfill varying from original thickness encountered.

Groundwater was generally found above the Loess-Glacial Till interface. The Loess soils in this zone had higher moisture contents, lower strengths and higher compressibility compared to Loess in the upper portions of the subsurface profile. Because of this, these soils were the focus of sampling and testing for the current investigation.

A plan view with borings, boring fence diagram, SPT blow counts and historical laboratory testing results are included in Attachment A.

Soil Design Parameters
Historical and current laboratory results are available to be considered when determining soil design parameters for design. While some of the testing, like consolidation testing, are directly comparable, there were modifications to the laboratory tests performed between the two investigations, specifically for strength testing. Historical strength testing included consolidated-undrained with pore pressure measurements triaxial testing (CU-bar), unconfined compression testing (UC) and in-situ vane shear testing. For the current conditions, strength testing included direct shear testing (DS) and unconsolidated-undrained triaxial testing (UU). Based on the differences in measured strengths and results, these different tests will all be evaluated separately in determining the design parameters.

Unit Weight
Based on historical testing results, average unit weights for the Loess and Glacial Till were calculated to be 114 and 121 pcf. These were used for the evaluations.

Undrained Strength
Four different tests that measure undrained shear strengths have been performed during the historical and current investigations including CU-bar, UC, UU and vane shear testing. For CU-bar testing, the undrained shear strength measured is the total shear strength envelope which provides the relationship between undrained shear strength and effective stress. For the UC, UU and vane shear testing, cohesion or the undrained shear strength is measured for the effective stress associated with the sampling/testing depth.

Most laboratory strength testing was performed on the Loess, with the exception being one CU-bar test performed on Glacial Till. As noted previously, the Loess was found to be of higher moisture content, lower density and lower strength than the Glacial Till and thus will be the controlling soil for any slope stability calculations.

For CU-bar testing from the previous investigation, the total friction angle and cohesion for the Loess were 16 degrees and 540 psf, respectively and total friction angle and cohesion for the Glacial Till were 17 degrees and 179 psf, respectively. As noted, these design parameters are the total shear strength envelope and not an undrained cohesion value. Per requirements from the Nebraska Department of Natural Resources (NeDNR) during previous submittals, slope stability calculations were required to be performed using this total shear strength envelope. These values were used as the basis for the total shear strength envelope for the current evaluations.

Previous and current laboratory testing included UC, UU and vane shear testing. For UC testing, significantly lower strengths were measured. It is possible that this testing type led to artificially lower shear strengths. Since there is no confining stress used for UC testing, any disturbance or failure plane within the sample will lead to a premature failure. Loess is cemented by nature, making it highly susceptible to apparent strength loss because of disturbance during sampling causing a breakdown of the cemented structure. Based on this, UC results were not considered.

For UU testing, disturbance is still a concern. However, since the samples are confined during testing to the approximate in-situ effective stress the samples, the effects from disturbance are partially mitigated. Results of the UU testing did vary significantly though, with cohesions ranging from 570 to 1,627 psf with no apparent correlation with depth.

Vane shear testing was also performed during the previous investigation. Since this test does not require obtaining a sample, it provides the most direct measurement of the materials in-situ and will be affected the least by disturbance. Results of the vane shear testing provided cohesions between 1,600 and 1,640 psf at different depths. However, the maximum measurable cohesion for the apparatus used was 1,640 psf, indicating higher undrained cohesions may have been possible. The vane shear testing results were considered the most representative for undrained shear strengths and were thus relied upon most in determining the undrained cohesion.

For the Glacial Till, SPT blow counts were used to estimate cohesion. The average SPT blow count was calculated to be 16 blows per foot. Correcting for an auto hammer efficiency of 75%, the average SPT blow count will be 20 blows per foot. Using the cohesion relationship of cohesion = $N_{60}/8$, an undrained cohesion of 2,500 psf was used for the Glacial Till.

Drained Strength
To measure drained shear strength, CU-bar and DS tests were performed during the historical and current investigations, respectively. The results from these tests are comparable.

For CU-bar testing from the previous investigation, the effective friction angle and cohesion for the Loess were 28 degrees and 234 psf, respectively and effective friction angle and cohesion for the Glacial Till were 28.1 degrees and 156 psf. The Glacial Till values were used as the basis for the effective shear strength envelope for Glacial Till in the current evaluations. Adjusted values were used for the Loess as discussed below.

For DS testing, three tests were performed on Loess. Instead of evaluating the results of each of the tests separately, the results of all three tests were evaluated together (9 points). This is considered reasonable since the material is all one soil type (Loess) and each testing point should represent the relationship between shear strength and effective stress for the soil. This approach also allows for assessing the variation of each test result from the determined overall relationship.

Based on all the DS results, a friction angle of 25.5 degrees and a cohesion of 161 psf were calculated for Loess. This relationship has a coefficient of variation of 5% for all the data points, which indicates a good fit between the drained shear strength envelope and all the measured data.

For Loess, the DS results were used as the basis for the effective shear strength envelope. For Glacial Till, the CU-bar results were used.

Consolidation
Four consolidation tests have been performed, three during the original investigation and one during the current investigation. Measured consolidation parameters ranged as noted below:

- Consolidation Index: 0.23 to 0.33, average = 0.26
- Reconsolidation index: 0.03 to 0.04, average = 0.037
- P'c: 1.1 to 2.6 tsf, average = 1.6 tsf

Settlement evaluations will be performed for the range of results to understand the effect the variations will have on performance of the liner system.

Design Parameters

			Total Strength Envelope		Effective Strength Envelope	
Soil Type	Unit Weight (pcf)	Undrained Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)
Loess	114	1640	16	540	25.5	161
Glacial Till	121	2500	17	190	28.1	156

Current strength testing results and consolidation are included in Attachment B.

Sections
Sections that show existing contours and the currently permitted MSW slopes and extents were drawn. As noted previously, current MSW contours are outside of the permitted boundary. Additionally, increasing the permitted elevation of the MSW was also to be considered.

Sections A through G were drawn and evaluated. Section D was found to be the controlling section overall based on the geometry of the section, specifically the liner sloping towards the perimeter and the generally downward slope of the liner system at the perimeter edge. Both of these factors lead to the stability of Section D being the controlling stability for the landfill.

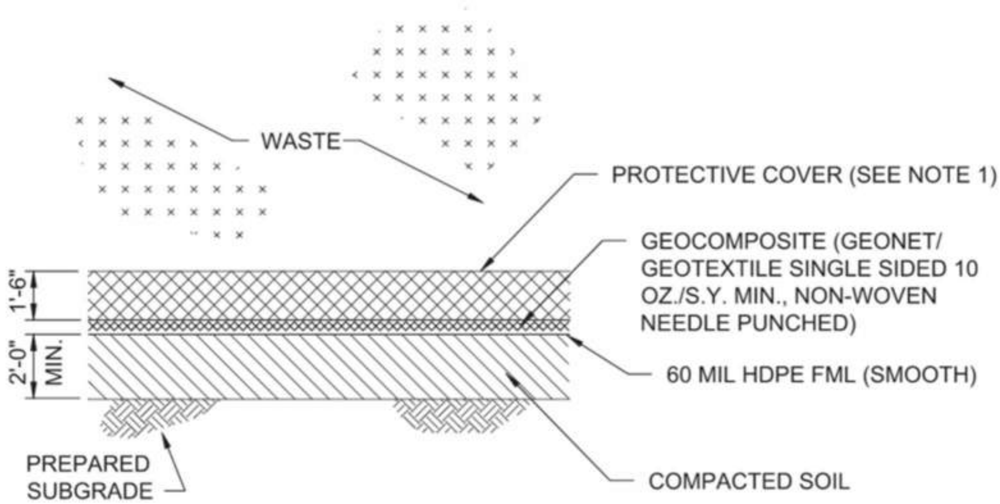
When drawing Section D, the cross-section was noted to be slightly askew from the slope face, leading to the horizontal distance being slightly exaggerated. This causes the measured slopes to be shallower than in actuality. To correct for this, the known 4H:1V slope that was drawn on the section was used to determine the required reduction factor needed. This factor was used in determining the actual slope of the current MSW surface at the site.

Another consideration in evaluating the existing MSW slope was how to consider differences in slope along the MSW surface. It can be seen that the slope does vary slightly, with the lower portion of Section D being steeper than the upper section. This level of detail does not affect the overall slope stability factors of safety. Therefore, the existing MSW surface was modeled with a single slope of 3.7H:1V that corresponds to the overall effective slope.

Additional crest elevation was also evaluated. To evaluate this, it was assumed that an adjusted sloped from the current conditions up to final design elevations would be constant. Based on evaluations, it was determined that the MSW surface above the current conditions can be stably placed at a 3.3H:1V slope and up to an outer crest elevation of 1840 feet.

For the new footprint addition to the landfill, along the west side, conditions were evaluated to determine how controlling this area may be in terms of stability. Based on subsurface conditions and grading, most of the Loess material will be removed. This material has been previously noted as being the weaker material at the site. Additionally, the landfill geometry will require that the liner system in this area slope up significantly at the landfill perimeter which will also greatly increase the stability factor of safety, especially compared to the east side of Section D. Based on this, the new landfill addition was deemed not be a controlling section for evaluation.

The landfill has a geocomposite base liner. This liner is made up of the following materials:



The existing landfill geomembrane is made up of smooth HDPE liner except along the slopes on the perimeter of the landfill where the HDPE is textured. Drawings indicate this textured HDPE should extend towards the center of the landfill at least 5 feet beyond the inner edge of the perimeter slope. These different liner materials were incorporated into the stability models that evaluated liner strength.

The controlling interface for the liner is between the HDPE and geocomposite. Based on published interface shear strength results in GRI Report #30, this interface (smooth HDPE-geocomposite) has a peak friction angle of 15 degrees and a residual friction angle of 12 degrees. Previous testing was performed on the textured HDPE-geocomposite used for the liner. Results from this testing showed a peak friction angle and cohesion of 21 degrees and 100 psf, respectively and a residual friction angle and cohesion of 11.7 degrees and 87 psf, respectively. Based on the available information, smooth HDPE-geocomposite strengths were based on the GRI Report #30 values and textured HDPE-geocomposite strengths were based on previous material testing.

MSW was modeled utilizing a friction angle of 20 degrees, a cohesion of 500 psf and a total unit weight of 59 pcf. These values were based off previous calculations for the site and were based on published values for similar material.

As previously noted, the existing slopes are steeper than current permits allow. Additional slopes are to be modeled at 3.3H:1V slope which is steeper than any existing slopes. Based on this, the slope stability calculations for the full landfill height (up to elevation 1840 feet) will also apply to existing conditions.

Section information and liner interface strength information are included in Attachment C.

Slope Stability

Slope stability calculations were performed for Section D using UTexas4. Calculations were performed for the following conditions:

- End of Construction 1 – Undrained strength (cohesion), full MSW height
- End of Construction 2 – Total Shear Strength envelope, full MSW height
- Long-term Steady State 1 – Effective Shear Strength envelope, full MSW height

- Long-term Steady State 2 – Noncircular Surface Through Liner, Effective Shear Strength envelope, Peak liner strength, full MSW height
- Seismic – Total Shear Strength Envelope, full MSW height, 2% in 50 Years Seismic Event Peak Ground Acceleration

For the End of Construction 1 case, the cohesion values determined based on the UU and vane shear testing were used for modeling the Loess. These tests were performed on materials that were only consolidated under the existing soil conditions at the time of the investigations. During placement of the MSW, the materials will be loaded in an undrained manner as different layers of MSW are placed. After each loading, dissipation of excess pore pressures will occur, increasing the effective stress increases in the Loess and Glacial Till soils leading the undrained shear strength of these materials to increase with time compared to the original values based on the in-situ effective stresses. Based on this, using the undrained cohesion under full MSW landfill loading, essentially assuming the MSW is placed instantaneously, is somewhat conservative.

For the Seismic case, the 2014 USGS Deaggregation online program was utilized for determining the design seismic event peak ground acceleration. For a Site Class B/C, which represents acceleration on bedrock, the bedrock acceleration is 0.056g. To account for possible amplification of the seismic shaking through the soil column, the bedrock acceleration is factored by 1.6, leading to a peak ground acceleration of 0.09g. This was used for the seismic evaluation.

For all cases except Long-term Steady State 2, a “floating grid” search method was used for calculating the stability factor of safety. This method involves setting a gridded location of circular centers and then choosing a point along the surface to run all the circular surfaces through. UTexas4 will then cycle through all the circles based on the different circular centers. Multiple points along the surface were evaluated to determine the lowest factor of safety.

For the Long-term Steady State 2 case, noncircular surfaces are evaluated. Since this case is to evaluate any possible sliding along the liner interface, the surface must stay within the liner system. This requires a noncircular surface. Multiple different points along the slope and liner are evaluated to determine the controlling factor of safety.

Results of the slope stability analyses are listed below:

Case	Factor of Safety
EOC – 1	1.40
EOC – 2	1.61
LTSS – 1	1.96
LTSS – 2	1.51
Seismic	1.28

All these factors of safety meet generally accepted minimum factors of safety for slope stability as listed below:

- End of Construction – 1.3
- Long-term Steady State – 1.5
- Seismic – 1.1

As a comparison to current calculations, the calculated factor of safety for the EOC – 2 case in previous calculations was 1.96. Compared to the current EOC – 2 case value indicates the decrease in slope stability factor of safety caused by the steepened slopes and additional MSW height.

Inputs and outputs from the UTexas4 program and the 2014 USGS deaggregation for the site are included in Attachment D.

Settlement

Settlement was also evaluated to confirm that the liner grades are not decrease and appropriate flow towards the sumps is disrupted. The liner slopes to the east side of the landfill, with a slight southeasterly orientation.

As noted previously, it is expected that most of the settlement will occur in the softer weaker Loess layer. Differences in settlement will be greatly driven by differences in the thickness of Loess across the site. Based on the borings and sections evaluated, the Loess material increases with thickness as one moves to the east and to the southeast. Based on this, it is expected that the highest settlements will occur along the east and southeast portions of the landfill which coincides with the locations of the sumps.

Settlement parameters varied between the different tests performed, including significant differences in the consolidation index and past preconsolidation pressures. To understand possible differences in the consolidation possible, two settlement scenarios were evaluated:

- Scenario 1: Cc = 0.25, p'c = 5.2 ksf
- Scenario 2: Cc = 0.33, p'c = 2.6 ksf

Scenario 1 roughly corresponds to the average values from the consolidation tests performed, both historical and current. It also matches the previously submitted calculations as part of previous permit submittals. Scenario 2 is based on the current consolidation test performed in the west expansion area of the Landfill.

For both cases, the amount of relative settlement across the site is controlled by the thickness of the Loess in a specific area and the loading from the MSW based on the final MSW surface slope. Based on the borings and conditions encountered, the Loess thickens in general from northwest to southwest.

The MSW landfill was modeled using fill areas. Areas with the MSW slopes were modeled as triangular shaped load distributions, with 0 psf at the landfill edges and 11.2 ksf at the inner edges (based on 190 feet of 59 pcf unit weight MSW). The center portion is modeled as a constant fill load with a bearing pressure of 11.2 ksf.

Maximum settlements vary between 35 (Scenario 1) and 70 inches (Scenario 2), depending on which consolidation parameters are used. The range in settlements were evaluated along the three query lines to understand the changes to the base liner slope that are caused by the settlement. Query 1 is along the north portion of the landfill, Query 2 is along the center of the landfill and Query 3 is along the south portion of the landfill.

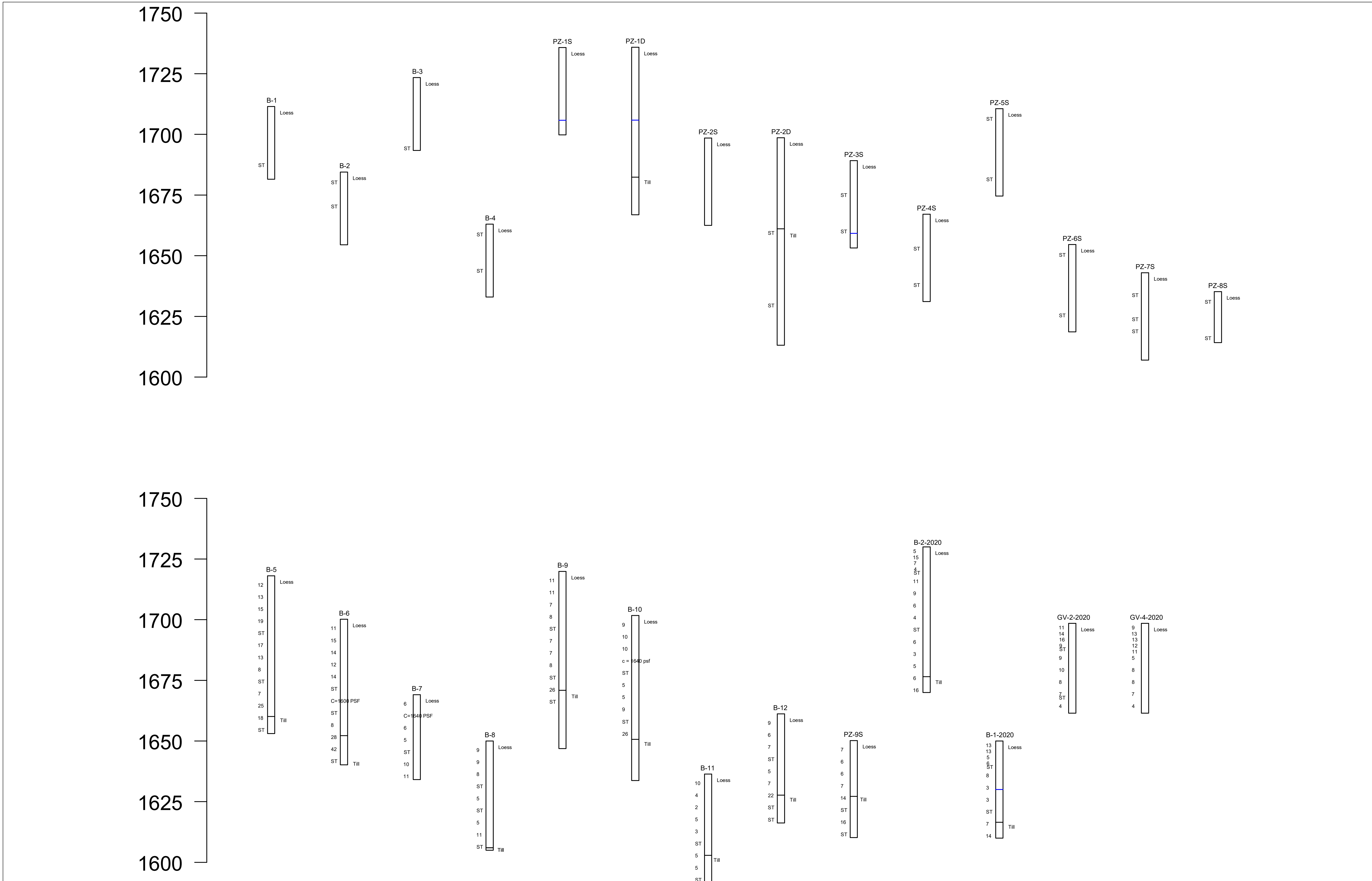
Based on the Settle3D results, final slopes were calculated for each 100 feet section of the liners, as well as the overall slope from the landfill approximate center point. For Scenario 1, the minimum slope over a 100 feet section was estimated to be approximately 1.4% and the overall center to edge minimum slope was estimated to be 1.8%. For Scenario 2, the minimum slope over a 100 feet section was estimated to be approximately 0.9% and the overall center to edge minimum slope was estimated to be 1.6%. It should be noted that the design base liner slope is 2%.

For Scenario 2, these settlements are considered conservative. Out of the four consolidation tests performed at the site, this is the only results that showed such high consolidation parameters. Based on this, while these results indicate some areas with base slopes that will be lower than the recommended minimum value of 1.2% (per previous settlement evaluations), actual settlements are expected to be more in line with Scenario 1. Based on this, liner slope changes caused by settlement are not expected to be an issue.

Results from the Settle3D analysis are included in Attachment E.

Attachment A – Boring Information


Gas Wells (2 ST samples)
PZ-2S/2D
B-02-2020 (not drilled)
B-5
B-1
B-6
B-02-2020
PZ-1D/1S
B-2
PZ-3S
B-9
B-7
PZ-4S
B-8
B-01-2020
B-3
B-11
PZ-8S
PZ-5S
B-10
572nd Ave
PZ-9S
B-12
B-4
PZ-6S
PZ-7S
N
1000 ft
Google Earth
© 2020 Google



1750
1725
1700
1675
1650
1625
1600
B-1
B-2
B-3
B-4
PZ-1S
PZ-1D
PZ-2S
PZ-2D
PZ-3S
PZ-4S
PZ-5S
PZ-6S
PZ-7S
PZ-8S
Loess
Till
ST
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
PZ-9S
B-2-2020
B-1-2020
GV-2-2020
GV-4-2020
C=1600 PSF
C=1640 PSF
c = 1640 psf

Boring	Material	Depth (ft)	Blow Count (bpf)
B-5	Loess	3.5	12
	Loess	8.5	13
	Loess	13.5	15
	Loess	18.5	19
	Loess	28.5	17
	Loess	33.5	13
	Loess	38.5	8
	Loess	48.5	7
	Loess	53.5	25
	Till	58.5	18
B-6	Loess	3.5	11
	Loess	8.5	15
	Loess	13.5	14
	Loess	18.5	12
	Loess	23.5	14
	Loess	43.5	8
	Till	48.5	28
	Till	53.5	42
B-7	Loess	3.5	6
	Loess	13.5	6
	Loess	18.5	5
	Loess	28.5	10
	Loess	33.5	11
B-8	Loess	3.5	9
	Loess	8.5	9
	Loess	13.5	8
	Loess	23.5	5
	Loess	33.5	5
	Loess	38.5	11
B-9	Loess	3.5	11
	Loess	8.5	11
	Loess	13.5	7
	Loess	18.5	8
	Loess	28.5	7
	Loess	33.5	7
	Loess	38.5	8
	Till	48.5	26
B-10	Loess	3.5	9
	Loess	8.5	10
	Loess	13.5	10
	Loess	28.5	5
	Loess	33.5	5
	Loess	38.5	9
	Loess	48.5	26
B-11	Loess	3.5	10
	Loess	8.5	4
	Loess	13.5	2
	Loess	18.5	5
	Loess	23.5	3
	Till	33.5	5
	Till	38.5	5
B-12	Loess	3.5	9
	Loess	8.5	6
	Loess	13.5	7
	Loess	23.5	5
	Loess	28.5	7
	Till	33.5	22

Boring	Material	Depth (ft)	Blow Count (bpf)
PZ-9S	Loess	3.5	7
	Loess	8.5	6
	Loess	13.5	6
	Loess	18.5	7
	Till	23.5	14
	Till	33.5	16
B-1-2020	Loess	1	13
	Loess	3.5	13
	Loess	6	5
	Loess	8.5	6
	Loess	13.5	8
	Loess	18.5	3
	Loess	23.5	3
	Till	33.5	7
	Till	38.5	14
B-2-2020	Loess	1	5
	Loess	3.5	15
	Loess	6	7
	Loess	8.5	4
	Loess	13.5	11
	Loess	18.5	9
	Loess	23.5	6
	Loess	28.5	4
	Loess	38.5	6
	Loess	43.5	3
	Loess	48.5	5
	Till	53.5	6
	Till	58.5	16
GV-2	Loess	1	11
	Loess	3.5	14
	Loess	6	16
	Loess	8.5	9
	Loess	13.5	9
	Loess	18.5	10
	Loess	23.5	8
	Loess	28.5	7
	Loess	33.5	4
GV-4	Loess	1	9
	Loess	3.5	13
	Loess	6	13
	Loess	8.5	12
	Loess	10	11
	Loess	13.5	5
	Loess	18.5	8
	Loess	23.5	8
	Loess	28.5	7
	Loess	33.5	4

	Average	Median	Min	Max
Loess	8.9	8	2	26
Till	16.8	16	5	42

Boring	Depth (ft)	Material	LL	PL	PI	Shrinkage	MC (%)	DD (pcf)	Uncon (psf)	Cc	Cr	p'c (tsf)	OCR	c (psf)	phi (deg)	c' (psf)	phi' (deg)
B-5	8	Loess	39	19	20		21.8										
	23	Loess	39	18	21		23.1	94									
	38	Loess					30.4										
	43	Loess	35	19	16		30	88	850								
	63	Till	39	14	25		15.8	112									
B-6	13	Loess	37	20	17	9	24.1										
	28	Loess	40	19	21		28.2	85	1000								
	38	Loess	38	19	19		30.1	86									
	43	Loess					31.1										
	53	Till	41	18	23	17	18.5										
	58	Till	49	14	35		18.4	108									
B-7	8	Loess	37	20	17		31.8	86		0.26	0.03	2.64	5.1				
	23	Loess	43	16	27		28.8	91									
B-8	3	Loess	50	23	27		35.1										
	18	Loess	42	18	24		32.2	76		0.23	0.04	1.12	0.7				
	28	Loess	37	18	19		34.7	85		0.23	0.039	1.35	0.8				
	38.5	Loess					27.6										
	43	Till	39	17	22		31.4	93									
B-9	8	Loess	39	20	19	11	27.4										
	23	Loess	40	19	21		30.9	86						536	15.7	234	28
	43	Loess	32	18	14		22.4	97	1300								
	48	Till					21.5										
	53	Till	36	14	22		19.1	105	750								
	55	Till	38	14	24												
B-10	23	Loess	40	19	21		30.7	88	650								
	38	Loess	50	14	36		27.5										
	43	Loess	54	18	36		22.5	102									
	50	Loess	46	13	33		22.5										
B-11	3	Loess	47	27	20		30.5										
	8	Loess					31.4										
	13	Loess	39	20	19	20	31.7										
	23	Loess	40	18	22		33.4										
	28	Loess	41	19	22		32.4	87	200								
	38	Till	38	18	20		30.8	89									
B-12	8	Loess	42	20	22	18	30.6										
	18	Loess	43	17	26		32.6	89	350								
	28	Loess	40	20	20		34.7										
	38	Till	38	17	21		27.4	92						191	17.1	156	28.1
	43	Till	40	16	24		30.5	92	300								
PZ-95	8	Loess	38	19	19		25.5										
	28	Till	47	15	32		23.6	100	1200								
	38	Till	63	19	44		26.7	93									

Loess	Average	41	19	22		29	89	725
	Median	40	19	21		30.5	87.5	750
	Min	32	13	14		21.8	76	200
	Max	54	27	36		35.1	102	1300

Till	Average	43	16	27		24	98	750
	Median	39	16	24		23.6	93	750
	Min	36	14	20		15.8	89	300
	Max	63	19	44		31.4	112	1200

Attachment B – Current Testing Results

		Dry Density (pcf)	Moisture Content (%)	Atterbergs			Normal	Shear	Shear - Calculated	Difference	Difference^2
B-1, ST-1	10-12	93.6	23.4				3.5	3.0	2.8	0.21	0.04
		93.6	23.3	39	24	15	10.4	6.0	6.1	-0.08	0.01
		92.2	25.1				20.8	11.0	11.0	0.00	0.00
B-2, ST-2	33.5-35.5	85.6	32.3				10.4	6.5	6.1	0.42	0.17
		84.9	32.3	38	25	13	20.8	10.0	11.0	-1.00	1.01
		86.2	32.4				41.7	21.6	21.0	0.54	0.29
GV-2, ST-1	10-12	84.1	21.3				3.5	3.1	2.8	0.27	0.07
		85.5	22.2	23	23	12	10.4	6.0	6.1	-0.05	0.00
		85.1	21.6				20.8	10.8	11.0	-0.29	0.09

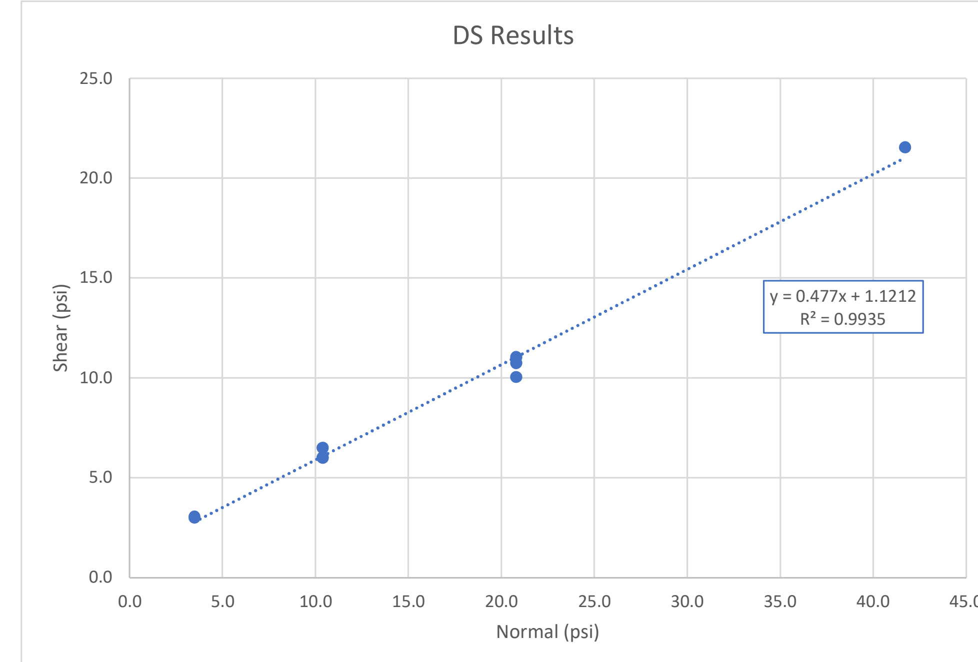
Phi (radians)	**0.477**
Cohesion	**1.121**
phi (deg)	**25.5**
c (psf)	**161**

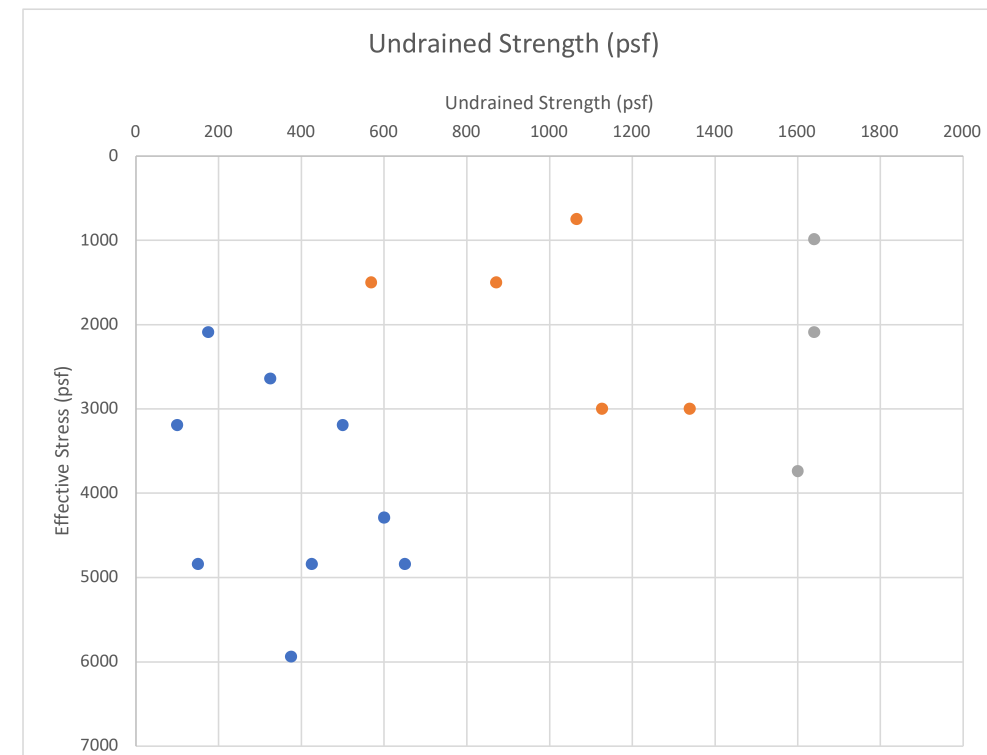
Sum	1.7
St Dev	0.46
Average	8.7
COV	5%

Previous Testing

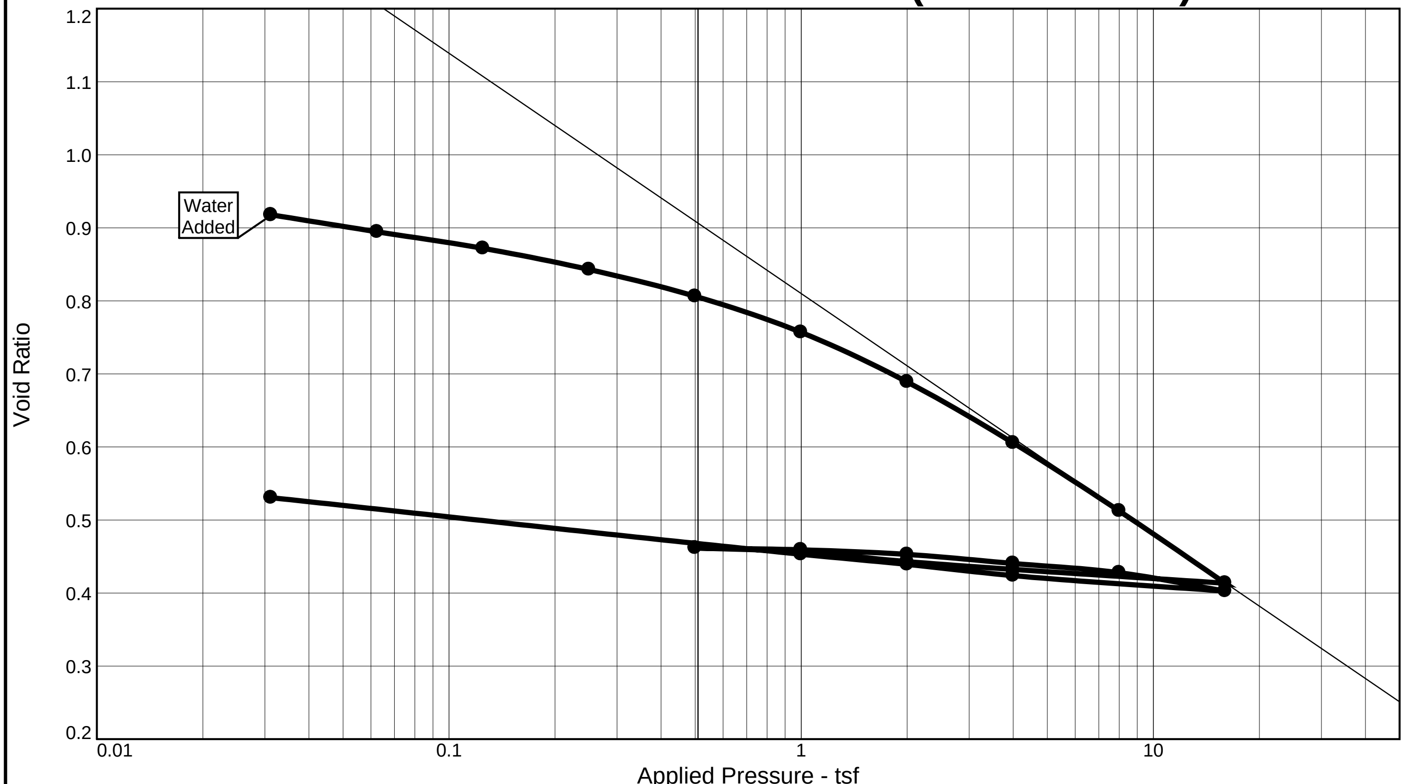
phi (deg)	**28.1**
c (psf)	**156**

		Material	Dry Density (pcf)	Moisture Content (%)	Atterbergs			Confining Pressure (psf)	Failure Stress (psf)	c-p ratio	Cohesion (psf)	Effective Stress (psf)
B-1, ST-2	28.5-30.5	Loess	92.8	29.9	44	21	23	1500	1742	0.58	871	1500
		Loess	90.3	30.7				1500	1138	0.38	569	1500
B-2, ST-1	10-12	Loess	95.8	26	36	24	12	750	3254	2.17	1627	750
		Loess	86	27.2				750	2131	1.42	1065.5	750
GV-2, ST-2	30-32	Loess	89.4	29.1	37	24	13	3000	2678	0.45	1339	3000
		Loess	89.7	30				3000	2254	0.38	1127	3000
B-5	43-45	Loess	88	30	35	19	16	0	850	0.09	425	4840
B-6	28-30	Loess	85	28.2	40	19	21	0	1000	0.16	500	3190
B-6	34	Loess						0		0.43	1600	3740
B-7	9	Loess						0		1.66	1640	990
B-9	43-45	Loess	97	22.4	32	18	14	0	1300	0.13	650	4840
B-9	53-55	Loess	105	19.1	36	14	22	0	750	0.06	375	5940
B-10	18-20	Loess						0		0.78	1640	2090
B-10	23-25	Loess	88	30.7	40	19	21	0	650	0.12	325	2640
B-11	28-30	Loess	87	32.4	41	19	22	0	200	0.03	100	3190
B-12	18-20	Loess	89	32.6	43	17	26	0	350	0.08	175	2090
B-12	43-45	Loess	92	30.5	40	16	24	0	300	0.03	150	4840
PZ-9S	38-40	Loess	100	23.6	47	15	32	0	1200	0.14	600	4290





One-Dimensional Consolidation (ASTM D2435)



Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α
7	1.00	0.155									
8	2.00	0.050									

Natural Saturation	Natural Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
102.3 %	34.7 %	87.9	44	23	2.70	0	1.3	0.33	0.04	0.917

MATERIAL DESCRIPTION	USCS	AASHTO
Brown, mottled gray, spotted reddish brown LEAN CLAY		

Project No. 20-198T **Client:** Burns & McDonnell

Project: NNSWC Landfill, #122625

Depth: 28.5' - 30.5' **Sample Number:** B-1, ST-2

ALPHA-OMEGA GEOTECH

Remarks:

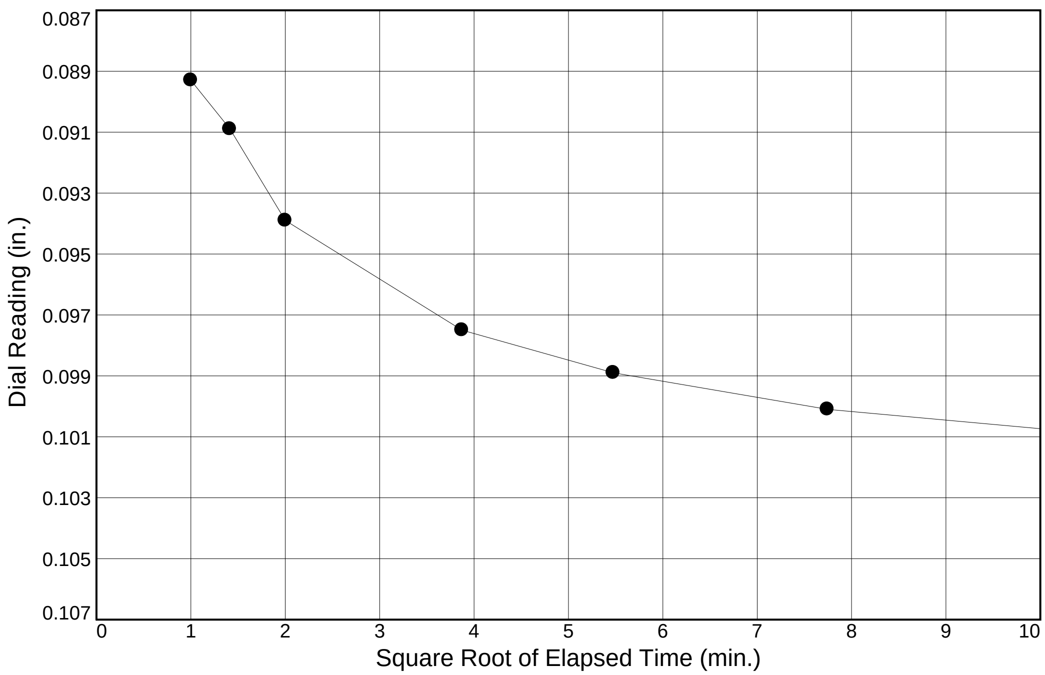
Figure 1 of 1

Tested By: D.B. **Checked By:** T.B.

Dial Reading vs. Time

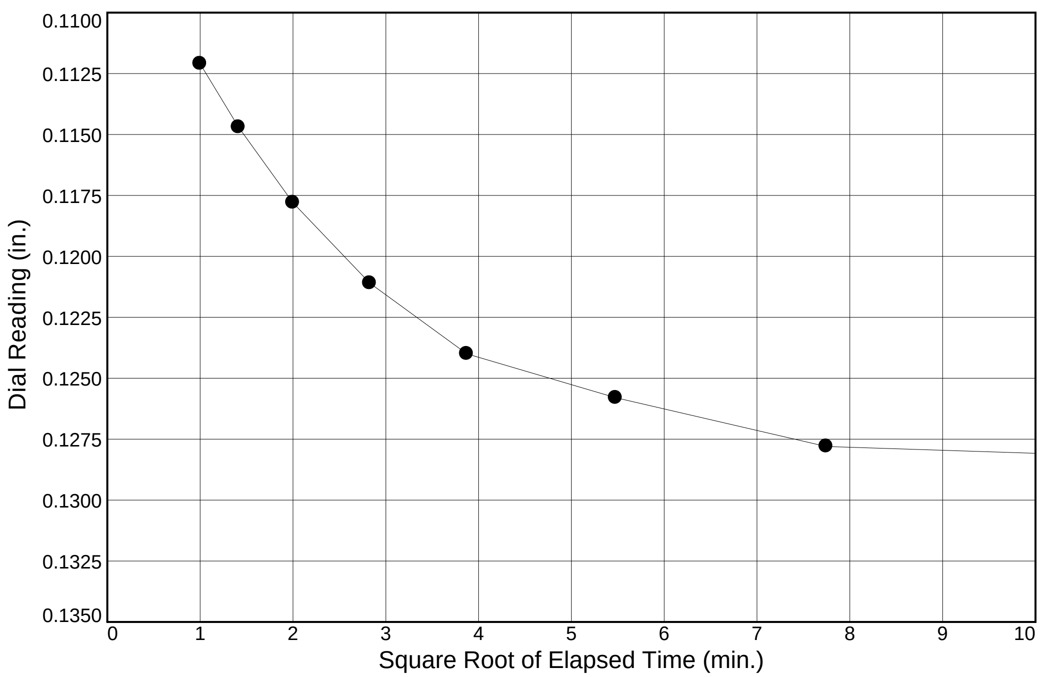
Project No.: 20-198T
Project: NNSWC Landfill, #122625

Depth: 28.5' - 30.5'   Sample Number: B-1, ST-2



Load No.= 7
Load= 1.00 tsf
D_0 = 0.0845
D_{90} = 0.0951
D_{100} = 0.0962
T_{90} = 6.83 min.

C_v @ T_{90}
0.155 ft.^{2}/day



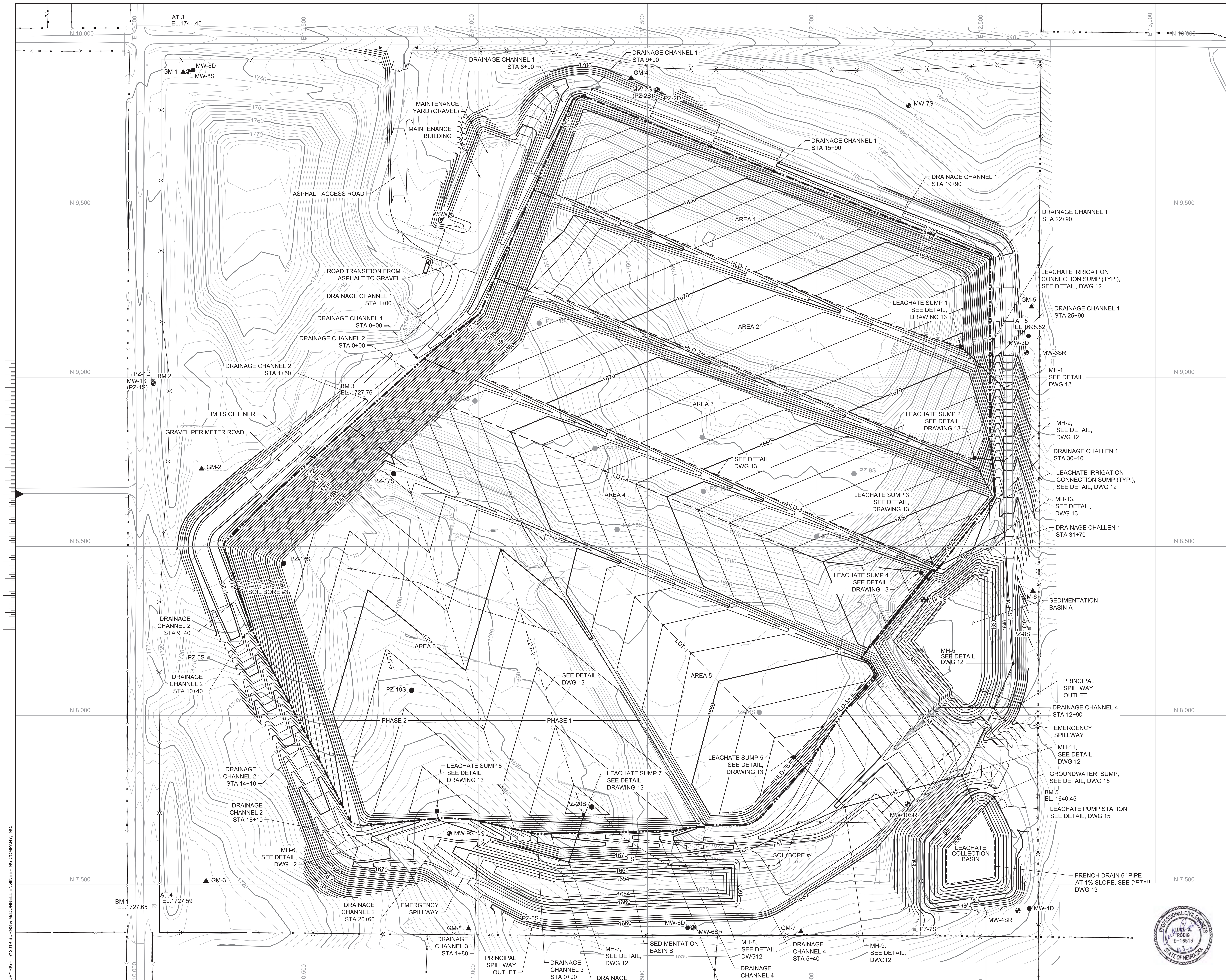
Load No.= 8
Load= 2.00 tsf
D_0 = 0.1088
D_{90} = 0.1246
D_{100} = 0.1264
T_{90} = 19.62 min.

C_v @ T_{90}
0.050 ft.^{2}/day

Figure 1 of 2

Alpha-Omega Geotech, Inc.

Attachment C – Section and Liner Information



no.	date	by	ckd	description
A	10/03/19	LAR	SAM	ISSUED FOR PERMIT

NOTES:

1. SITE TOPOGRAPHY WAS FLOWN APRIL 6, 1999 BY WESTERN AIR MAPS, INC., LEXEXA, KANSAS. TOPOTRAPHY WITHIN THE LANDFILL BOUNDARY IS FROM A SURVEY DATED NOVEMBER 27, 2018 BY JEO CONSULTING GROUP. INC.
2. LANDFILL BOTTOM ELEVATIONS SHOWN ARE TOP OF LINER.
3. EXCAVATION CONTOURS IN THE LANDFILL AREA ARE A MINIMUM OF 2 FEET BELOW THE ELEVATIONS SHOWN ON THIS DRAWING.
4. EXISTING PIEZOMETERS WITHIN LANDFILL AREA 6 WILL BE ABANDONED PRIOR TO CONSTRUCTION OF THE LANDFILL AREA.
5. LAYOUT OF GROUNDWATER DRAINAGE SYSTEM BENEATH LANDFILL AREAS 3, 4, 5 AND 6 IS SHOWN ON DRAWING 17.

BURNS McDONNELL

date: SEPTEMBER 2019	detailed: J. HEDMAN
designed: L. RODIG	checked: S. MARTIN

NORTHEAST NEBRASKA SOLID WASTE COALITION

PERMIT MODIFICATION AND RENEWAL DRAWINGS

TOTAL SITE DEVELOPMENT PLAN

PROFESSIONAL CIVIL ENGINEER LUKE A. RODIG E-16513 STATE OF NEBRASKA

project: 118418	contract
drawing: 4	rev. –

sheet 9 of 24 sheets

file 4 - Total Site Development Plan.dwg

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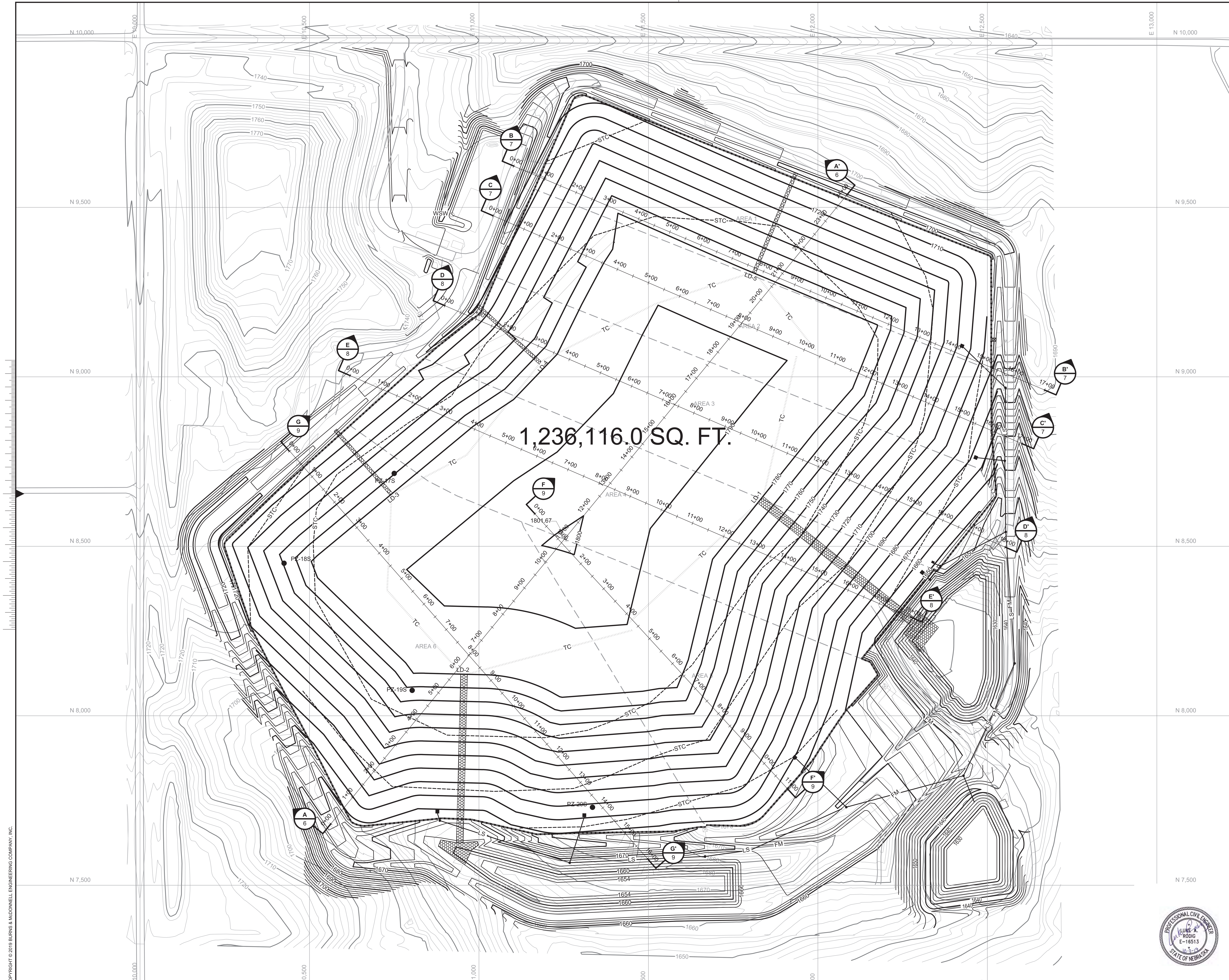

no.	date	by	ckd	description
A	10/03/19	LAR	SAM	ISSUED FOR PERMIT

NOTES:

1. SITE TOPOGRAPHY WAS FLOWN APRIL 6, 1999 BY WESTERN AIR MAPS, INC., LEXEXA, KANSAS. TOPOTRAPHY WITHIN THE LANDFILL BOUNDARY IS FROM A SURVEY DATED NOVEMBER 27, 2018 BY JEO CONSULTING GROUP. INC.
2. A SINGLE PHASE CLOSURE OF THE PANDFILL IS PROPOSED.

BURNS McDONNELL

date SEPTEMBER 2019
detailed J. HEDMAN
designed L. RODIG
checked S. MARTIN

NORTHEAST NEBRASKA SOLID WASTE COALITION

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FINAL CLOSURE PLAN

project 118418
contract
drawing 5
rev. –
sheet 10 of 24 sheets
file 5 - Final Closure Plan.dwg

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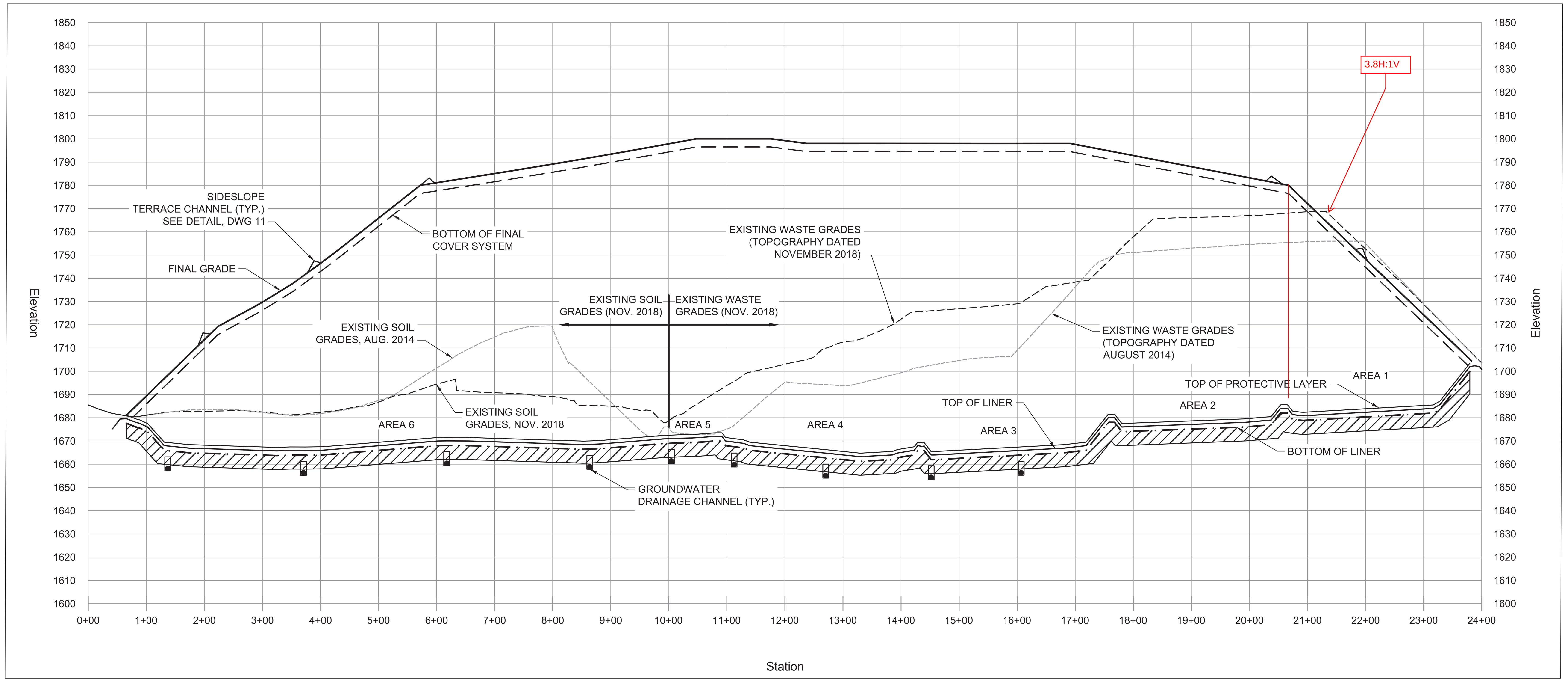
Reduce x distance by 0.952



SECTION AREAS 1-6
(SOUTH TO NORTH)
VERTICAL SCALE: 1" = 40'
HORIZONTAL SCALE: 1" = 100'

A-A'
5

LEGEND

- FINAL GRADE
- BOTTOM OF FINAL COVER SYSTEM
- EXISTING GRADE 2018
- EXISTING GRADE 2014
- TOP OF PROTECTIVE COVER
- TOP OF LINER
- BOTTOM OF LINER
- MINIMUM DESATURATED ZONE

0 40' 80'
VERTICAL SCALE IN FEET

0 100' 200'
HORIZONTAL SCALE IN FEET

BURNS McDONNELL

date	detailed
SEPTEMBER 2019	J. HEDMAN
designed	checked
L. RODIG	S. MARTIN

PROFESSIONAL CIVIL ENGINEER
LUKE A. RODIG
E-16513
STATE OF NEBRASKA

NORTHEAST NEBRASKA SOLID WASTE COALITION

PERMIT MODIFICATION AND RENEWAL DRAWINGS

LANDFILL CROSS SECTIONS 1

project	contract
118418	

drawing 6 rev. –

sheet 11 of 24 sheets

file 6 - Landfill Cross Sections 1.dwg

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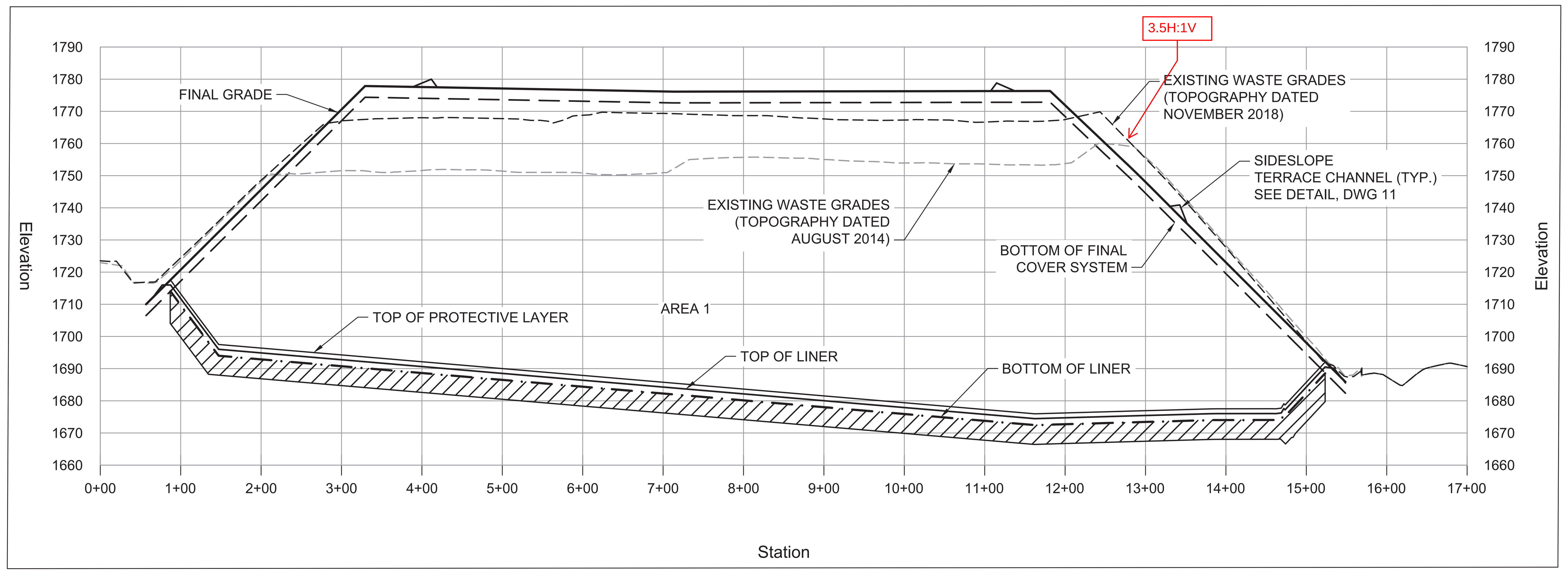
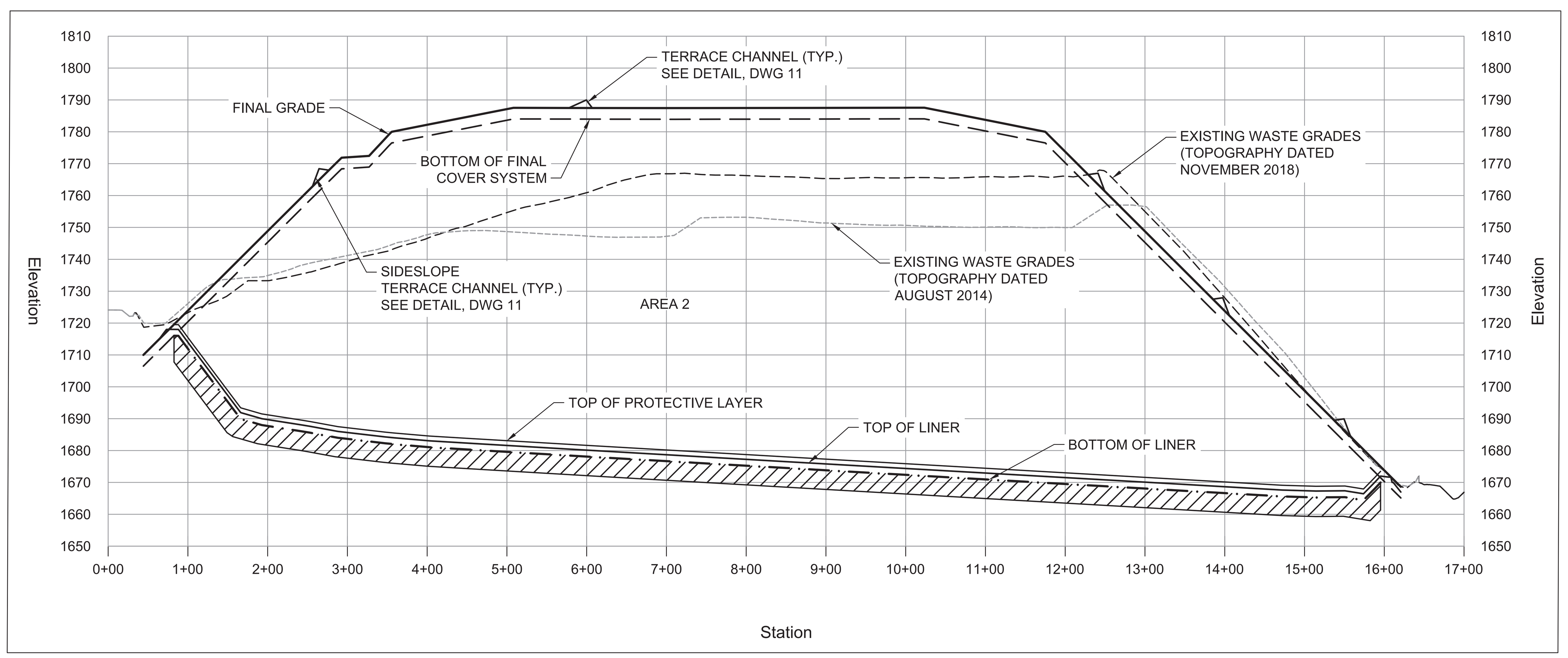


SECTION AREA 1 (WEST TO EAST) B-B' / 5
VERTICAL SCALE: 1" = 40'
HORIZONTAL SCALE: 1" = 100'



SECTION AREA 2 (WEST TO EAST) C-C' / 5
VERTICAL SCALE: 1" = 40'
HORIZONTAL SCALE: 1" = 100'

LEGEND

- FINAL GRADE
- BOTTOM OF FINAL COVER SYSTEM
- EXISTING GRADE 2018
- EXISTING GRADE 2014
- TOP OF PROTECTIVE COVER
- TOP OF LINER
- BOTTOM OF LINER
- MINIMUM DESATURATED ZONE

VERTICAL SCALE IN FEET: 0, 40', 80'
HORIZONTAL SCALE IN FEET: 0, 100', 200'

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date	detailed
SEPTEMBER 2019	J. HEDMAN
designed	checked
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NORTHEAST NEBRASKA SOLID WASTE COALITION

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LANDFILL CROSS SECTIONS 2

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project	contract
118418	

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sheet 12 of 24 sheets

file 7 - Landfill Cross Sections 2.dwg

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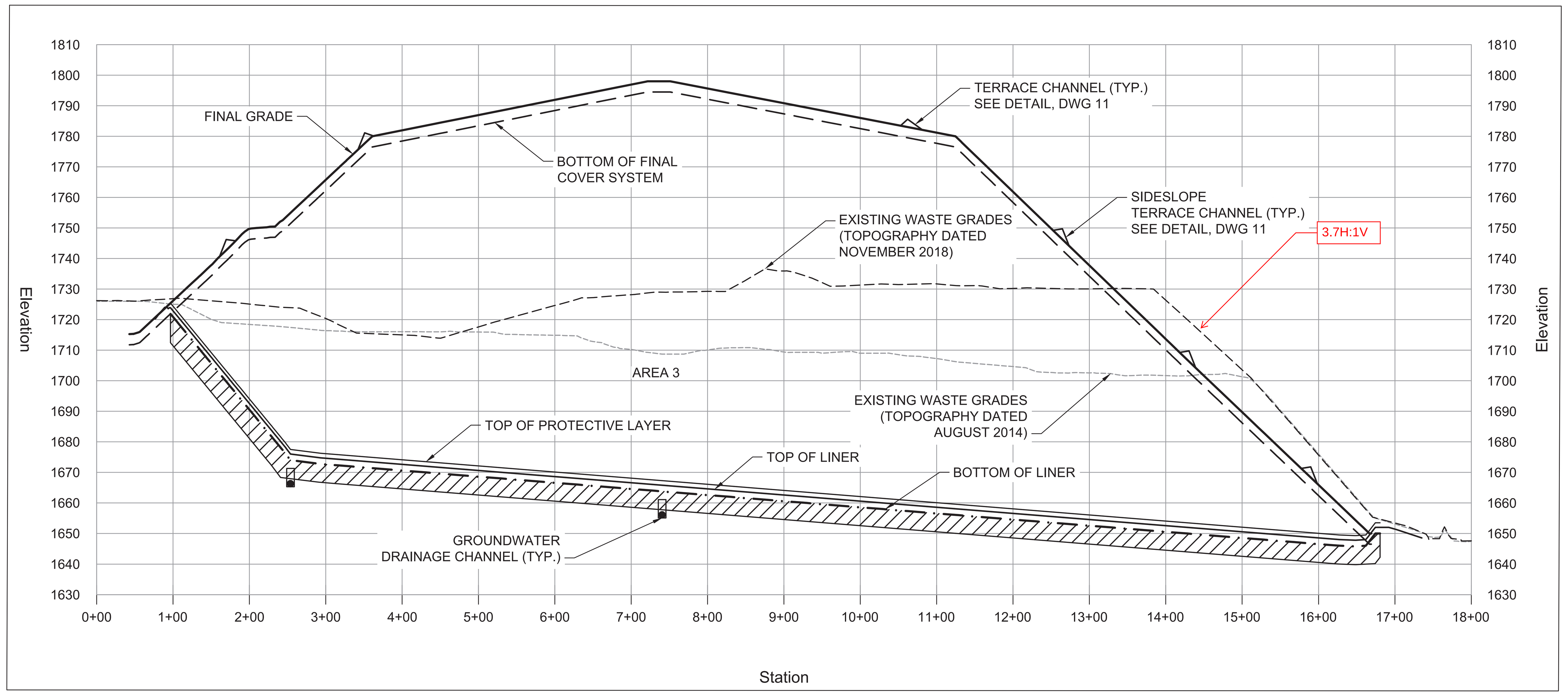
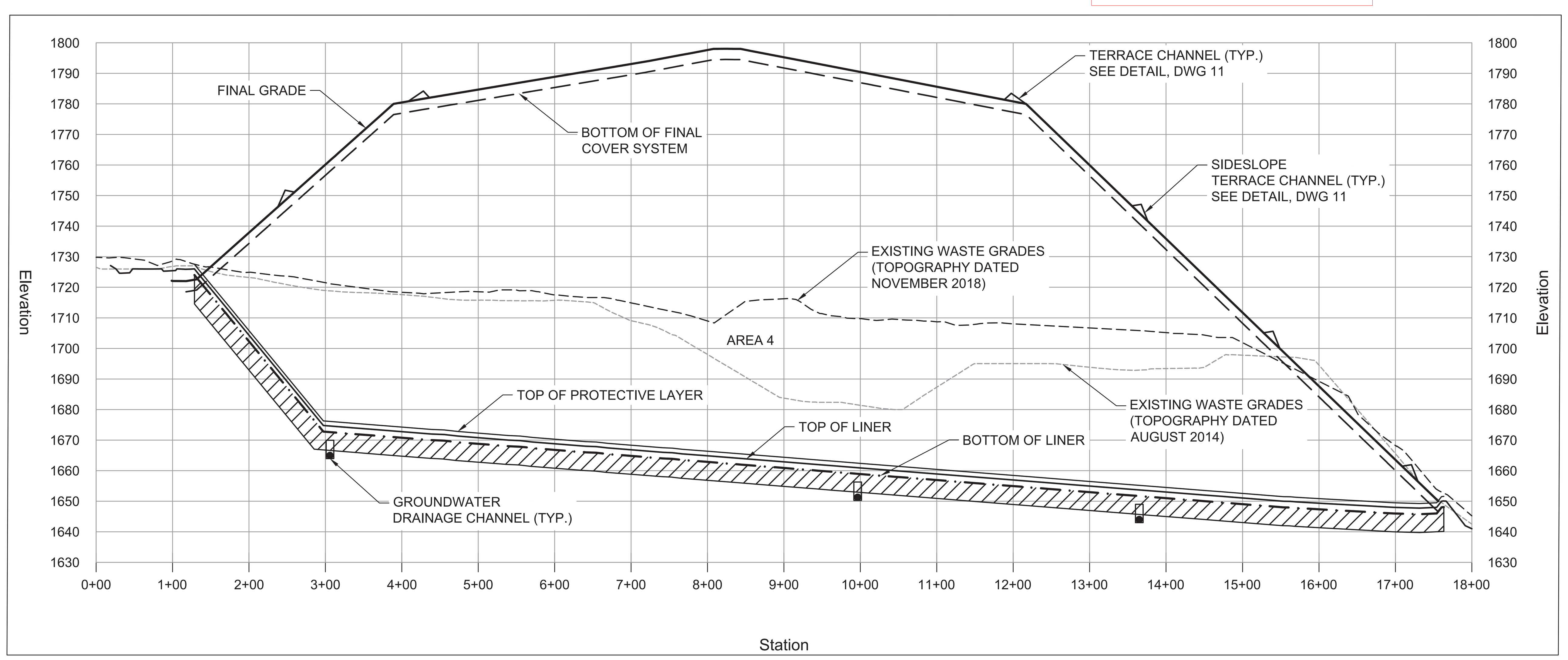


SECTION AREA 3 (WEST TO EAST) D-D' 5
VERTICAL SCALE: 1" = 40'
HORIZONTAL SCALE: 1" = 100'

Reduce x distance by 0.97



SECTION AREA 4 (WEST TO EAST) E-E' 5
VERTICAL SCALE: 1" = 40'
HORIZONTAL SCALE: 1" = 100'

LEGEND

- FINAL GRADE
- BOTTOM OF FINAL COVER SYSTEM
- EXISTING GRADE 2018
- EXISTING GRADE 2014
- TOP OF PROTECTIVE COVER
- TOP OF LINER
- BOTTOM OF LINER
- MINIMUM DESATURATED ZONE

0 40' 80' VERTICAL SCALE IN FEET
0 100' 200' HORIZONTAL SCALE IN FEET

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SEPTEMBER 2019	J. HEDMAN
designed	checked
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NORTHEAST NEBRASKA SOLID WASTE COALITION

PERMIT MODIFICATION AND RENEWAL DRAWINGS
LANDFILL CROSS SECTIONS 3

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drawing **8** rev. **–**
sheet 13 of 24 sheets
file 8 - Landfill Cross Sections 3.dwg

PROFESSIONAL CIVIL ENGINEER LUKE A. RODIG E-16513 STATE OF NEBRASKA

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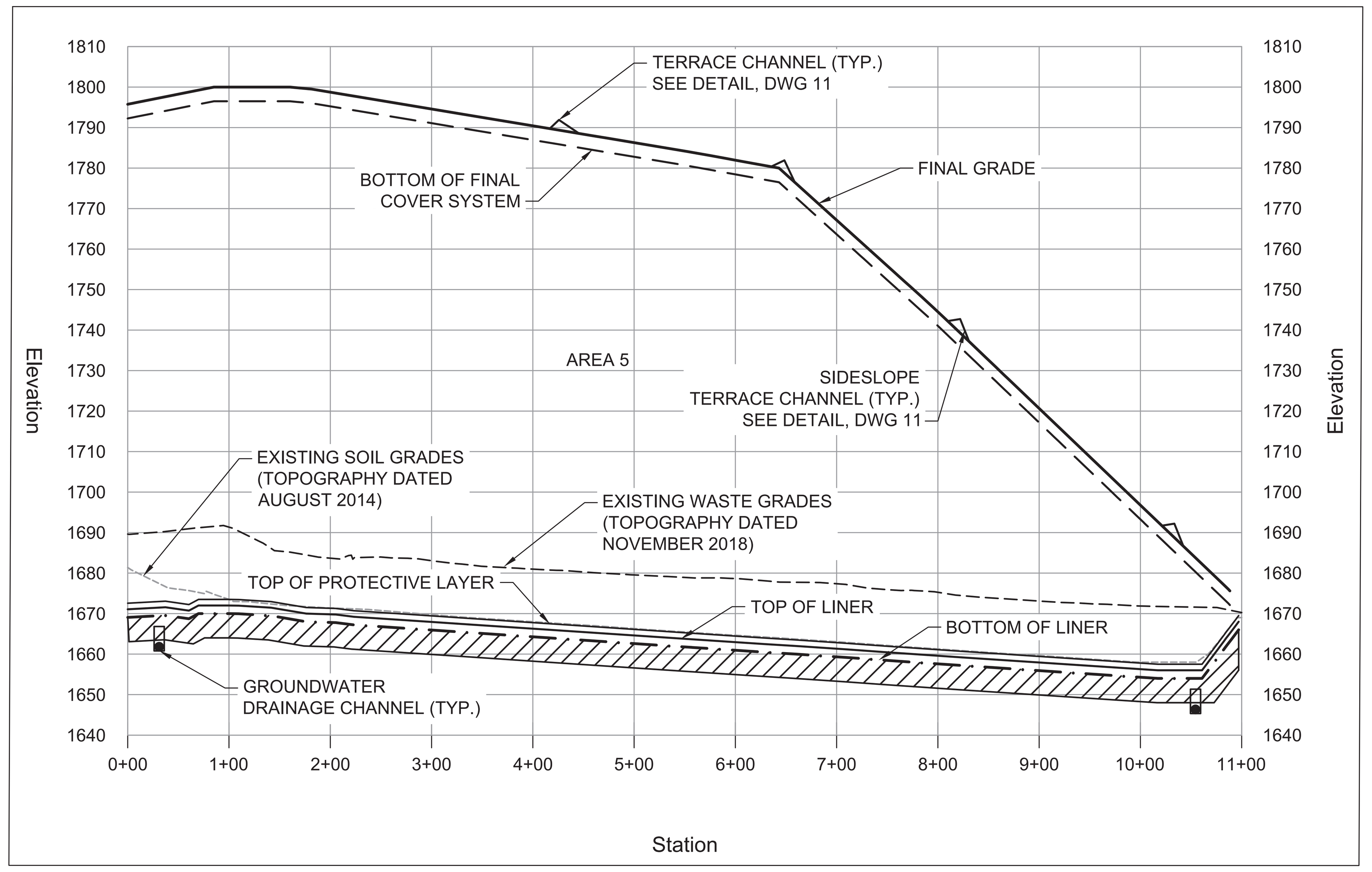
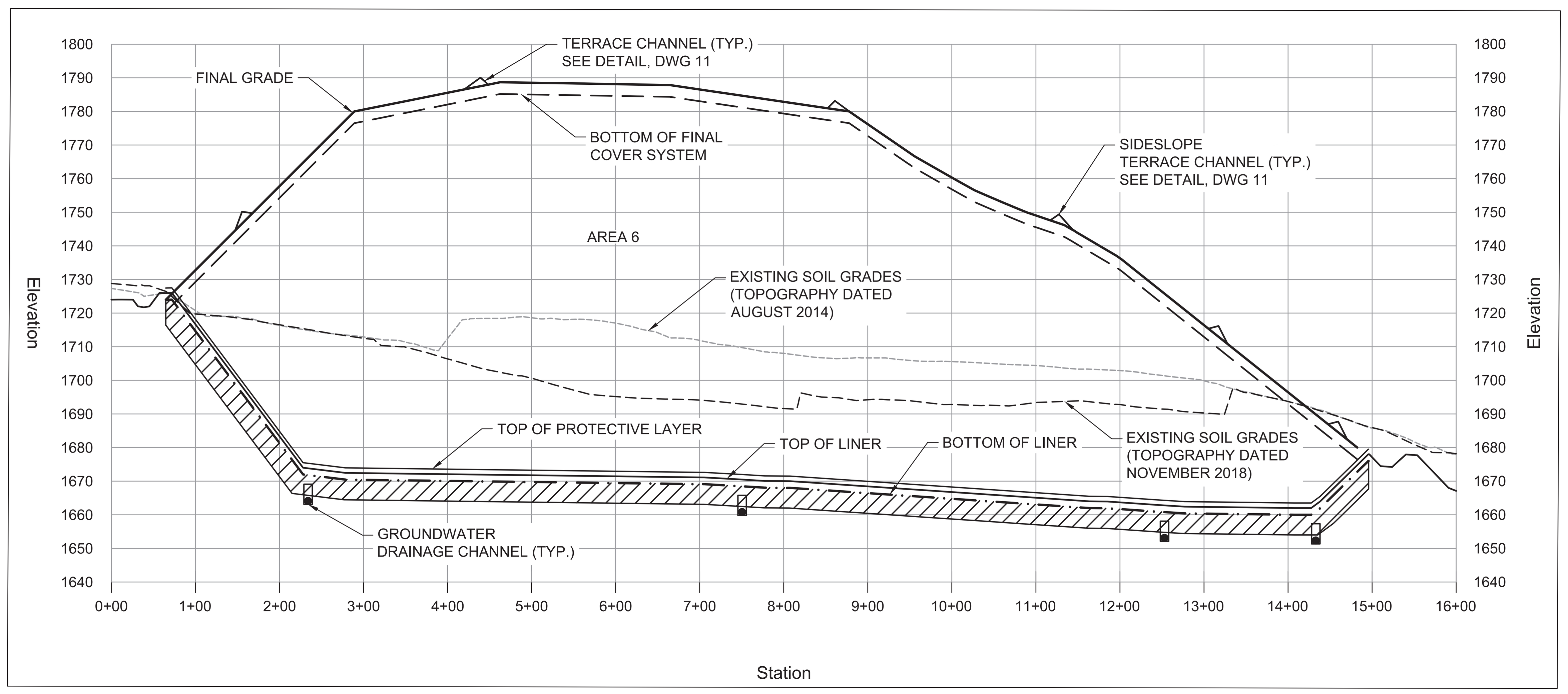


SECTION AREA 5 (WEST TO EAST) F-F' / 5
VERTICAL SCALE: 1" = 40'
HORIZONTAL SCALE: 1" = 100'



SECTION AREA 6 (WEST TO EAST) G-G' / 5
VERTICAL SCALE: 1" = 40'
HORIZONTAL SCALE: 1" = 100'

LEGEND

- FINAL GRADE
- BOTTOM OF FINAL COVER SYSTEM
- EXISTING GRADE 2018
- EXISTING GRADE 2014
- TOP OF PROTECTIVE COVER
- TOP OF LINER
- BOTTOM OF LINER
- MINIMUM DESATURATED ZONE

0 40' 80'
VERTICAL SCALE IN FEET
0 100' 200'
HORIZONTAL SCALE IN FEET

BURNS McDONNELL

date	detailed
SEPTEMBER 2019	J. HEDMAN
designed	checked
L. RODIG	S. MARTIN

NORTHEAST NEBRASKA SOLID WASTE COALITION

PERMIT MODIFICATION AND RENEWAL DRAWINGS
LANDFILL CROSS SECTIONS 4

project	contract
118418	
drawing 9	rev. –

sheet 14 of 24 sheets
file 9 - Landfill Cross Sections 4.dwg

PROFESSIONAL CIVIL ENGINEER LUKE A. RODIG E-16513 10-3-19 STATE OF NEBRASKA

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Appendix Table 1. Summary of interface shear strengths.

Interface 1*	Interface 2*	Peak Strength					Residual Strength				
		Fig. No.	δ (deg)	Ca (kPa)	Points	R^2	Fig. No.	δ (deg)	Ca (kPa)	Points	R^2
HDPE-S	Granular Soil	1a	21	0	162	0.93	1b	17	0	128	0.92
HDPE-S	Cohesive Soil										
	Saturated	1c	11	7	79	0.94	1d	11	0	59	0.95
	Unsaturated	1c	22	0	44	0.93	1d	18	0	32	0.93
HDPE-S	NW-NP GT	1e	11	0	149	0.93	1f	9	0	82	0.96
HDPE-S	Geonet	1g	11	0	196	0.90	1h	9	0	118	0.93
HDPE-S	Geocomposite	1i	15	0	36	0.97	1j	12	0	30	0.93
HDPE-T	Granular Soil	2a	34	0	251	0.98	2b	31	0	239	0.96
HDPE-T	Cohesive Soil										
	Saturated	2c	18	10	167	0.93	2d	16	0	150	0.90
	Unsaturated	2c	19	23	62	0.91	2d	22	0	35	0.93
HDPE-T	NW-NP GT	2e	25	8	254	0.96	2f	17	0	217	0.95
HDPE-T	Geonet	2g	13	0	31	0.99	2h	10	0	27	0.99
HDPE-T	Geocomposite	2i	26	0	168	0.95	2j	15	0	164	0.94
LLDPE-S	Granular Soil	3a	27	0	6	1.00	3b	24	0	9	1.00
LLDPE-S	Cohesive Soil	3c	11	12.4	12	0.94	3d	12	3.7	9	0.93
LLDPE-S	NW-NP GT	3e	10	0	23	0.63	3f	9	0	23	0.49
LLDPE-S	Geonet	3g	11	0	9	0.99	3h	10	0	9	1.00
LLDPE-T	Granular Soil	4a	26	7.7	12	0.95	4b	25	5.2	12	0.95
LLDPE-T	Cohesive Soil	4c	21	5.8	12	1.00	4d	13	7.0	9	0.98
LLDPE-T	NW-NP GT	4e	26	8.1	9	1.00	4f	17	9.5	9	0.96
LLDPE-T	Geonet	4g	15	3.6	6	0.97	4h	11	0	6	0.98
PVC-S	Granular Soil	5a	26	0.4	6	0.99	5b	19	0	6	0.99
PVC-S	Cohesive Soil	5c	22	0.9	11	0.88	5d	15	0	9	0.95
PVC-S	NW-NP GT	5e	20	0	89	0.91	5f	16	0	83	0.74
PVC-S	NW-HB GT	5g	18	0	3	1.00	5h	12	0.1	3	1.00
PVC-S	Woven GT	5i	17	0	6	0.54	5j	7	0	6	0.93
PVC-S	Geonet	5k	18	0.1	3	1.00	5l	16	0.6	3	1.00

Appendix Table 1. (continued)

Interface 1*	Interface 2*	Peak Strength					Residual Strength				
		Fig. No.	δ (deg)	Ca (kPa)	Points	R^2	Fig. No.	δ (deg)	Ca (kPa)	Points	R^2
PVC-F	NW-NP GT	6a	27	0.2	26	0.95	6b	23	0	26	0.95
PVC-F	NW-HB GT	6c	30	0	8	0.97	6d	27	0	8	0.90
PVC-F	Woven GT	6e	15	0	6	0.78	6f	10	0	6	0.76
PVC-F	Geonet	6g	25	0	11	1.00	6h	19	0	11	0.99
PVC-F	Geocomposite	6i	27	1.1	5	1.00	6j	22	4.7	6	1.00
CSPE-R	Granular Soil	7a	36	0	3	1.00	7b	16	0	3	1.00
CSPE-R	Cohesive Soil	7c	31	5.7	6	0.71	7d	18	0	6	0.99
CSPE-R	NW-NP GT	7e	14	0	6	0.97	7f	10	0	6	0.98
CSPE-R	NW-HB GT	7g	21	0	3	1.00	7h	10	0	3	1.00
CSPE-R	Woven GT	7i	11	0	6	0.92	7j	11	0	3	1.00
CSPE-R	Geonet	7k	28	0	9	0.87	7l	16	0	9	0.80
NW-NP GT	Granular Soil	8a	33	0	290	0.97	8b	33	0	117	0.96
NW-HB GT	Granular Soil	8c	28	0	6	0.99	8d	16	0	6	0.91
Woven GT	Granular Soil	8e	32	0	81	0.99	8f	29	0	28	0.98
NW-NP GT	Cohesive Soil	9a	30	5	79	0.96	9b	21	0	28	0.79
NW-HB GT	Cohesive Soil	9c	29	0.9	15	0.71	9d	10	0	15	0.83
Woven GT	Cohesive Soil	9e	29	0	34	0.94	9f	19	0	16	0.86
GCL Reinforced (internal)	N/A	10a	16	38	406	0.85	10b	6	12	182	0.91
GCL (NW-NP GT)	HDPE-T	11a	23	8	180	0.95	11b	13	0	157	0.90
GCL (W-SF GT)	HDPE-T	11c	18	11	196	0.96	11d	12	0	153	0.92
Geonet	NW-NP GT	12a	23	0	52	0.97	12b	16	0	32	0.97
Geocomposite (NW-NP GT)	Granular Soil	13a	27	14	14	0.86	13b	21	8	10	0.92

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FAX (610) 522-8441

Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces

by

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GRI Report #30

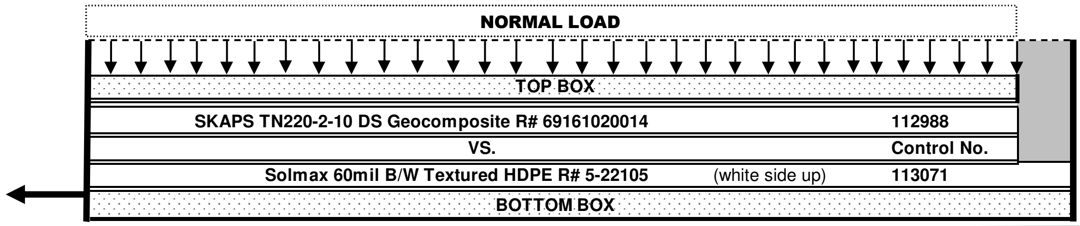
June 14, 2005

TABLE 2
CLIENT: JJ Westhoff Construction
PROJECT: NNSWC

INTERFACE SHEAR TEST RESULT (ASTM D5321)
TRI Job No. G160536

Reviewed By:
Date: 13-Jun-2016

TEST CONFIGURATION 2



TEST CONDITIONS:
SAMPLE PREPARATION:
1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box,with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:
1. Each set of specimen was consolidated under **dry** condition for **4 hours** at normal load before shearing.
2. Normal loads were applied using **bladder** for the 9 psi and 6 psi loads and **dead weights** for the 3 psi load.

SHEAR TEST:
1. Shear test was conducted at **0.04 in/min**.
2. Sheared at a maximum of **3.0 inch** horizontal displacement
3. The test specimens were sheared at **dry** condition .
4. Test were performed in general accordance with ASTM D5321 using Geotac Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Pre-test Asperity Heights	PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
			Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(mils)	(psf)	(degrees)	(psf)	(degrees)
3.0	432	18	258	31	158	20
6.0	864	17	465	28	302	19
9.0	1,296	18	595	25	337	15
		COHESION (psf) :	102		87	
		COEFFICIENT OF FRICTION :	0.39		0.21	
		FRICTION ANGLE (degrees) :	21.3		11.7	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:
1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. No tearing, stretching and wrinkling observed on the specimens.
4. Sliding occurred between the two interfacing surfaces.

Figure #1
Normal Stress/ Interface Stress

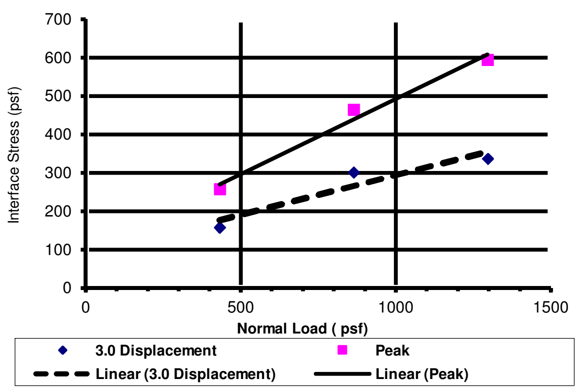
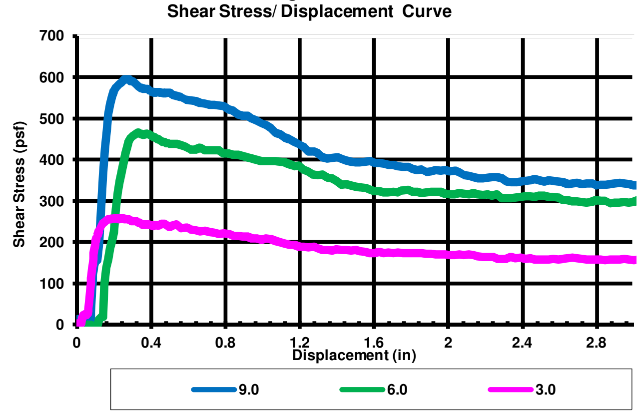


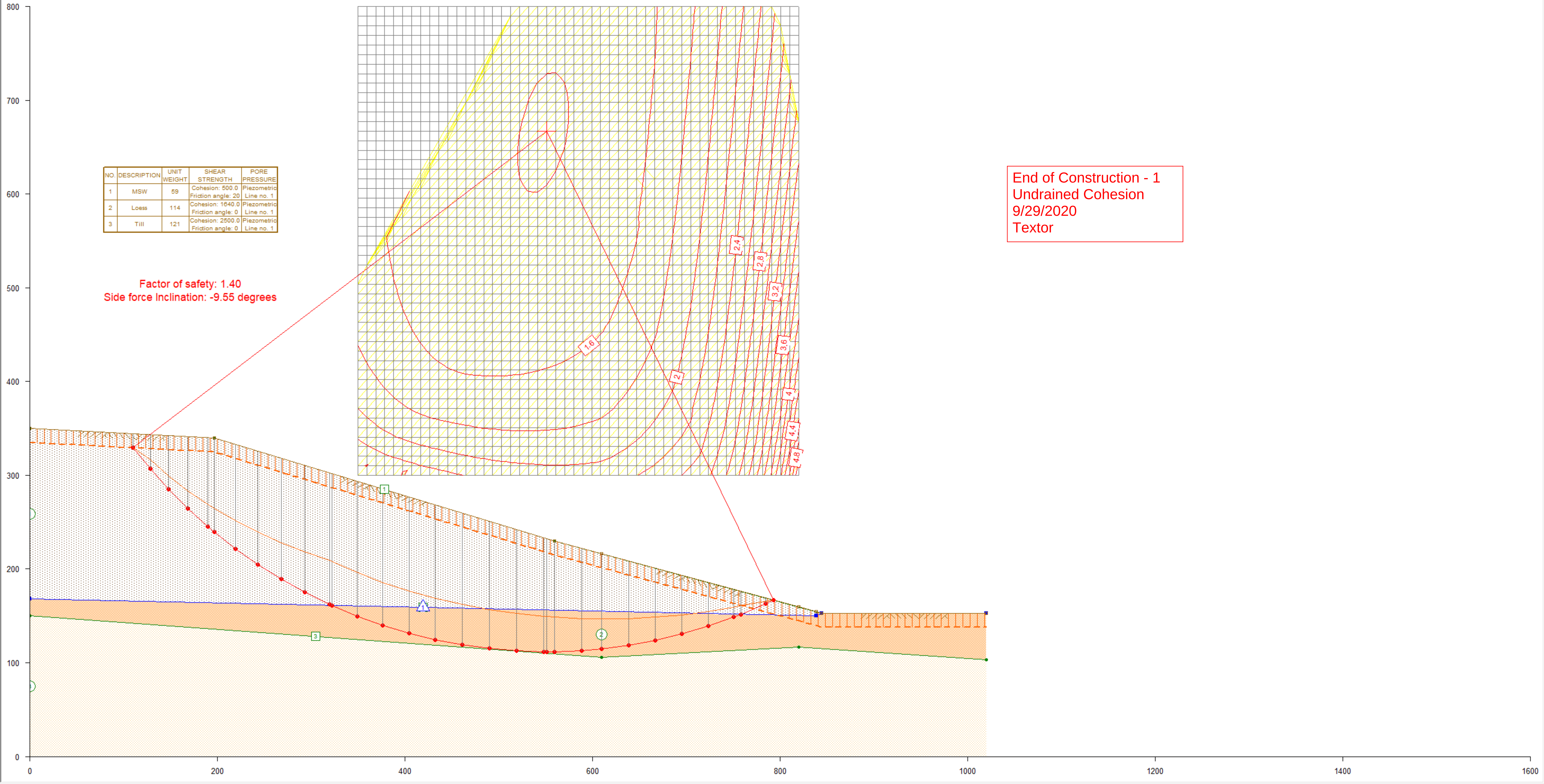
Figure #2
Shear Stress/ Displacement Curve



Attachment D – Utexas4 Input/Output and USGS Deaggregation

Section D EOC - 1.graphics-utexas - TexGraf4

File Edit Display Settings Utexas Window View Help



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	MSW	59	Cohesion: 500.0 Friction angle: 20	Piezometric Line no. 1
2	Loess	114	Cohesion: 1640.0 Friction angle: 0	Piezometric Line no. 1
3	Till	121	Cohesion: 2500.0 Friction angle: 0	Piezometric Line no. 1

Current data set: NNSWC Landfill Evaluation - Section D EOC - 1

X: 1600.64 Y: 328.62

```
GRAphics
HEAding follows -
NNSWC Landfill Evaluation - Section D EOC - 1
#122625

PROfile lines
   1 1 MSW
         0 350
         197 340
         560 230
         845 153

   2 2 Loess
         0 168
         839 150
         845 153
         1020 153

   3 3 Till
         0 150.4
         610 106
         820 116.5
         1020 102.9


MATerial properties
   1 MSW
      59 = unit weight
      Conventional Shear Strength
         500 20
      Piezometric Line
         1
   2 Loess
      114 = unit weight
      Conventional Shear Strength
         1640 0
      Piezometric Line
         1
   3 Till
      121 = unit weight
      Conventional Shear Strength
         2500 00
      Piezometric Line
         1

PIEzometric line
     1 Piezometric Line
         0 168
         839 150
         845 153
         1020 153


LABel
NNSWC Landfill Evaluation - Section D EOC - 1
```

```
ANALYSIS/COMPUTATION
   Circular Search 2
     50 50
     350 300 350 800 820 800 820 300
     5 5
   Tangent
         0 150.4
         610 106
         820 116.5
         1020 102.9


   Minimum
     5000
   Crack
     15 D
   Short

COMpute
```

```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.1.0.8 - Last Revision Date: 11/9/2009
(C) Copyright 1985-2008 S. G. Wright - All rights reserved
*****************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE         *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE       *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA      *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
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* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS     *
* OR ADAPTABILITY OF THIS SOFTWARE.                             *
*****************************************************************
```

```
UTEXAS4 S/N:10001  - Version: 4.1.0.8 - Latest Revision: 11/9/2009
Licensed for use by: Nathan Textor, Burns & McDonnell
Time and date of run: Tue Sep 29 14:04:57 2020
Name of input data file:
Z:\Clients\ENS\NNSWC\122625_NNSWC2020MOD\Design\GeoTech\Working\Dsgn\Stability - Existing
Conditions\Section D\Final\Section D EOC - 1.dat

NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: MSW

Point        X           Y

   1        0.00      350.00
   2      197.00      340.00
   3      560.00      230.00
   4      845.00      153.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: Loess

Point        X           Y

   1        0.00      168.00
   2      839.00      150.00
   3      845.00      153.00
   4     1020.00      153.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: Till

Point        X           Y

   1        0.00      150.40
   2      610.00      106.00
   3      820.00      116.50
   4     1020.00      102.90
```

```
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#122625

TABLE NO. 4
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
------------------------------------------------------------------
Description: MSW

Constant unit weight of soil (material): 59.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 500.0
Friction angle - - - - - 20.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
------------------------------------------------------------------
Description: Loess

Constant unit weight of soil (material): 114.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 1640.0
Friction angle - - - - - 0.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
------------------------------------------------------------------
Description: Till

Constant unit weight of soil (material): 121.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 2500.0
Friction angle - - - - - 0.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.
```

```
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Conditions\Section D\Final\Section D EOC - 1.dat

NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 6
*********************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************

---------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
---------------------------------------------------------
Description: Piezometric Line
Unit weight of fluid (water): 62.4

Point        X           Y

  1        0.00      168.00
  2      839.00      150.00
  3      845.00      153.00
  4     1020.00      153.00
```

```
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TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************


Search will be conducted using a fixed grid.
Number of Points Across Grid: 50
Number of Points Up Grid: 50

Grid Corner
   Number           X              Y

     1           350.00         300.00
     2           350.00         800.00
     3           820.00         800.00
     4           820.00         300.00

----- Control Parameters for Finding "Critical" Radius -----
Initial number of subdivisions between maximum and minimum
radius for finding a critical radius/radii: 5

Minimum radius increment for terminating subdivision of radii: 5.000

The following criteria will be used for determining
the maximum and minimum radii:
Tangent Line  -        X           Y
      0.00    150.40
    610.00    106.00
    820.00    116.50
   1020.00    102.90

Minimum weight required for computations to be performed: 5000

Depth of crack: 15.000
Automatic search output will be in short form.

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
There is no water in a crack.
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Radii for each grid point will be sorted in the order of increasing radius.
Critical circles for grid points will be output in the order of increasing factor of safety.
Standard sign convention used for direction of shear stress on shear surface.
Procedure of Analysis: Spencer
```

```
Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure: -10.00
```

```
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TABLE NO. 26
*************************************
* NEW, COMPUTED SLOPE GEOMETRY DATA *
*************************************

These slope geometry were generated from the Profile Lines.

     Point       X           Y

        1        0.00      350.00
        2      197.00      340.00
        3      560.00      230.00
        4      610.00      216.49
        5      820.00      159.75
        6      839.00      154.62
        7      845.00      153.00
        8     1020.00      153.00
```

```
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#122625

TABLE NO. 38
*************************************************
* FINAL SUMMARY OF COMPUTATIONS WITH FIXED-GRID *
*************************************************


Number of circles attempted: 2500
Number of circles for which F calculated: 2194
Circle with Lowest Factor of Safety:
     X coordinate for center: 551.43
     Y coordinate for center: 667.35
     Radius of circle: 555.614
Factor of safety: 1.395
Side force inclination: -9.55
Time Required for Computations: 2.0 seconds
```

```
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Conditions\Section D\Final\Section D EOC - 1.dat

NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 43
************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure     *
* Information for Individual Slices for Conventional       *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the critical shear surface in the    *
* case of an automatic search.)                            *
************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	110.41	329.40					
1	119.56	318.09	27891	1	500.0	20.00	0.0
	128.70	306.78					
2	138.43	295.96	53947	1	500.0	20.00	0.0
	148.15	285.15					
3	158.43	274.86	81378	1	500.0	20.00	0.0
	168.71	264.57					
4	179.51	254.83	109698	1	500.0	20.00	0.0
	190.31	245.09					
5	193.66	242.27	38620	1	500.0	20.00	0.0
	197.00	239.46					
6	208.44	230.48	143163	1	500.0	20.00	0.0
	219.88	221.50					
7	231.77	213.13	163279	1	500.0	20.00	0.0
	243.67	204.76					
8	255.98	197.02	181815	1	500.0	20.00	0.0
	268.30	189.28					
9	281.00	182.20	198390	1	500.0	20.00	0.0
	293.71	175.12					
10	306.76	168.71	212660	1	500.0	20.00	0.0
	319.82	162.31					
11	321.17	161.69	22354	1	500.0	20.00	0.0
	322.52	161.08					
12	335.92	155.44	233245	2	1640.0	0.00	334.2
	349.32	149.79					
13	363.01	144.86	256933	2	1640.0	0.00	958.0
	376.69	139.93					
14	390.61	135.71	275810	2	1640.0	0.00	1491.7
	404.53	131.50					
15	418.65	128.03	289457	2	1640.0	0.00	1933.9
	432.78	124.55					
16	447.06	121.82	297547	2	1640.0	0.00	2283.3
	461.35	119.08					
17	475.76	117.10	299847	2	1640.0	0.00	2539.1
	490.16	115.12					
18	504.66	113.90	296224	2	1640.0	0.00	2700.5
	519.15	112.67					
19	533.69	112.21	286642	2	1640.0	0.00	2767.0
	548.22	111.74					
20	549.83	111.74	30790	2	1640.0	0.00	2774.7
	551.43	111.73					

21	555.71	111.77	81339	2	1640.0	0.00	2765.0
	560.00	111.80					
22	574.53	112.40	264080	2	1640.0	0.00	2700.0
	589.06	113.01					
23	599.53	113.92	177661	2	1640.0	0.00	2572.0
	610.00	114.83					
24	624.42	116.74	223134	2	1640.0	0.00	2362.7
	638.84	118.65					
25	653.13	121.31	192308	2	1640.0	0.00	2038.8
	667.43	123.98					
26	681.57	127.39	156830	2	1640.0	0.00	1621.9
	695.71	130.79					
27	709.65	134.94	117228	2	1640.0	0.00	1113.1
	723.60	139.08					
28	737.30	143.95	74113	2	1640.0	0.00	513.8
	751.01	148.81					
29	754.71	150.27	12486	2	1640.0	0.00	95.9
	758.42	151.73					
30	771.77	157.50	24082	1	500.0	20.00	0.0
	785.12	163.27					
31	789.09	165.15	1386	1	500.0	20.00	0.0
	793.07	167.03					

No water in crack.

```
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Conditions\Section D\Final\Section D EOC - 1.dat

NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 44
*********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.              *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
*********************************************************

There are no seismic forces or forces due to distributed loads
for the current shear surface
```

```
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NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 47
**************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
**************************************************************
Allowable force imbalance for convergence:  48
Allowable moment imbalance for convergence: 21311

        Trial     Trial
       Factor   Side Force     Force       Moment                  Delta
Iter-    of    Inclination   Imbalance   Imbalance    Delta-F     Theta
ation  Safety   (degrees)      (lbs.)    (ft.-lbs.)              (degrees)

   1   3.00000   -17.1887  -4.887e+005   1.094e+008
First-order corrections to F and Theta ............   -4.3415    32.2236
Reduced values - Deltas were too large ............   -0.3860     2.8648

   2   2.61402   -14.3239  -4.367e+005   9.791e+007
First-order corrections to F and Theta ............   -2.6194    16.8599
Reduced values - Deltas were too large ............   -0.4451     2.8648

   3   2.16894   -11.4592  -3.440e+005   7.787e+007
First-order corrections to F and Theta ............   -1.2482     4.7023
Reduced values - Deltas were too large ............   -0.5000     1.8837

   4   1.66894    -9.5755  -1.624e+005   3.805e+007
First-order corrections to F and Theta ............   -0.3257     0.0422
Second-order corrections to F and Theta ...........   -0.2801     0.0251

   5   1.38884    -9.5503   4.405e+003  -1.022e+006
First-order corrections to F and Theta ............    0.0062    -0.0029
Second-order corrections to F and Theta ...........    0.0062    -0.0029

   6   1.39508    -9.5532  -8.297e-002   1.890e+001
First-order corrections to F and Theta ............   -0.0000     0.0000
```

```
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Conditions\Section D\Final\Section D EOC - 1.dat

NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 55
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************

Summation of Horizontal Forces: 4.12944e-010

Summation of Vertical Forces: 4.96372e-010

Summation of Moments: 1.38545e-006

Mohr Coulomb Shear Force/Shear Strength Check Summation: 1.20161e-010
```

```
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NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 58
*************************************************************************
* Final Results for Stresses Along the Shear Surface                    *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.395     Side Force Inclination:  -9.55

       -------- VALUES AT CENTER OF BASE OF SLICE --------
```

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	119.56	318.09	768.1	768.1	558.8
2	138.43	295.96	1699.0	1699.0	801.7
3	158.43	274.86	2641.3	2641.3	1047.5
4	179.51	254.83	3585.0	3585.0	1293.7
5	193.66	242.27	4201.3	4201.3	1454.5
6	208.44	230.48	4668.1	4668.1	1576.3
7	231.77	213.13	5303.0	5303.0	1741.9
8	255.98	197.02	5887.6	5887.6	1894.5
9	281.00	182.20	6415.6	6415.6	2032.2
10	306.76	168.71	6880.9	6880.9	2153.6
11	321.17	161.69	7118.5	7118.5	2215.6
12	335.92	155.44	7847.0	7512.8	1175.6
13	363.01	144.86	8639.2	7681.2	1175.6
14	390.61	135.71	9276.1	7784.4	1175.6
15	418.65	128.03	9752.4	7818.5	1175.6
16	447.06	121.82	10063.4	7780.1	1175.6
17	475.76	117.10	10205.1	7666.0	1175.6
18	504.66	113.90	10173.6	7473.1	1175.6
19	533.69	112.21	9965.8	7198.8	1175.6
20	549.83	111.74	9794.7	7020.0	1175.6
21	555.71	111.77	9709.1	6944.0	1175.6
22	574.53	112.40	9399.0	6699.0	1175.6
23	599.53	113.92	8916.1	6344.1	1175.6
24	624.42	116.74	8276.3	5913.6	1175.6
25	653.13	121.31	7372.8	5334.0	1175.6
26	681.57	127.39	6281.8	4660.0	1175.6
27	709.65	134.94	5001.6	3888.5	1175.6
28	737.30	143.95	3530.0	3016.2	1175.6
29	754.71	150.27	2510.8	2414.9	1175.6
30	771.77	157.50	1449.7	1449.7	736.6
31	789.09	165.15	536.9	536.9	498.5

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NNSWC Landfill Evaluation - Section D EOC - 1
#122625

TABLE NO. 59

```
***********************************************************************
* Final Results for Side Forces and Stresses Between Slices           *
* (Results are for the critical shear surface in the case of a search.) *
***********************************************************************
```

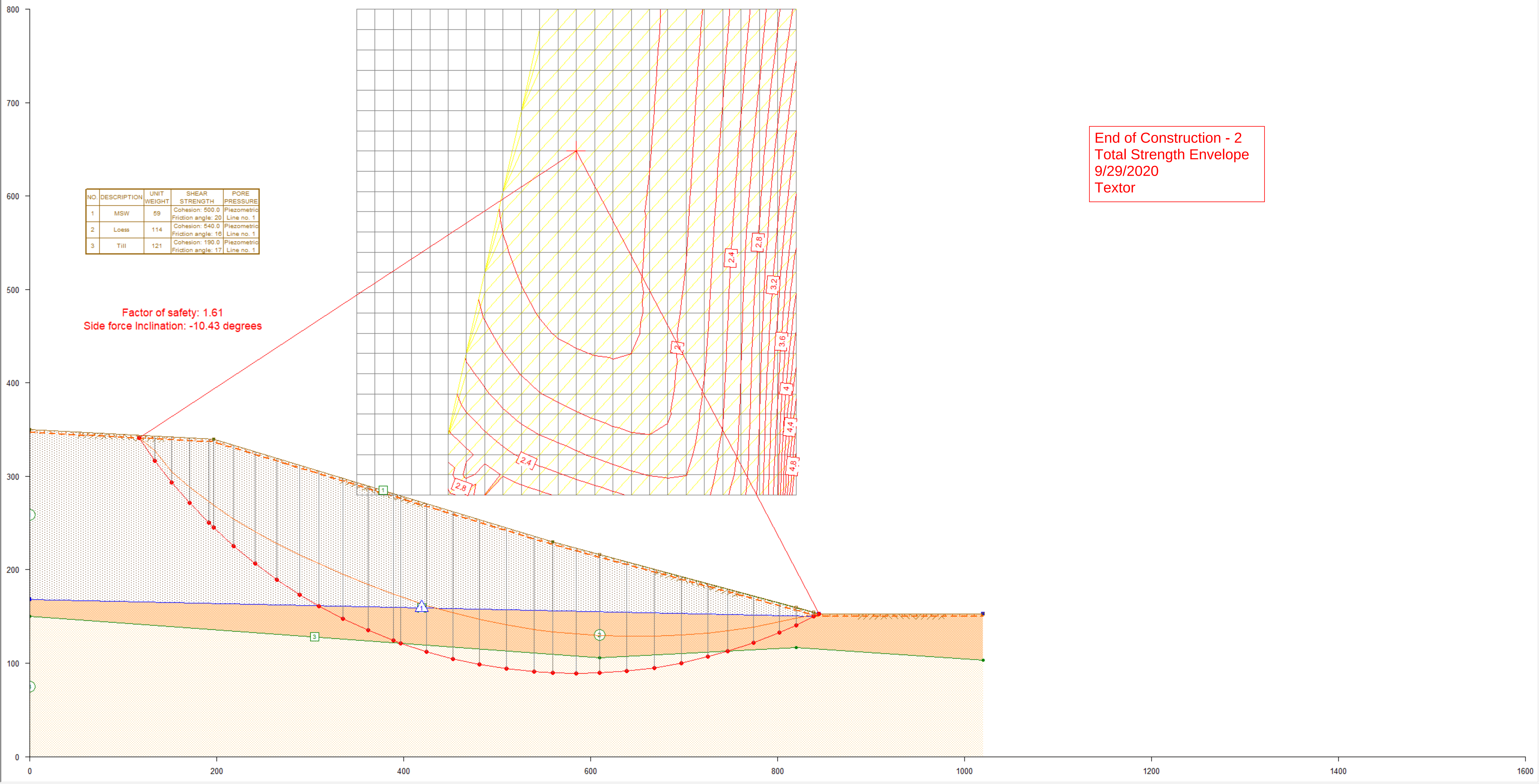
--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	128.70	7252	316.55	0.266	-78.4	468.2
2	148.15	28706	299.11	0.244	-265.9	1253.4
3	168.71	61999	283.56	0.247	-411.7	2002.5
4	190.31	104466	268.98	0.251	-535.3	2698.4
5	197.00	118581	264.74	0.251	-571.2	2897.4
6	219.88	167041	251.51	0.269	-569.8	3522.6
7	243.67	215047	239.39	0.286	-497.8	4000.1
8	268.30	260107	228.26	0.302	-374.9	4348.2
9	293.71	299886	218.16	0.317	-207.9	4570.5
10	319.82	332264	209.16	0.334	2.7	4662.3
11	322.52	335066	208.31	0.335	26.8	4663.8
12	349.32	392917	196.35	0.323	-164.0	5543.8
13	376.69	446748	185.81	0.315	-330.6	6381.2
14	404.53	492782	176.67	0.310	-463.8	7138.5
15	432.78	527880	168.84	0.308	-559.3	7789.1
16	461.35	549600	162.27	0.307	-615.8	8313.8
17	490.16	556261	156.90	0.307	-633.8	8698.2
18	519.15	546979	152.71	0.309	-614.1	8931.2
19	548.22	521711	149.67	0.311	-558.6	9004.7
20	551.43	517981	149.40	0.312	-550.6	9003.0
21	560.00	507112	148.75	0.313	-527.0	8988.6
22	589.06	460934	147.25	0.314	-489.7	8819.3
23	610.00	419522	146.84	0.315	-450.0	8588.8
24	638.84	353064	147.20	0.317	-378.4	8111.3
25	667.43	279151	148.60	0.320	-290.0	7440.5
26	695.71	202022	151.03	0.324	-185.1	6556.1
27	723.60	126753	154.51	0.330	-50.1	5400.9
28	751.01	59230	159.30	0.355	252.0	3697.2
29	758.42	42976	161.24	0.386	538.1	2898.6
30	785.12	6066	165.82	0.431	596.1	1428.5
31	793.07	-0	167.03	0.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

Section D EOC - 2.graphics-utexas - TexGraf4

File Edit Display Settings Utexas Window View Help



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	MSW	59	Cohesion: 500.0 Friction angle: 20	Piezometric Line no. 1
2	Loess	114	Cohesion: 540.0 Friction angle: 16	Piezometric Line no. 1
3	Till	121	Cohesion: 190.0 Friction angle: 17	Piezometric Line no. 1

Current data set: NNSWC Landfill Evaluation - Section D EOC - 2

X: 1563.34 Y: 336.33

NNSWC Landfill Expansion

Cross-Section: D
Case: End of Construction 2 – Total Strength Envelope
Filename: 20200929 Profile D EOC 2_input (textor).docx

UTEXAS4 Input File


```
GRAphics
HEAding follows -
NNSWC Landfill Evaluation - Section D EOC - 2
#122625

PROfile lines
   1 1 MSW
         0 350
         197 340
         560 230
         845 153

   2 2 Loess
         0 168
         839 150
         845 153
         1020 153

   3 3 Till
         0 150.4
         610 106
         820 116.5
         1020 102.9


MATerial properties
   1 MSW
      59 = unit weight
      Conventional Shear Strength
         500 20
      Piezometric Line
         1
   2 Loess
      114 = unit weight
      Conventional Shear Strength
         540 16
      Piezometric Line
         1
   3 Till
      121 = unit weight
      Conventional Shear Strength
         190 17
      Piezometric Line
         1

PIEzometric line
     1 Piezometric Line
         0 168
         839 150
         845 153
         1020 153


LABel
NNSWC Landfill Evaluation - Section D EOC - 2
```

Cross-Section: D
Case: End of Construction 2 – Total Strength Envelope
Filename: 20200929 Profile D EOC 2_input (textor).docx

UTEXAS4 Input File


```
ANALYSIS/COMPUTATION
   Circular Search 2
     25 25
     350 280 350 800 820 800 820 280
     5 5
   Point
     845 153

   Minimum
     5000
   Crack
     3 D
   Short

COMpute
```

Cross-Section: D
Case: End of Construction 2 – Total Strength Envelope
Filename: 20200929 Profile D EOC 2_output (textor).docx

UTEXAS4 Output File


```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.1.0.8 - Last Revision Date: 11/9/2009
(C) Copyright 1985-2008 S. G. Wright - All rights reserved
*****************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE         *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE       *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA      *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING    *
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*****************************************************************
```

```
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Conditions\Section D\Final\Section D EOC - 2.dat

NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
----------------------------------------------------------
Description: MSW

Point        X           Y

   1        0.00      350.00
   2      197.00      340.00
   3      560.00      230.00
   4      845.00      153.00

----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
----------------------------------------------------------
Description: Loess

Point        X           Y

   1        0.00      168.00
   2      839.00      150.00
   3      845.00      153.00
   4     1020.00      153.00

----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
----------------------------------------------------------
Description: Till

Point        X           Y

   1        0.00      150.40
   2      610.00      106.00
   3      820.00      116.50
   4     1020.00      102.90
```

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 4
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
------------------------------------------------------------------
Description: MSW

Constant unit weight of soil (material): 59.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 500.0
Friction angle - - - - - 20.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
------------------------------------------------------------------
Description: Loess

Constant unit weight of soil (material): 114.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 540.0
Friction angle - - - - - 16.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
------------------------------------------------------------------
Description: Till

Constant unit weight of soil (material): 121.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 190.0
Friction angle - - - - - 17.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.
```

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 6
**********************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

---------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
---------------------------------------------------------
Description: Piezometric Line
Unit weight of fluid (water): 62.4

Point        X           Y

  1        0.00      168.00
  2      839.00      150.00
  3      845.00      153.00
  4     1020.00      153.00
```

```
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#122625

TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************


Search will be conducted using a fixed grid.
Number of Points Across Grid: 25
Number of Points Up Grid: 25

Grid Corner
   Number           X              Y

     1           350.00         280.00
     2           350.00         800.00
     3           820.00         800.00
     4           820.00         280.00

----- Control Parameters for Finding "Critical" Radius -----
Initial number of subdivisions between maximum and minimum
radius for finding a critical radius/radii: 5

Minimum radius increment for terminating subdivision of radii: 5.000

The following criteria will be used for determining
the maximum and minimum radii:
     Point circles pass through - X: 845.00     Y: 153.00
Minimum weight required for computations to be performed: 5000

Depth of crack: 3.000
Automatic search output will be in short form.

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
There is no water in a crack.
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Radii for each grid point will be sorted in the order of increasing radius.
Critical circles for grid points will be output in the order of increasing factor of safety.
Standard sign convention used for direction of shear stress on shear surface.
Procedure of Analysis: Spencer

Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Initial trial factor of safety: 3.000
```

```
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure: -10.00
```

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 26
*************************************
* NEW, COMPUTED SLOPE GEOMETRY DATA *
*************************************

These slope geometry were generated from the Profile Lines.

     Point       X           Y

        1        0.00      350.00
        2      197.00      340.00
        3      560.00      230.00
        4      610.00      216.49
        5      820.00      159.75
        6      839.00      154.62
        7      845.00      153.00
        8     1020.00      153.00
```

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 38
*************************************************
* FINAL SUMMARY OF COMPUTATIONS WITH FIXED-GRID *
*************************************************


Number of circles attempted: 625
Number of circles for which F calculated: 434
Circle with Lowest Factor of Safety:
     X coordinate for center: 585.00
     Y coordinate for center: 648.33
     Radius of circle: 559.424
Factor of safety: 1.615
Side force inclination: -10.43
Time Required for Computations: 0.0 seconds
```

```
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Conditions\Section D\Final\Section D EOC - 2.dat

NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 43
************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure     *
* Information for Individual Slices for Conventional       *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the critical shear surface in the    *
* case of an automatic search.)                            *
************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	117.54	341.03					
1	125.90	329.01	14403	1	500.0	20.00	0.0
	134.26	316.99					
2	143.24	305.42	39530	1	500.0	20.00	0.0
	152.22	293.85					
3	161.79	282.77	66662	1	500.0	20.00	0.0
	171.36	271.69					
4	181.50	261.12	95313	1	500.0	20.00	0.0
	191.64	250.56					
5	194.32	247.94	29138	1	500.0	20.00	0.0
	197.00	245.33					
6	207.81	235.45	129198	1	500.0	20.00	0.0
	218.62	225.58					
7	229.94	216.28	151845	1	500.0	20.00	0.0
	241.25	206.98					
8	253.04	198.29	173452	1	500.0	20.00	0.0
	264.82	189.60					
9	277.04	181.53	193587	1	500.0	20.00	0.0
	289.27	173.47					
10	299.47	167.41	170344	1	500.0	20.00	0.0
	309.67	161.36					
11	322.60	154.49	234390	2	540.0	16.00	411.5
	335.53	147.61					
12	348.80	141.43	266841	2	540.0	16.00	1191.1
	362.08	135.24					
13	375.66	129.76	295205	2	540.0	16.00	1883.1
	389.24	124.28					
14	393.02	122.90	85568	2	540.0	16.00	2288.1
	396.79	121.52					
15	410.71	116.95	325228	3	190.0	17.00	2635.4
	424.62	112.39					
16	438.76	108.56	343559	3	190.0	17.00	3121.6
	452.89	104.73					
17	467.21	101.65	355973	3	190.0	17.00	3514.9
	481.52	98.56					
18	495.98	96.23	362167	3	190.0	17.00	3814.4
	510.44	93.90					
19	525.00	92.33	361942	3	190.0	17.00	4019.0
	539.56	90.76					
20	549.78	90.11	249669	3	190.0	17.00	4124.1
	560.00	89.47					

21	572.50	89.19	297612	3	190.0	17.00	4151.4
	585.00	88.91					
22	597.50	89.19	286593	3	190.0	17.00	4117.9
	610.00	89.47					
23	624.61	90.51	316658	3	190.0	17.00	3999.5
	639.21	91.54					
24	653.75	93.34	290864	3	190.0	17.00	3783.4
	668.28	95.14					
25	682.70	97.70	259370	3	190.0	17.00	3472.7
	697.12	100.26					
26	711.38	103.57	222625	3	190.0	17.00	3068.1
	725.65	106.88					
27	736.27	109.86	140677	3	190.0	17.00	2642.2
	746.88	112.84					
28	760.79	117.45	147989	2	540.0	16.00	2136.0
	774.69	122.05					
29	788.33	127.37	101479	2	540.0	16.00	1479.6
	801.97	132.70					
30	810.99	136.68	40937	2	540.0	16.00	868.6
	820.00	140.66					
31	829.50	145.28	18495	2	540.0	16.00	307.3
	839.00	149.90					
32	842.00	151.45	853	2	540.0	16.00	3.2
	845.00	153.00					

No water in crack.

```
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Conditions\Section D\Final\Section D EOC - 2.dat

NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 44
**********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
**********************************************************

There are no seismic forces or forces due to distributed loads
for the current shear surface
```

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 47
**************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
**************************************************************
Allowable force imbalance for convergence:  61
Allowable moment imbalance for convergence: 29327

        Trial     Trial
       Factor   Side Force     Force       Moment                 Delta
Iter-    of    Inclination   Imbalance   Imbalance    Delta-F     Theta
ation  Safety   (degrees)      (lbs.)    (ft.-lbs.)             (degrees)

   1   3.00000   -17.1887  -4.772e+005   9.213e+007
First-order corrections to F and Theta ............   -2.9468    15.7925
Reduced values - Deltas were too large ............   -0.5000     2.6796

   2   2.50000   -14.5091  -3.755e+005   7.252e+007
First-order corrections to F and Theta ............   -1.4753     7.7105
Reduced values - Deltas were too large ............   -0.5000     2.6132

   3   2.00000   -11.8959  -2.109e+005   4.140e+007
First-order corrections to F and Theta ............   -0.4871     2.0260
Second-order corrections to F and Theta ...........   -0.3989     1.5442

   4   1.60111   -10.3517   8.981e+003  -1.556e+006
First-order corrections to F and Theta ............    0.0134    -0.0805
Second-order corrections to F and Theta ...........    0.0135    -0.0815

   5   1.61461   -10.4332  -6.503e-001   9.328e+001
First-order corrections to F and Theta ............   -0.0000     0.0000
```

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 55
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************

Summation of Horizontal Forces: 5.44605e-010

Summation of Vertical Forces: 4.96989e-010

Summation of Moments: 5.93853e-005

Mohr Coulomb Shear Force/Shear Strength Check Summation: 1.97582e-010
```

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 58
*************************************************************************
* Final Results for Stresses Along the Shear Surface                    *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.615     Side Force Inclination: -10.43
```

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	125.90	329.01	305.7	305.7	378.6
2	143.24	305.42	1251.1	1251.1	591.7
3	161.79	282.77	2220.0	2220.0	810.1
4	181.50	261.12	3201.1	3201.1	1031.3
5	194.32	247.94	3824.5	3824.5	1171.8
6	207.81	235.45	4314.0	4314.0	1282.2
7	229.94	216.28	5029.2	5029.2	1443.4
8	253.04	198.29	5701.9	5701.9	1595.0
9	277.04	181.53	6324.9	6324.9	1735.4
10	299.47	167.41	6843.8	6843.8	1852.4
11	322.60	154.49	7737.6	7326.1	1635.5
12	348.80	141.43	8818.8	7627.7	1689.1
13	375.66	129.76	9763.3	7880.1	1733.9
14	393.02	122.90	10308.8	8020.7	1758.9
15	410.71	116.95	10795.3	8159.9	1662.8
16	438.76	108.56	11435.9	8314.3	1692.0
17	467.21	101.65	11907.3	8392.3	1706.8
18	495.98	96.23	12202.2	8387.8	1705.9
19	525.00	92.33	12313.8	8294.7	1688.3
20	549.78	90.11	12271.4	8147.3	1660.4
21	572.50	89.19	12117.6	7966.3	1626.1
22	597.50	89.19	11838.6	7720.7	1579.6
23	624.61	90.51	11374.1	7374.6	1514.1
24	653.75	93.34	10689.9	6906.5	1425.4
25	682.70	97.70	9788.9	6316.3	1313.7
26	711.38	103.57	8663.0	5594.8	1177.1
27	736.27	109.86	7494.0	4851.9	1036.4
28	760.79	117.45	6253.0	4117.0	1065.6
29	788.33	127.37	4552.1	3072.5	880.1
30	810.99	136.68	2951.5	2082.9	704.3
31	829.50	145.28	1466.9	1159.6	540.4
32	842.00	151.45	482.4	479.2	419.5

```
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NNSWC Landfill Evaluation - Section D EOC - 2
#122625

TABLE NO. 59
*************************************************************************
* Final Results for Side Forces and Stresses Between Slices             *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************

       --------------- VALUES AT RIGHT SIDE OF SLICE ---------------
```
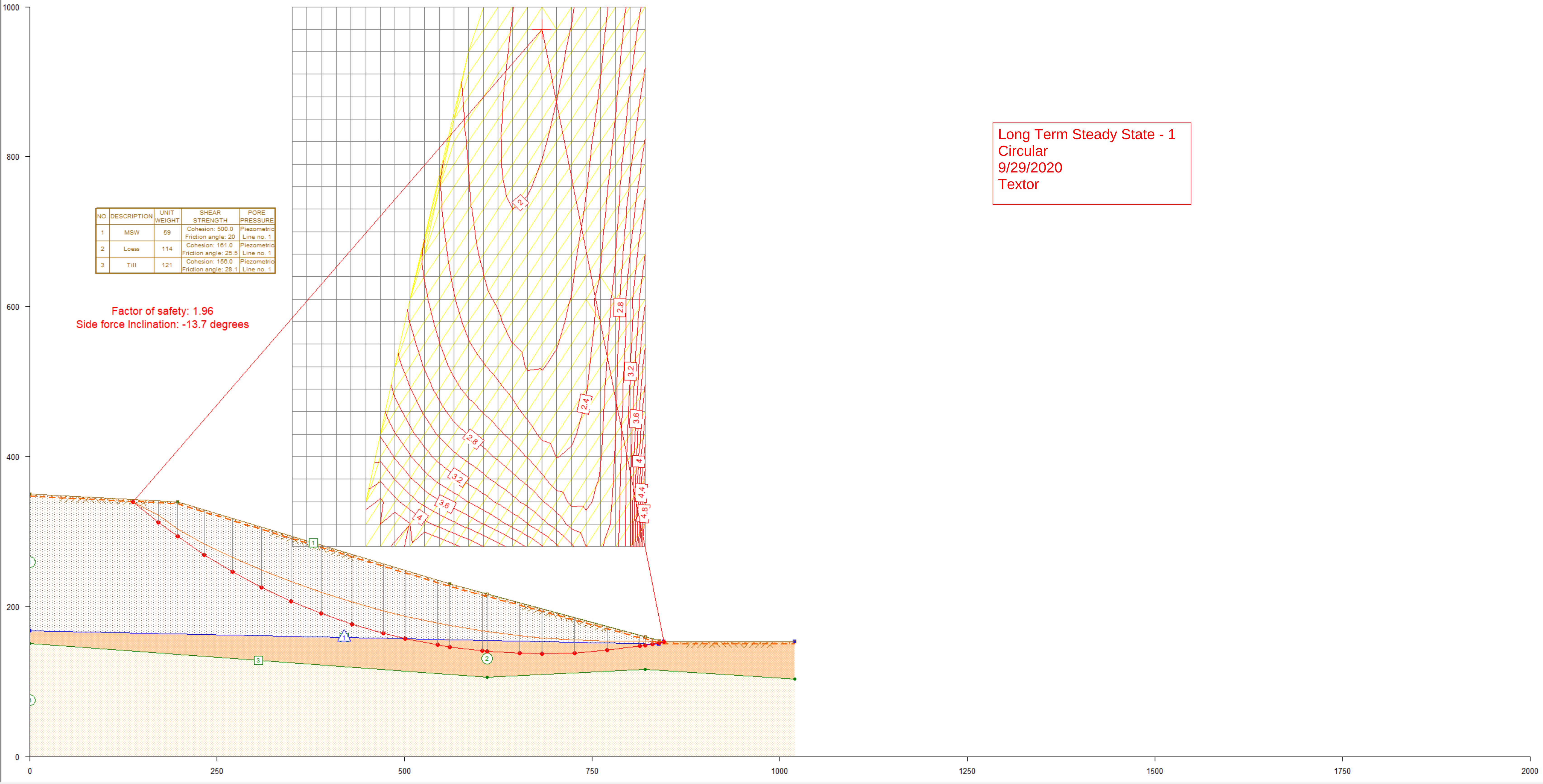

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	134.26	1037	327.47	0.400	15.6	62.2
2	152.22	19663	304.84	0.227	-254.9	1053.6
3	171.36	53924	288.41	0.240	-425.4	1949.1
4	191.64	101442	272.77	0.248	-572.0	2796.1
5	197.00	115386	268.84	0.248	-611.0	3008.4
6	218.62	173848	254.30	0.266	-637.4	3807.4
7	241.25	235731	240.70	0.282	-597.9	4474.4
8	264.82	298302	227.92	0.295	-517.7	5036.2
9	289.27	358886	215.97	0.307	-407.0	5501.1
10	309.67	404743	206.92	0.315	-297.4	5806.7
11	335.53	469853	195.22	0.317	-309.5	6453.9
12	362.08	535180	184.07	0.316	-363.2	7166.3
13	389.24	596139	173.77	0.314	-425.5	7872.0
14	396.79	611570	171.11	0.314	-441.6	8058.0
15	424.62	664713	161.86	0.312	-530.8	8772.8
16	452.89	705138	153.75	0.311	-594.7	9388.2
17	481.52	730140	146.79	0.311	-628.9	9881.3
18	510.44	737828	140.96	0.311	-631.3	10234.8
19	539.56	727186	136.27	0.313	-601.4	10436.1
20	560.00	708767	133.66	0.314	-561.8	10482.0
21	585.00	674317	131.21	0.315	-546.4	10419.6
22	610.00	627435	129.57	0.316	-512.7	10228.5
23	639.21	558469	128.69	0.317	-450.5	9834.7
24	668.28	477205	128.90	0.320	-364.8	9253.1
25	697.12	387756	130.17	0.323	-262.1	8490.1
26	725.65	295306	132.43	0.326	-162.9	7574.8
27	746.88	227469	134.66	0.327	-121.5	6833.0
28	774.69	138810	138.90	0.337	67.5	5399.0
29	801.97	65105	144.09	0.357	282.3	3728.7
30	820.00	28295	148.25	0.397	560.8	2354.2
31	839.00	4082	152.00	0.445	571.2	1128.3
32	845.00	-0	153.00	0.000	0.0	0.0

```
Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.
```

Section D LTSS - 1.graphics-utexas - TexGraf4

File Edit Display Settings Utexas Window View Help



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	MSW	59	Cohesion: 500.0 Friction angle: 20	Piezometric Line no. 1
2	Loess	114	Cohesion: 161.0 Friction angle: 25.5	Piezometric Line no. 1
3	Till	121	Cohesion: 156.0 Friction angle: 28.1	Piezometric Line no. 1

Ready X: 1090.03 Y: 973.47

NNSWC Landfill Expansion

Cross-Section: D
Case: Long Term Steady State 1 – Circular
Filename: 20200929 Profile D LTSS 1_input (textor).docx

UTEXAS4 Input File


```
GRAphics
HEAding follows -
NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

PROfile lines
   1 1 MSW
         0 350
         197 340
         560 230
         845 153

   2 2 Loess
         0 168
         839 150
         845 153
         1020 153

   3 3 Till
         0 150.4
         610 106
         820 116.5
         1020 102.9


MATerial properties
   1 MSW
      59 = unit weight
      Conventional Shear Strength
         500 20
      Piezometric Line
         1
   2 Loess
      114 = unit weight
      Conventional Shear Strength
         161 25.5
      Piezometric Line
         1
   3 Till
      121 = unit weight
      Conventional Shear Strength
         156 28.1
      Piezometric Line
         1

PIEzometric line
     1 Piezometric Line
         0 168
         839 150
         845 153
         1020 153


LABel
NNSWC Landfill Evaluation - Section D LTSS - 1
```

```
ANALYSIS/COMPUTATION
   Circular Search 2
     25 25
     350 280 350 1000 820 1000 820 280
     5 5
   Point
     845 153

   Minimum
     5000
   Crack
     3 D
   Short

COMpute
```

Cross-Section: D
Case: Long Term Steady State 1 – Circular
Filename: 20200929 Profile D LTSS 1_output (textor).docx

UTEXAS4 Output File


```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.1.0.8 - Last Revision Date: 11/9/2009
(C) Copyright 1985-2008 S. G. Wright - All rights reserved
*****************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE         *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE       *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA      *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING    *
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*****************************************************************
```

```
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Time and date of run: Tue Sep 29 14:04:57 2020
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Conditions\Section D\Final\Section D LTSS - 1.dat

NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: MSW

Point        X           Y

   1        0.00      350.00
   2      197.00      340.00
   3      560.00      230.00
   4      845.00      153.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: Loess

Point        X           Y

   1        0.00      168.00
   2      839.00      150.00
   3      845.00      153.00
   4     1020.00      153.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: Till

Point        X           Y

   1        0.00      150.40
   2      610.00      106.00
   3      820.00      116.50
   4     1020.00      102.90
```

```
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#122625

TABLE NO. 4
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
------------------------------------------------------------------
Description: MSW

Constant unit weight of soil (material): 59.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 500.0
Friction angle - - - - - 20.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
------------------------------------------------------------------
Description: Loess

Constant unit weight of soil (material): 114.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 161.0
Friction angle - - - - - 25.50 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
------------------------------------------------------------------
Description: Till

Constant unit weight of soil (material): 121.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 156.0
Friction angle - - - - - 28.10 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 6
*********************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************

---------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
---------------------------------------------------------
Description: Piezometric Line
Unit weight of fluid (water): 62.4

Point        X           Y

  1        0.00      168.00
  2      839.00      150.00
  3      845.00      153.00
  4     1020.00      153.00
```

```
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Conditions\Section D\Final\Section D LTSS - 1.dat

NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************


Search will be conducted using a fixed grid.
Number of Points Across Grid: 25
Number of Points Up Grid: 25

Grid Corner
   Number           X              Y

     1           350.00         280.00
     2           350.00        1000.00
     3           820.00        1000.00
     4           820.00         280.00

----- Control Parameters for Finding "Critical" Radius -----
Initial number of subdivisions between maximum and minimum
radius for finding a critical radius/radii: 5

Minimum radius increment for terminating subdivision of radii: 5.000

The following criteria will be used for determining
the maximum and minimum radii:
     Point circles pass through - X: 845.00     Y: 153.00
Minimum weight required for computations to be performed: 5000

Depth of crack: 3.000
Automatic search output will be in short form.

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
There is no water in a crack.
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Radii for each grid point will be sorted in the order of increasing radius.
Critical circles for grid points will be output in the order of increasing factor of safety.
Standard sign convention used for direction of shear stress on shear surface.
Procedure of Analysis: Spencer

Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Initial trial factor of safety: 3.000
```

```
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure: -10.00
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 26
*************************************
* NEW, COMPUTED SLOPE GEOMETRY DATA *
*************************************

These slope geometry were generated from the Profile Lines.

     Point       X           Y

        1       0.00      350.00
        2     197.00      340.00
        3     560.00      230.00
        4     610.00      216.49
        5     820.00      159.75
        6     839.00      154.62
        7     845.00      153.00
        8    1020.00      153.00
```

```
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TABLE NO. 38
*************************************************
* FINAL SUMMARY OF COMPUTATIONS WITH FIXED-GRID *
*************************************************


Number of circles attempted: 625
Number of circles for which F calculated: 402
Circle with Lowest Factor of Safety:
     X coordinate for center: 682.92
     Y coordinate for center: 970.00
     Radius of circle: 832.923
Factor of safety: 1.956
Side force inclination: -13.70
Time Required for Computations: 0.0 seconds
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 43
************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure     *
* Information for Individual Slices for Conventional       *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the critical shear surface in the    *
* case of an automatic search.)                            *
************************************************************

Slice                         Slice   Matl.             Friction     Pore
  No.      X          Y       Weight   No.    Cohesion    Angle    Pressure
        138.08     339.99
   1    154.94     326.17       31770    1       500.0    20.00         0.0
        171.80     312.34
   2    184.40     302.92       56084    1       500.0    20.00         0.0
        197.00     293.51
   3    215.04     281.25      113392    1       500.0    20.00         0.0
        233.07     269.00
   4    251.72     257.71      144617    1       500.0    20.00         0.0
        270.37     246.42
   5    289.59     236.12      171938    1       500.0    20.00         0.0
        308.81     225.82
   6    328.54     216.54      194631    1       500.0    20.00         0.0
        348.27     207.26
   7    368.46     199.03      212061    1       500.0    20.00         0.0
        388.65     190.79
   8    409.24     183.63      223692    1       500.0    20.00         0.0
        429.83     176.46
   9    450.77     170.38      229091    1       500.0    20.00         0.0
        471.71     164.30
  10    486.19     160.78      156537    1       500.0    20.00         0.0
        500.68     157.26
  11    522.07     153.05      232102    2       161.0    25.50       234.2
        543.46     148.83
  12    551.73     147.52       90789    2       161.0    25.50       539.6
        560.00     146.20
  13    581.64     143.54      234359    2       161.0    25.50       747.3
        603.28     140.89
  14    606.64     140.58       35762    2       161.0    25.50       898.6
        610.00     140.28
  15    631.76     138.94      221189    2       161.0    25.50       967.8
        653.52     137.60
  16    668.22     137.34      136382    2       161.0    25.50      1018.8
        682.92     137.08
  17    704.71     137.65      173486    2       161.0    25.50       950.5
        726.51     138.22
  18    748.24     139.93      129305    2       161.0    25.50       749.9
        769.98     141.64
  19    791.60     144.49       74049    2       161.0    25.50       407.5
        813.21     147.33
  20    816.61     147.88        6088    2       161.0    25.50       162.0
        820.00     148.44
```

```
  21    825.07    149.31         5973    2       161.0    25.50        61.5
        830.13    150.19
  22    834.57    151.01         2516    1       500.0    20.00         0.0
        839.00    151.83
  23    842.00    152.42          494    1       500.0    20.00         0.0
        845.00    153.00

No water in crack.
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 44
*********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
*********************************************************

There are no seismic forces or forces due to distributed loads
for the current shear surface
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 47
**************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
**************************************************************
Allowable force imbalance for convergence:  29
Allowable moment imbalance for convergence: 13890

        Trial     Trial
       Factor   Side Force     Force       Moment                  Delta
Iter-    of    Inclination   Imbalance   Imbalance    Delta-F     Theta
ation  Safety   (degrees)      (lbs.)    (ft.-lbs.)              (degrees)

   1   3.00000   -17.1887  -2.410e+005   7.040e+007
First-order corrections to F and Theta ............   -2.5893   101.4771
Reduced values - Deltas were too large ............   -0.0731     2.8648

   2   2.92690   -14.3239  -2.342e+005   6.843e+007
First-order corrections to F and Theta ............   -1.8723    39.1924
Reduced values - Deltas were too large ............   -0.1369     2.8648

   3   2.79004   -11.4592  -2.164e+005   6.348e+007
First-order corrections to F and Theta ............   -0.7626   -41.3580
Reduced values - Deltas were too large ............   -0.0528    -2.8648

   4   2.73722   -14.3239  -2.014e+005   5.867e+007
First-order corrections to F and Theta ............   -1.1261     4.0438
Reduced values - Deltas were too large ............   -0.5000     1.7954

   5   2.23722   -12.5285  -9.172e+004   2.803e+007
First-order corrections to F and Theta ............   -0.3164    -1.9538
Second-order corrections to F and Theta ...........   -0.2848    -1.2280

   6   1.95242   -13.7566   1.599e+003  -5.617e+005
First-order corrections to F and Theta ............    0.0040     0.0534
Second-order corrections to F and Theta ...........    0.0040     0.0538

   7   1.95643   -13.7027  -8.833e-003   3.944e+000
First-order corrections to F and Theta ............   -0.0000    -0.0000
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 55
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************

Summation of Horizontal Forces: 1.06996e-010

Summation of Vertical Forces: 2.13797e-010

Summation of Moments: 7.65845e-008

Mohr Coulomb Shear Force/Shear Strength Check Summation: 6.27561e-011
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 58
*************************************************************************
* Final Results for Stresses Along the Shear Surface                    *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.956     Side Force Inclination: -13.70
```

	-------- VALUES AT CENTER OF BASE OF SLICE --------				
Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	154.94	326.17	608.2	608.2	368.7
2	184.40	302.92	1643.3	1643.3	561.3
3	215.04	281.25	2432.3	2432.3	708.1
4	251.72	257.71	3115.0	3115.0	835.1
5	289.59	236.12	3712.0	3712.0	946.1
6	328.54	216.54	4213.7	4213.7	1039.5
7	368.46	199.03	4610.8	4610.8	1113.4
8	409.24	183.63	4894.7	4894.7	1166.2
9	450.77	170.38	5056.9	5056.9	1196.3
10	486.19	160.78	5102.0	5102.0	1204.7
11	522.07	153.05	5234.6	5000.4	1301.4
12	551.73	147.52	5387.1	4847.5	1264.1
13	581.64	143.54	5400.8	4653.5	1216.8
14	606.64	140.58	5381.9	4483.3	1175.3
15	631.76	138.94	5207.2	4239.3	1115.8
16	668.22	137.34	4849.0	3830.2	1016.1
17	704.71	137.65	4246.1	3295.5	885.7
18	748.24	139.93	3261.0	2511.1	694.5
19	791.60	144.49	1947.1	1539.6	457.6
20	816.61	147.88	1062.0	900.0	301.7
21	825.07	149.31	721.4	659.9	243.2
22	834.57	151.01	449.5	449.5	339.2
23	842.00	152.42	223.1	223.1	297.1

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NNSWC Landfill Evaluation - Section D LTSS - 1
#122625

TABLE NO. 59

```
*************************************************************************
* Final Results for Side Forces and Stresses Between Slices             *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************
```

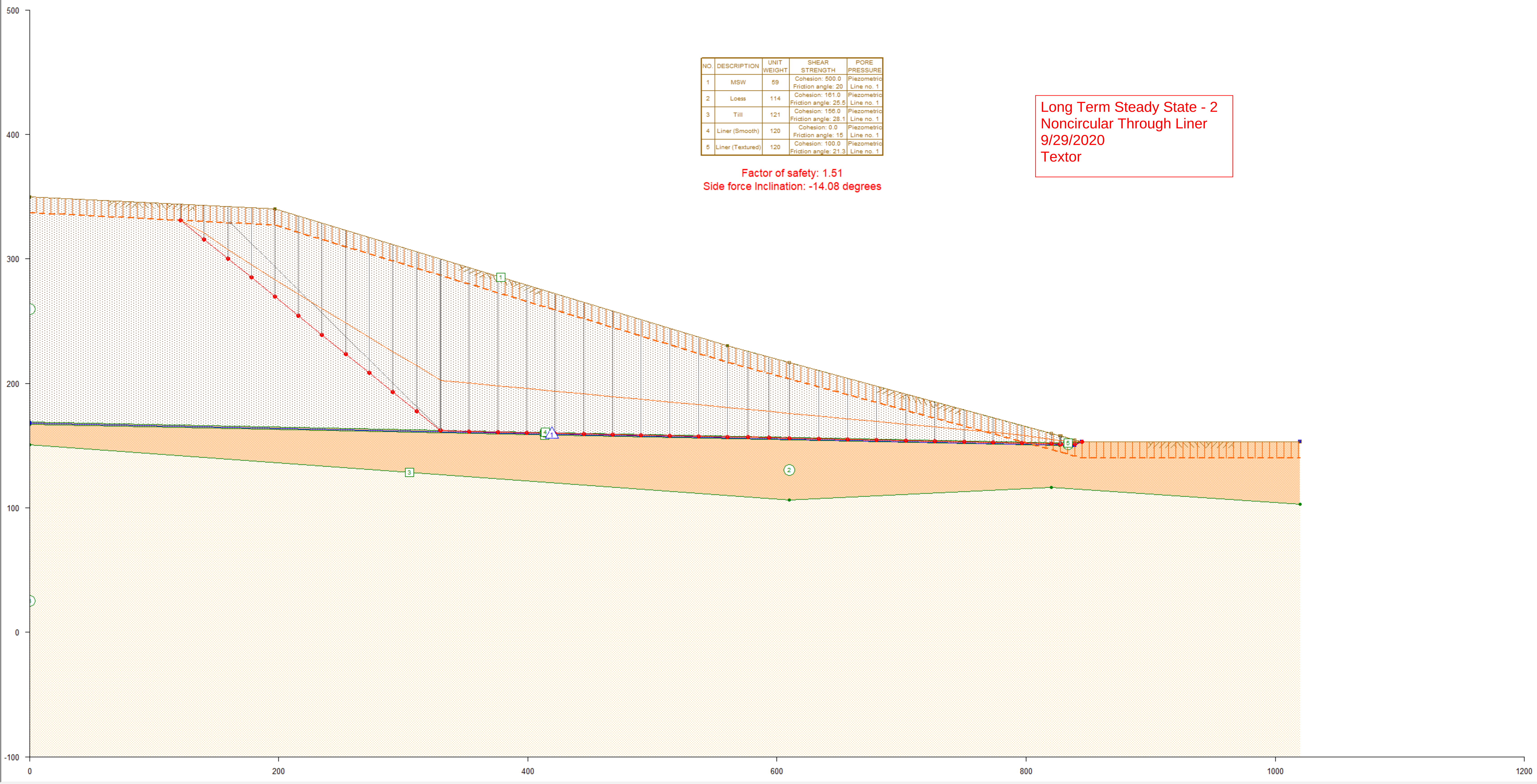
--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	171.80	4512	322.05	0.336	2.1	300.8
2	197.00	21809	303.17	0.208	-342.9	1254.3
3	233.07	56868	283.58	0.243	-500.6	2340.1
4	270.37	97209	265.63	0.269	-508.5	3155.9
5	308.81	138483	248.86	0.287	-466.2	3817.3
6	348.27	176759	233.28	0.299	-401.7	4354.0
7	388.65	208646	218.96	0.309	-324.3	4772.9
8	429.83	231423	205.93	0.317	-237.7	5073.6
9	471.71	243138	194.25	0.324	-143.6	5253.5
10	500.68	244199	187.06	0.329	-75.8	5306.3
11	543.46	232275	178.11	0.340	99.5	5137.8
12	560.00	225383	174.95	0.343	152.6	5073.2
13	603.28	200659	167.61	0.345	178.7	4857.8
14	610.00	195955	166.60	0.345	181.6	4814.1
15	653.52	160325	160.96	0.348	204.6	4435.6
16	682.92	132174	158.06	0.351	233.7	4067.2
17	726.51	87443	155.16	0.362	312.6	3318.4
18	769.98	44883	153.98	0.390	469.1	2288.3
19	813.21	13111	153.66	0.444	593.0	1194.0
20	820.00	9798	153.68	0.463	656.1	1025.8
21	830.13	5959	153.23	0.445	568.0	1128.0
22	839.00	2103	153.15	0.472	608.0	857.2
23	845.00	-0	153.00	1.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

Section D LTSS - 2.graphics-utexas - TexGraf4

File Edit Display Settings Utexas Window View Help



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	MSW	59	Cohesion: 500.0 Friction angle: 20	Piezometric Line no. 1
2	Loess	114	Cohesion: 161.0 Friction angle: 25.5	Piezometric Line no. 1
3	Till	121	Cohesion: 156.0 Friction angle: 28.1	Piezometric Line no. 1
4	Liner (Smooth)	120	Cohesion: 0.0 Friction angle: 15	Piezometric Line no. 1
5	Liner (Textured)	120	Cohesion: 100.0 Friction angle: 21.3	Piezometric Line no. 1

Current data set: NNSWC Landfill Evaluation - Section D EOC - 2

X: 327.49 Y: 499.52

NNSWC Landfill Expansion

Cross-Section: D
Case: Long Term Steady State 2 – Noncircular Through Liner
Filename: 20200929 Profile D LTSS 2_input (textor).docx

UTEXAS4 Input File
Page 1 of 2

```
GRAphics
HEAding follows -
NNSWC Landfill Evaluation - Section D LTSS - 2
#122625

PROfile lines
   1 1 MSW
         0 350
         197 340
         560 230
         845 153

   2 2 Loess
         0 166.8
         827 150.24
         839 150
         845 153
         1020 153

   3 3 Till
         0 150.4
         610 106
         820 116.5
         1020 102.9

   4 4 Liner (smooth)
         0 168.8
         828 152.24

   5 5 Liner (textured)
         827 150.24
         828 152.24
         839 152
         845 153


MATerial properties
   1 MSW
      59 = unit weight
      Conventional Shear Strength
         500 20
      Piezometric Line
         1
   2 Loess
      114 = unit weight
      Conventional Shear Strength
         161 25.5
      Piezometric Line
         1
   3 Till
      121 = unit weight
      Conventional Shear Strength
         156 28.1
      Piezometric Line
         1
```

```
   4 Liner (Smooth)
      120 = unit weight
      Conventional Shear Strength
         0 15
      Piezometric Line
         1
   5 Liner (Textured)
      120 = unit weight
      Conventional Shear Strength
         100 21.3
      Piezometric Line
         1

PIEzometric line
     1 Piezometric Line
         0 168
         839 150
         845 153
         1020 153


LABel
NNSWC Landfill Evaluation - Section D LTSS - 2
ANALYSIS/COMPUTATION
   NonCircular Search
     150 340
     330 162
     839 151 fixed
     845 153 fixed

     5 1
   Crack
     13 D
   Short

COMpute
```

```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.1.0.8 - Last Revision Date: 11/9/2009
(C) Copyright 1985-2008 S. G. Wright - All rights reserved
*****************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE         *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE       *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA      *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING    *
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*****************************************************************
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 2
#122625

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: MSW

Point        X           Y

   1        0.00      350.00
   2      197.00      340.00
   3      560.00      230.00
   4      845.00      153.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: Loess

Point        X           Y

   1        0.00      166.80
   2      827.00      150.24
   3      839.00      150.00
   4      845.00      153.00
   5     1020.00      153.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: Till

Point        X           Y

   1        0.00      150.40
   2      610.00      106.00
   3      820.00      116.50
   4     1020.00      102.90

-----------------------------------------------------------
----- Profile Line No. 4 - Material Type (Number): 4 -----
-----------------------------------------------------------
Description: Liner (smooth)

Point        X           Y

   1        0.00      168.80
   2      828.00      152.24
```

```
-----------------------------------------------------------
----- Profile Line No. 5 - Material Type (Number): 5 -----
-----------------------------------------------------------
Description: Liner (textured)

Point        X           Y

   1      827.00      150.24
   2      828.00      152.24
   3      839.00      152.00
   4      845.00      153.00
```

```
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#122625

TABLE NO. 4
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
------------------------------------------------------------------
Description: MSW

Constant unit weight of soil (material): 59.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 500.0
Friction angle - - - - - 20.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
------------------------------------------------------------------
Description: Loess

Constant unit weight of soil (material): 114.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 161.0
Friction angle - - - - - 25.50 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
------------------------------------------------------------------
Description: Till

Constant unit weight of soil (material): 121.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 156.0
Friction angle - - - - - 28.10 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 4 -------------------
```

```
------------------------------------------------------------------
Description: Liner (Smooth)

Constant unit weight of soil (material): 120.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 0.0
Friction angle - - - - - 15.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 5 -------------------
------------------------------------------------------------------
Description: Liner (Textured)

Constant unit weight of soil (material): 120.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 100.0
Friction angle - - - - - 21.30 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.
```

```
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NNSWC Landfill Evaluation - Section D LTSS - 2
#122625

TABLE NO. 6
*******************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*******************************************************************

---------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
---------------------------------------------------------
Description: Piezometric Line
Unit weight of fluid (water): 62.4

Point        X           Y

  1        0.00      168.00
  2      839.00      150.00
  3      845.00      153.00
  4     1020.00      153.00
```

```
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#122625

TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Coordinates of points on shear surface which are to be shifted

Point         X              Y      Shift Angle

   1        150.00         340.00   angle to be computed - moveable
   2        330.00         162.00   angle to be computed - moveable
   3        839.00         151.00                        - fixed
   4        845.00         153.00                        - fixed

Initial distance for shifting points on shear surface = 5.000
Final distance for shifting points on shear surface = 1.000
Maximum steepness permitted for toe of shear surface = 50.00


Depth of crack: 13.000
Automatic search output will be in short form.

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Maximum increment for slice subdivision: 30
There is no water in a crack.
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Maximum number of passes for noncircular search: 50
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Standard sign convention used for direction of shear stress on shear surface.
Procedure of Analysis: Spencer

Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Minimum weight required for computations to be performed: 100
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure: -10.00
```

```
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TABLE NO. 26
*************************************
* NEW, COMPUTED SLOPE GEOMETRY DATA *
*************************************

These slope geometry were generated from the Profile Lines.

     Point       X           Y

        1       0.00      350.00
        2     197.00      340.00
        3     560.00      230.00
        4     610.00      216.49
        5     820.00      159.75
        6     827.00      157.86
        7     828.00      157.59
        8     839.00      154.62
        9     845.00      153.00
       10    1020.00      153.00

Left end point on noncircular shear surface adjusted to:
X: 161.31, Y: 328.81
Adjustment was made to put end point at bottom of crack.

Noncircular Shear Surface Points After End Point Adjustment
Coordinates of points on shear surface which are to be shifted

Point         X              Y      Shift Angle

   1        161.31         328.81   angle to be computed - moveable
   2        330.00         162.00   angle to be computed - moveable
   3        839.00         151.00                        - fixed
   4        845.00         153.00                        - fixed
Computed crack depth: 13.00
```

```
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TABLE NO. 40
*********************************************************************
* Short-Form Output Table for Search with Noncircular Shear Surfaces *
*********************************************************************

  Shift    Factor of
Distance    Safety       Point       X          Y       Point       X          Y
   5.000     1.525         1     161.31     328.81        3     839.00     151.00
                           2     330.00     162.00        4     845.00     153.00
End of Trial: 1
   2.500     1.525         1     161.31     328.81        3     839.00     151.00
                           2     330.00     162.00        4     845.00     153.00
End of Trial: 2
   2.500     1.523         1     158.82     328.94        3     839.00     151.00
                           2     329.97     161.93        4     845.00     153.00
End of Trial: 3
   2.500     1.520         1     156.32     329.06        3     839.00     151.00
                           2     329.95     161.91        4     845.00     153.00
End of Trial: 4
   2.500     1.518         1     153.82     329.19        3     839.00     151.00
                           2     329.95     161.90        4     845.00     153.00
End of Trial: 5
   2.500     1.516         1     151.33     329.32        3     839.00     151.00
                           2     329.95     161.89        4     845.00     153.00
End of Trial: 6
   2.500     1.514         1     148.83     329.45        3     839.00     151.00
                           2     329.95     161.89        4     845.00     153.00
End of Trial: 7
   2.500     1.513         1     146.33     329.57        3     839.00     151.00
                           2     329.95     161.89        4     845.00     153.00
End of Trial: 8
   2.500     1.511         1     143.84     329.70        3     839.00     151.00
                           2     329.95     161.89        4     845.00     153.00
End of Trial: 9
   2.500     1.510         1     141.34     329.83        3     839.00     151.00
                           2     329.95     161.89        4     845.00     153.00
End of Trial: 10
   2.500     1.509         1     138.84     329.95        3     839.00     151.00
                           2     329.95     161.90        4     845.00     153.00
End of Trial: 11
   2.500     1.508         1     136.35     330.08        3     839.00     151.00
                           2     329.95     161.90        4     845.00     153.00
End of Trial: 12
   2.500     1.507         1     133.85     330.21        3     839.00     151.00
                           2     329.95     161.90        4     845.00     153.00
End of Trial: 13
   2.500     1.506         1     131.35     330.33        3     839.00     151.00
                           2     329.95     161.90        4     845.00     153.00
End of Trial: 14
   2.500     1.506         1     128.86     330.46        3     839.00     151.00
                           2     329.95     161.90        4     845.00     153.00
End of Trial: 15
```

```
   2.500     1.506          1      126.36     330.59         3      839.00     151.00
                            2      329.95     161.90         4      845.00     153.00
End of Trial: 16
   2.500     1.506          1      123.86     330.71         3      839.00     151.00
                            2      329.95     161.90         4      845.00     153.00
End of Trial: 17
   2.500     1.506          1      121.37     330.84         3      839.00     151.00
                            2      329.95     161.90         4      845.00     153.00
End of Trial: 18
   1.250     1.505          1      121.37     330.84         3      839.00     151.00
                            2      329.95     161.90         4      845.00     153.00
End of Trial: 19
   0.625     1.505          1      121.37     330.84         3      839.00     151.00
                            2      329.95     161.90         4      845.00     153.00
End of Trial: 20
```

```
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TABLE NO. 41
****************************************
*  Critical Noncircular Shear Surface  *
****************************************

***** CRITICAL NONCIRCULAR SHEAR SURFACE *****
X:     121.37     Y:     330.84
X:     329.95     Y:     161.90
X:     839.00     Y:     151.00
X:     845.00     Y:     153.00

Minimum factor of safety: 1.505
Side force inclination: -14.08

Time required to find most critical surface:      0.0 seconds
Number of passes required to find most critical surface: 20
Total number of shear surfaces attempted: 100
Total number of shear surfaces for which the factor of safety
was successfully calculated: 100
```

Pass	Shift Distance	Pt.	Max. Dist. Moved	Minimum F	n Tried	n Computed
1	5.0000	1	5.000	1.5246	5	5
2	2.5000	1	2.500	1.5225	10	10
3	2.5000	1	2.500	1.5203	15	15
4	2.5000	1	2.500	1.5181	20	20
5	2.5000	1	2.500	1.5161	25	25
6	2.5000	1	2.500	1.5142	30	30
7	2.5000	1	2.500	1.5126	35	35
8	2.5000	1	2.500	1.5112	40	40
9	2.5000	1	2.500	1.5098	45	45
10	2.5000	1	2.500	1.5087	50	50
11	2.5000	1	2.500	1.5078	55	55
12	2.5000	1	2.500	1.5070	60	60
13	2.5000	1	2.500	1.5064	65	65
14	2.5000	1	2.500	1.5060	70	70
15	2.5000	1	2.500	1.5057	75	75
16	2.5000	1	2.500	1.5055	80	80
17	2.5000	1	2.500	1.5055	85	85
18	2.5000	2	0.001	1.5055	90	90
19	1.2500	1	1.250	1.5055	95	95
20	0.6250	1	0.625	1.5055	100	100

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TABLE NO. 43

```
*********************************************************
* Coordinate, Weight, Strength and Pore Water Pressure     *
* Information for Individual Slices for Conventional       *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the critical shear surface in the    *
* case of an automatic search.)                            *
*********************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	121.37	330.84					
1	130.82	323.18	22510	1	500.0	20.00	0.0
	140.27	315.52					
2	149.73	307.87	38524	1	500.0	20.00	0.0
	159.18	300.21					
3	168.64	292.55	54538	1	500.0	20.00	0.0
	178.09	284.90					
4	187.55	277.24	70552	1	500.0	20.00	0.0
	197.00	269.58					
5	206.47	261.91	84049	1	500.0	20.00	0.0
	215.94	254.24					
6	225.41	246.57	94776	1	500.0	20.00	0.0
	234.88	238.90					
7	244.35	231.23	105503	1	500.0	20.00	0.0
	253.82	223.56					
8	263.29	215.90	116230	1	500.0	20.00	0.0
	272.76	208.23					
9	282.23	200.56	126957	1	500.0	20.00	0.0
	291.70	192.89					
10	301.16	185.22	137684	1	500.0	20.00	0.0
	310.63	177.55					
11	320.10	169.88	148411	1	500.0	20.00	0.0
	329.57	162.21					
12	329.76	162.06	3069	4	0.0	15.00	0.0
	329.95	161.90					
13	341.45	161.66	183091	4	0.0	15.00	0.0
	352.96	161.41					
14	364.46	161.16	174344	4	0.0	15.00	0.0
	375.96	160.92					
15	387.46	160.67	165597	4	0.0	15.00	0.0
	398.97	160.42					
16	410.47	160.18	156849	4	0.0	15.00	0.0
	421.97	159.93					
17	433.47	159.69	148102	4	0.0	15.00	0.0
	444.98	159.44					
18	456.48	159.19	139354	4	0.0	15.00	0.0
	467.98	158.95					
19	479.48	158.70	130607	4	0.0	15.00	0.0
	490.99	158.45					
20	502.49	158.21	121860	4	0.0	15.00	0.0
	513.99	157.96					

21	525.49	157.71	113112	4	0.0	15.00	0.0
	537.00	157.47					
22	548.50	157.22	104365	4	0.0	15.00	0.0
	560.00	156.98					
23	568.33	156.80	70416	4	0.0	15.00	0.0
	576.67	156.62					
24	585.00	156.44	66363	4	0.0	15.00	0.0
	593.33	156.26					
25	601.67	156.08	62310	4	0.0	15.00	0.0
	610.00	155.90					
26	621.67	155.65	80425	4	0.0	15.00	0.0
	633.33	155.41					
27	645.00	155.16	72482	4	0.0	15.00	0.0
	656.67	154.91					
28	668.33	154.66	64538	4	0.0	15.00	0.0
	680.00	154.41					
29	691.67	154.16	56595	4	0.0	15.00	0.0
	703.33	153.91					
30	715.00	153.66	48651	4	0.0	15.00	0.0
	726.67	153.41					
31	738.33	153.16	40707	4	0.0	15.00	0.0
	750.00	152.91					
32	761.67	152.66	32764	4	0.0	15.00	0.0
	773.33	152.41					
33	785.00	152.16	24820	4	0.0	15.00	0.0
	796.67	151.91					
34	808.33	151.66	16877	4	0.0	15.00	0.0
	820.00	151.41					
35	823.50	151.33	3514	4	0.0	15.00	0.0
	827.00	151.26					
36	827.25	151.25	225	4	0.0	15.00	0.0
	827.50	151.25					
37	827.75	151.24	219	5	100.0	21.30	0.0
	828.00	151.24					
38	833.50	151.12	3910	5	100.0	21.30	0.0
	839.00	151.00					
39	842.00	152.00	824	5	100.0	21.30	0.0
	845.00	153.00					

No water in crack.

```
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TABLE NO. 44
**********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
**********************************************************

There are no seismic forces or forces due to distributed loads
for the current shear surface
```

```
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TABLE NO. 47
**************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
**************************************************************
Allowable force imbalance for convergence:  31
Allowable moment imbalance for convergence: 13005

        Trial     Trial
       Factor   Side Force     Force       Moment                  Delta
Iter-    of    Inclination   Imbalance   Imbalance    Delta-F     Theta
ation  Safety   (degrees)      (lbs.)    (ft.-lbs.)              (degrees)

   1   3.00000   -17.1887  -3.532e+005   1.001e+008
First-order corrections to F and Theta ............   -2.5433   -11.7406
Reduced values - Deltas were too large ............   -0.5000    -2.3081

   2   2.50000   -19.4969  -2.718e+005   7.577e+007
First-order corrections to F and Theta ............   -3.1412    89.5246
Reduced values - Deltas were too large ............   -0.1005     2.8648

   3   2.39948   -16.6321  -2.627e+005   7.327e+007
First-order corrections to F and Theta ............   -2.2300    48.5728
Reduced values - Deltas were too large ............   -0.1315     2.8648

   4   2.26796   -13.7673  -2.461e+005   6.881e+007
First-order corrections to F and Theta ............   -1.0828    -3.6784
Reduced values - Deltas were too large ............   -0.5000    -1.6985

   5   1.76796   -15.4658  -1.027e+005   2.736e+007
First-order corrections to F and Theta ............   -0.3153     2.2262
Second-order corrections to F and Theta ...........   -0.2681     1.4680

   6   1.49989   -13.9978   2.391e+003  -5.412e+005
First-order corrections to F and Theta ............    0.0056    -0.0803
Second-order corrections to F and Theta ...........    0.0056    -0.0810

   7   1.50550   -14.0788  -3.429e-002   4.524e+000
First-order corrections to F and Theta ............   -0.0000     0.0000
```

```
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TABLE NO. 55
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************

Summation of Horizontal Forces: 1.99341e-010

Summation of Vertical Forces: 2.28370e-010

Summation of Moments: 1.10645e-007

Mohr Coulomb Shear Force/Shear Strength Check Summation: 7.01221e-011
```

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TABLE NO. 58
```
*******************************************************************
* Final Results for Stresses Along the Shear Surface              *
* (Results are for the critical shear surface in the case of a search.) *
*******************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.505 Side Force Inclination: -14.08

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	130.82	323.18	750.8	750.8	513.6
2	149.73	307.87	1383.6	1383.6	666.6
3	168.64	292.55	2016.4	2016.4	819.6
4	187.55	277.24	2649.3	2649.3	972.6
5	206.47	261.91	3177.3	3177.3	1100.3
6	225.41	246.57	3600.5	3600.5	1202.6
7	244.35	231.23	4023.8	4023.8	1304.9
8	263.29	215.90	4447.0	4447.0	1407.2
9	282.23	200.56	4870.2	4870.2	1509.5
10	301.16	185.22	5293.4	5293.4	1611.9
11	320.10	169.88	5716.6	5716.6	1714.2
12	329.76	162.06	6244.4	6244.4	1111.4
13	341.45	161.66	8251.3	8251.3	1468.6
14	364.46	161.16	7857.1	7857.1	1398.4
15	387.46	160.67	7462.9	7462.9	1328.2
16	410.47	160.18	7068.7	7068.7	1258.1
17	433.47	159.69	6674.5	6674.5	1187.9
18	456.48	159.19	6280.2	6280.2	1117.8
19	479.48	158.70	5886.0	5886.0	1047.6
20	502.49	158.21	5491.8	5491.8	977.4
21	525.49	157.71	5097.6	5097.6	907.3
22	548.50	157.22	4703.4	4703.4	837.1
23	568.33	156.80	4380.2	4380.2	779.6
24	585.00	156.44	4128.1	4128.1	734.7
25	601.67	156.08	3876.0	3876.0	689.9
26	621.67	155.65	3573.5	3573.5	636.0
27	645.00	155.16	3220.5	3220.5	573.2
28	668.33	154.66	2867.6	2867.6	510.4
29	691.67	154.16	2514.6	2514.6	447.6
30	715.00	153.66	2161.7	2161.7	384.7
31	738.33	153.16	1808.7	1808.7	321.9
32	761.67	152.66	1455.8	1455.8	259.1
33	785.00	152.16	1102.8	1102.8	196.3
34	808.33	151.66	749.9	749.9	133.5
35	823.50	151.33	520.5	520.5	92.6
36	827.25	151.25	463.7	463.7	82.5
37	827.75	151.24	481.2	481.2	191.0
38	833.50	151.12	391.9	391.9	167.9

```
  39       842.00    152.00       230.2       230.2       126.0
```

```
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TABLE NO. 59
*********************************************************************
* Final Results for Side Forces and Stresses Between Slices         *
* (Results are for the critical shear surface in the case of a search.) *
*********************************************************************

       --------------- VALUES AT RIGHT SIDE OF SLICE ---------------
```
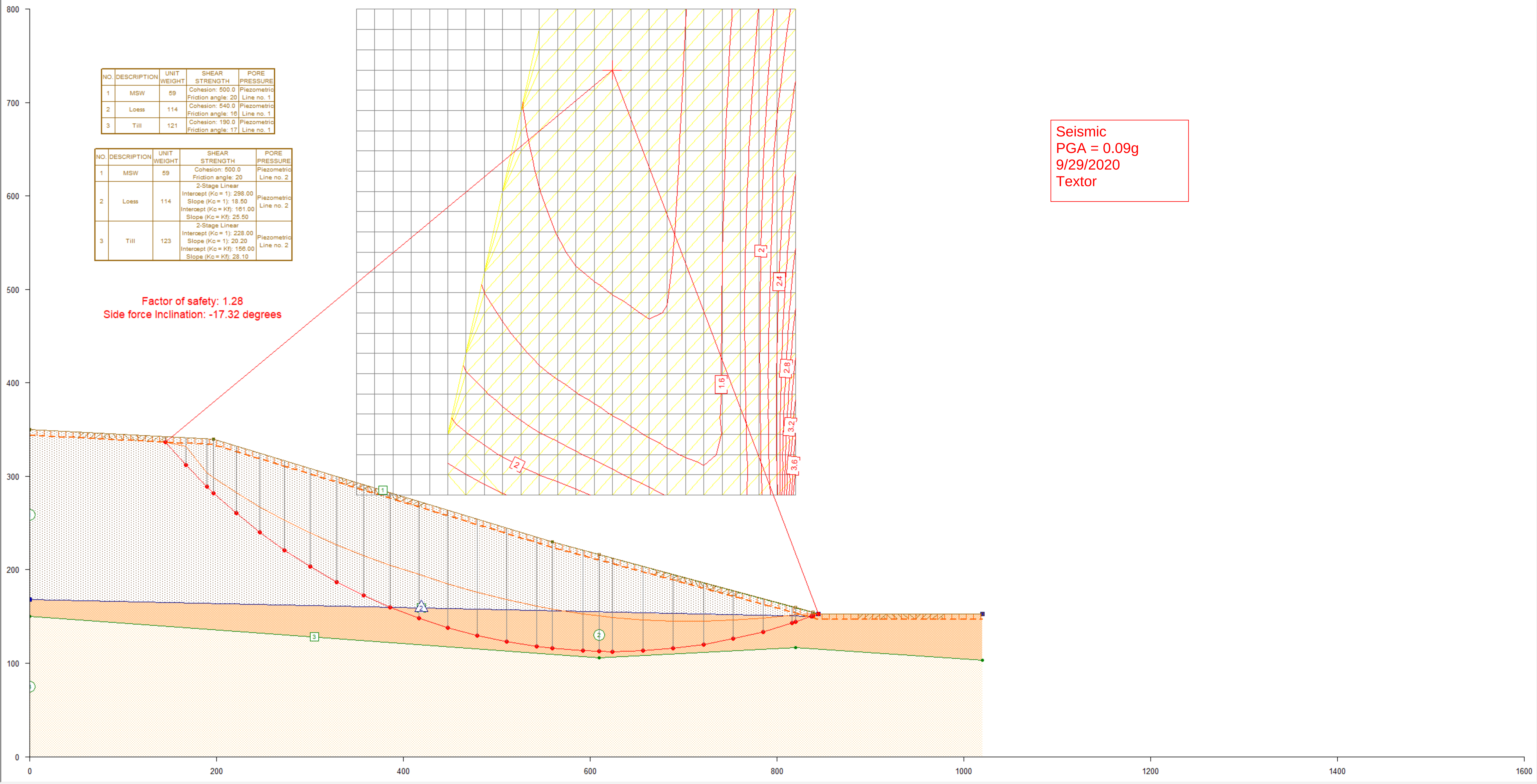

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	140.27	1841	320.81	0.193	-54.9	185.4
2	159.18	10691	307.32	0.170	-243.1	740.3
3	178.09	26551	295.17	0.183	-413.5	1332.2
4	197.00	49419	283.23	0.194	-569.9	1931.3
5	215.94	78182	271.51	0.216	-668.3	2563.7
6	234.88	111640	260.00	0.235	-710.1	3126.7
7	253.82	149793	248.53	0.252	-718.2	3646.9
8	272.76	192641	237.05	0.265	-705.4	4139.6
9	291.70	240184	225.54	0.276	-679.3	4614.0
10	310.63	292422	214.02	0.285	-644.3	5075.6
11	329.57	349355	202.46	0.292	-603.5	5528.2
12	329.95	350890	202.19	0.292	-607.6	5547.1
13	352.96	320251	200.02	0.294	-558.2	5288.8
14	375.96	291076	197.86	0.296	-508.3	5031.0
15	398.97	263364	195.70	0.298	-457.8	4773.9
16	421.97	237116	193.54	0.300	-406.7	4517.6
17	444.98	212333	191.39	0.303	-355.0	4262.4
18	467.98	189013	189.23	0.306	-302.7	4008.8
19	490.99	167156	187.08	0.310	-249.9	3757.0
20	513.99	146764	184.92	0.314	-196.7	3508.0
21	537.00	127835	182.75	0.318	-143.4	3262.7
22	560.00	110370	180.56	0.323	-90.7	3022.7
23	576.67	98587	178.98	0.325	-72.9	2849.5
24	593.33	87482	177.39	0.326	-54.4	2676.1
25	610.00	77054	175.81	0.329	-35.2	2502.4
26	633.33	63596	173.61	0.332	-7.2	2259.3
27	656.67	51466	171.41	0.337	22.9	2015.6
28	680.00	40666	169.24	0.344	55.8	1771.4
29	703.33	31196	167.07	0.352	92.7	1526.8
30	726.67	23054	164.93	0.365	134.8	1282.1
31	750.00	16242	162.79	0.384	184.3	1038.8
32	773.33	10759	160.61	0.411	243.5	802.5
33	796.67	6606	158.23	0.447	308.0	597.5
34	820.00	3782	155.10	0.442	287.6	591.3
35	827.00	3194	153.88	0.397	177.8	760.0
36	827.50	3156	153.78	0.391	163.7	781.0
37	828.00	3063	153.73	0.393	166.0	768.7
38	839.00	1254	152.75	0.484	303.6	368.3
39	845.00	-0	153.00	0.000	0.0	0.0

```
Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.
```

Section D Seismic.graphics-utexas - TexGraf4

File Edit Display Settings Utexas Window View Help



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	MSW	59	Cohesion: 500.0 Friction angle: 20	Piezometric Line no. 1
2	Loess	114	Cohesion: 540.0 Friction angle: 16	Piezometric Line no. 1
3	Till	121	Cohesion: 190.0 Friction angle: 17	Piezometric Line no. 1

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	MSW	59	Cohesion: 500.0 Friction angle: 20	Piezometric Line no. 2
2	Loess	114	2-Stage Linear Intercept (Kc = 1): 298.00 Slope (Kc = 1): 18.50 Intercept (Kc = Kf): 161.00 Slope (Kc = Kf): 25.50	Piezometric Line no. 2
3	Till	123	2-Stage Linear Intercept (Kc = 1): 228.00 Slope (Kc = 1): 20.20 Intercept (Kc = Kf): 156.00 Slope (Kc = Kf): 28.10	Piezometric Line no. 2

Current data set: NNSWC Landfill Evaluation - Section D Seismic

X: 1379.42 Y: 564.63

Cross-Section: D
Case: Seismic
Filename: 20200929 Profile D Seismic_input (textor).docx

UTEXAS4 Input File


```
GRAphics
HEAding follows -
NNSWC Landfill Evaluation - Section D Seismic
#122625

PROfile lines
   1 1 MSW
         0 350
         197 340
         560 230
         845 153

   2 2 Loess
         0 168
         839 150
         845 153
         1020 153

   3 3 Till
         0 150.4
         610 106
         820 116.5
         1020 102.9


MATerial properties
   1 MSW
      59 = unit weight
      Conventional Shear Strength
         500 20
      Piezometric Line
         1
   2 Loess
      114 = unit weight
      Conventional Shear Strength
         540 16
      Piezometric Line
         1
   3 Till
      121 = unit weight
      Conventional Shear Strength
         190 17
      Piezometric Line
         1

PIEzometric line
     1 Piezometric Line
         0 168
         839 150
         845 153
         1020 153


Second Stage input activated
MATerial properties
```

```
    1 MSW
      59 = unit weight
      Conventional Shear Strength
         500 20
      Piezometric Line
         2
   2 Loess
      114 = unit weight
      2-Stage Linear Strength Envelope
         298 18.5 161 25.5
      Piezometric Line
         2
   3 Till
      123 = unit weight
      2-Stage Linear Strength Envelope
         228 20.2 156 28.1
      Piezometric Line
         2

PIEzometric line
     2 Piezometric Line
         0 168
         839 150
         845 153
         1020 153


LABel
NNSWC Landfill Evaluation - Section D Seismic
ANALYSIS/COMPUTATION
   Circular Search 2
     25 25
     350 280 350 800 820 800 820 280
     5 5
   Point
     845 153

   Minimum
     5000
   Crack
     6 D
   Seismic
     0.09
   Two-stage Computation
   Short

COMpute
```

Cross-Section: D
Case: Seismic
Filename: 20200929 Profile D Seismic_output (textor).docx

UTEXAS4 Output File


```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.1.0.8 - Last Revision Date: 11/9/2009
(C) Copyright 1985-2008 S. G. Wright - All rights reserved
*****************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE         *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE       *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA      *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING    *
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* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS     *
* OR ADAPTABILITY OF THIS SOFTWARE.                             *
*****************************************************************
```

```
UTEXAS4 S/N:10001  - Version: 4.1.0.8 - Latest Revision: 11/9/2009
Licensed for use by: Nathan Textor, Burns & McDonnell
Time and date of run: Tue Sep 29 14:04:57 2020
Name of input data file:
Z:\Clients\ENS\NNSWC\122625_NNSWC2020MOD\Design\GeoTech\Working\Dsgn\Stability - Existing
Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: MSW

Point        X           Y

   1        0.00      350.00
   2      197.00      340.00
   3      560.00      230.00
   4      845.00      153.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: Loess

Point        X           Y

   1        0.00      168.00
   2      839.00      150.00
   3      845.00      153.00
   4     1020.00      153.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: Till

Point        X           Y

   1        0.00      150.40
   2      610.00      106.00
   3      820.00      116.50
   4     1020.00      102.90
```

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 4
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
------------------------------------------------------------------
Description: MSW

Constant unit weight of soil (material): 59.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 500.0
Friction angle - - - - - 20.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
------------------------------------------------------------------
Description: Loess

Constant unit weight of soil (material): 114.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 540.0
Friction angle - - - - - 16.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
------------------------------------------------------------------
Description: Till

Constant unit weight of soil (material): 121.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 190.0
Friction angle - - - - - 17.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.
```

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 6
**********************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

----------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
----------------------------------------------------------
Description: Piezometric Line
Unit weight of fluid (water): 62.4

Point        X           Y

  1        0.00      168.00
  2      839.00      150.00
  3      845.00      153.00
  4     1020.00      153.00
```

```
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NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 5
2222222222222222222222222222222222222222222222222222222222
2 NEW MATERIAL PROPERTY DATA - SECOND_STAGE COMPUTATIONS 2
2222222222222222222222222222222222222222222222222222222222

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
------------------------------------------------------------------
Description: MSW

Constant unit weight of soil (material): 59.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 500.0
Friction angle - - - - - 20.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 2
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
------------------------------------------------------------------
Description: Loess

Constant unit weight of soil (material): 114.0

---- 2-STAGE STRENGTHS FOR SECOND STAGE OF COMPUTATIONS

Kc = 1 ENVELOPE:
     Intercept of envelope ("d") - - - - - - - - 298.0
     Slope of envelope ("psi") - - - - - - - - - 18.50 (degrees)
Kc = Kf ENVELOPE:
     Intercept of envelope ("d") - - - - - - - - 161.0
     Slope of envelope ("psi") - - - - - - - - - 25.50 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 2
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
------------------------------------------------------------------
Description: Till

Constant unit weight of soil (material): 123.0

---- 2-STAGE STRENGTHS FOR SECOND STAGE OF COMPUTATIONS

Kc = 1 ENVELOPE:
     Intercept of envelope ("d") - - - - - - - - 228.0
     Slope of envelope ("psi") - - - - - - - - - 20.20 (degrees)
```

```
Kc = Kf ENVELOPE:
     Intercept of envelope ("d") - - - - - - - - - 156.0
     Slope of envelope ("psi") - - - - - - - - - - 28.10 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 2
Negative pore water pressures are NOT allowed - set to zero.
```

```
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NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 7
222222222222222222222222222222222222222222222222222222222222222222222
2 NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS 2
222222222222222222222222222222222222222222222222222222222222222222222

---------------------------------------------------------
--------------- Piezometric Line Number 2 ---------------
---------------------------------------------------------
Description: Piezometric Line
Unit weight of fluid (water): 62.4

Point        X           Y

  1        0.00      168.00
  2      839.00      150.00
  3      845.00      153.00
  4     1020.00      153.00
```

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************


Search will be conducted using a fixed grid.
Number of Points Across Grid: 25
Number of Points Up Grid: 25

Grid Corner
   Number           X              Y

     1           350.00         280.00
     2           350.00         800.00
     3           820.00         800.00
     4           820.00         280.00

----- Control Parameters for Finding "Critical" Radius -----
Initial number of subdivisions between maximum and minimum
radius for finding a critical radius/radii: 5

Minimum radius increment for terminating subdivision of radii: 5.000

The following criteria will be used for determining
the maximum and minimum radii:
     Point circles pass through - X: 845.00     Y: 153.00
Minimum weight required for computations to be performed: 5000

Depth of crack: 6.000
Seismic coefficient: 0.090
Seismic force acts at center of gravity.
Two-stage computations will be performed.
Automatic search output will be in short form.

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
There is no water in a crack.
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Radii for each grid point will be sorted in the order of increasing radius.
Critical circles for grid points will be output in the order of increasing factor of safety.
Standard sign convention used for direction of shear stress on shear surface.
Procedure of Analysis: Spencer

Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
```

```
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure: -10.00
```

```
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NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 26
*************************************
* NEW, COMPUTED SLOPE GEOMETRY DATA *
*************************************

These slope geometry were generated from the Profile Lines.

     Point       X           Y

        1        0.00      350.00
        2      197.00      340.00
        3      560.00      230.00
        4      610.00      216.49
        5      820.00      159.75
        6      839.00      154.62
        7      845.00      153.00
        8     1020.00      153.00
```

```
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NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 38
*************************************************
* FINAL SUMMARY OF COMPUTATIONS WITH FIXED-GRID *
*************************************************


Number of circles attempted: 625
Number of circles for which F calculated: 432
Circle with Lowest Factor of Safety:
     X coordinate for center: 624.17
     Y coordinate for center: 735.00
     Radius of circle: 622.488
Factor of safety: 1.283
Side force inclination: -17.32
Time Required for Computations: 0.0 seconds
```

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 43
111111111111111111111111111111111111111111111111111111111111
1 Coordinate, Weight, Strength and Pore Water Pressure     1
1 Information for Individual Slices for Conventional       1
1 Computations or First Stage of Multi-Stage Computations. 1
1 (Information is for the critical shear surface in the    1
1 case of an automatic search.)                            1
111111111111111111111111111111111111111111111111111111111111
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	145.87	336.60					
1	156.63	324.35	22455	1	500.0	20.00	0.0
	167.38	312.11					
2	178.76	300.45	54354	1	500.0	20.00	0.0
	190.14	288.78					
3	193.57	285.50	22139	1	500.0	20.00	0.0
	197.00	282.21					
4	209.14	271.34	93095	1	500.0	20.00	0.0
	221.28	260.47					
5	233.98	250.26	117639	1	500.0	20.00	0.0
	246.67	240.04					
6	259.88	230.50	140995	1	500.0	20.00	0.0
	273.09	220.96					
7	286.78	212.12	162644	1	500.0	20.00	0.0
	300.48	203.29					
8	314.61	195.18	182105	1	500.0	20.00	0.0
	328.75	187.08					
9	343.29	179.72	198939	1	500.0	20.00	0.0
	357.83	172.37					
10	372.11	166.04	203807	1	500.0	20.00	0.0
	386.40	159.71					
11	401.62	153.88	232067	2	540.0	16.00	343.3
	416.83	148.05					
12	432.34	143.03	256600	2	540.0	16.00	979.2
	447.84	138.01					
13	463.58	133.80	274975	2	540.0	16.00	1513.3
	479.32	129.60					
14	495.26	126.22	286742	2	540.0	16.00	1943.9
	511.21	122.85					
15	527.30	120.31	291566	2	540.0	16.00	2269.9
	543.40	117.77					
16	551.70	116.80	149289	2	540.0	16.00	2456.2
	560.00	115.83					
17	576.25	114.57	286254	2	540.0	16.00	2562.4
	592.49	113.32					
18	601.25	113.00	149888	2	540.0	16.00	2627.4
	610.00	112.67					
19	617.08	112.59	118099	2	540.0	16.00	2631.3
	624.17	112.51					
20	640.46	112.94	257266	2	540.0	16.00	2578.4
	656.75	113.37					

21	672.99	114.64	232149	2	540.0	16.00	2428.5
	689.23	115.92					
22	705.39	118.05	200409	2	540.0	16.00	2172.6
	721.55	120.18					
23	737.57	123.15	162483	2	540.0	16.00	1811.5
	753.59	126.11					
24	769.43	129.92	118926	2	540.0	16.00	1346.2
	785.28	133.72					
25	800.90	138.35	70398	2	540.0	16.00	777.9
	816.53	142.98					
26	818.26	143.55	4735	2	540.0	16.00	430.3
	820.00	144.12					
27	828.52	147.08	13375	2	540.0	16.00	196.2
	837.04	150.04					
28	838.02	150.40	518	1	500.0	20.00	0.0
	839.00	150.76					
29	842.00	151.88	684	1	500.0	20.00	0.0
	845.00	153.00					

No water in crack.

```
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NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 44
1111111111111111111111111111111111111111111111111111111111
1 Seismic Forces and Forces Due to Distributed Loads for 1
1 Individual Slices for Conventional Computations or the 1
1 First Stage of Multi-Stage Computations.              1
1 (Information is for the critical shear surface in the  1
1 case of an automatic search.)                         1
1111111111111111111111111111111111111111111111111111111111

There are no seismic forces or forces due to distributed loads
for the current shear surface
```

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 47
1111111111111111111111111111111111111111111111111111111111111
1  Information for the Iterative Solution for the Factor of  1
1  Safety and Side Force Inclination by Spencer's Procedure  1
1  Stage 1 of Multi-Stage Computations                       1
1111111111111111111111111111111111111111111111111111111111111
Allowable force imbalance for convergence:  43
Allowable moment imbalance for convergence: 21330

        Trial     Trial
       Factor   Side Force     Force       Moment                   Delta
Iter-    of    Inclination   Imbalance   Imbalance    Delta-F       Theta
ation  Safety   (degrees)      (lbs.)    (ft.-lbs.)               (degrees)

   1   3.00000   -17.1887  -3.817e+005   9.561e+007
First-order corrections to F and Theta ............   -2.9289    30.1197
Reduced values - Deltas were too large ............   -0.2786     2.8648

   2   2.72142   -14.3239  -3.408e+005   8.582e+007
First-order corrections to F and Theta ............   -1.8327    10.5820
Reduced values - Deltas were too large ............   -0.4962     2.8648

   3   2.22526   -11.4592  -2.257e+005   5.860e+007
First-order corrections to F and Theta ............   -0.6973    -0.9637
Reduced values - Deltas were too large ............   -0.5000    -0.6910

   4   1.72526   -12.1501  -1.827e+004   3.975e+006
First-order corrections to F and Theta ............   -0.0372     0.2419
Second-order corrections to F and Theta ...........   -0.0364     0.2318

   5   1.68887   -11.9183   8.130e+000  -1.361e+003
First-order corrections to F and Theta ............    0.0000    -0.0002
Second-order corrections to F and Theta ...........    0.0000    -0.0002

   6   1.68889   -11.9185  -7.776e-010   4.491e-008
First-order corrections to F and Theta ............   -0.0000     0.0000
```

```
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Time and date of run: Tue Sep 29 14:04:57 2020
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Z:\Clients\ENS\NNSWC\122625_NNSWC2020MOD\Design\GeoTech\Working\Dsgn\Stability - Existing
Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 48
222222222222222222222222222222222222222222222222222222222222
2 Detailed Information from Evaluation of Shear Strengths 2
2 for Stage 2 - Information is Only Given for Slices with 2
2 Two-Stage Shear Strengths (Strength Options 6 and 7).   2
2 (Information is for the critical shear surface in the   2
2 case of an automatic search.)                           2
222222222222222222222222222222222222222222222222222222222222
```

Slice No.	Effective Normal Stress at Consol.	Shear Stress at Consol.	Strength (Kc = 1)	Strength (Kc = Kf)	Kc	Kf
11	6485.7	1420.9	2468.1	3254.5	1.563	2.627
12	6615.0	1442.9	2511.4	3316.2	1.560	2.625
13	6676.8	1453.4	2532.0	3345.7	1.559	2.624
14	6664.1	1451.2	2527.8	3339.6	1.559	2.624
15	6569.8	1435.2	2496.2	3294.7	1.561	2.626
16	6448.3	1414.6	2455.6	3236.7	1.564	2.628
17	6288.7	1387.5	2402.2	3160.6	1.568	2.631
18	6102.5	1355.8	2339.9	3071.7	1.573	2.634
19	5950.0	1330.0	2288.9	2999.0	1.577	2.638
20	5668.1	1282.1	2194.5	2864.6	1.585	2.644
21	5191.6	1201.2	2035.1	2637.3	1.600	2.657
22	4594.9	1099.9	1835.4	2352.7	1.625	2.676
23	3868.4	976.5	1592.4	2006.1	1.665	2.708
24	3001.1	829.3	1302.2	1592.5	1.742	2.768
25	1980.2	655.9	960.6	1105.5	1.928	2.910
26	1352.5	549.4	750.5	806.1	2.210	3.117
27	939.8	479.3	612.4	609.3	Strength from S envelope.	

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 49
2222222222222222222222222222222222222222222222222222222222
2 Coordinate, Weight, Strength and Pore Water Pressure  2
2 Information for Individual Slices for Second          2
2 Stage of Multi-Stage Computations.                    2
2 (Information is for the critical shear surface in the 2
2 case of an automatic search.)                         2
2222222222222222222222222222222222222222222222222222222222

Slice                        Slice   Matl.            Friction     Pore
  No.      X         Y       Weight   No.    Cohesion    Angle    Pressure
        145.87    336.60
   1    156.63    324.35      22455    1       500.0    20.00         0.0
        167.38    312.11
   2    178.76    300.45      54354    1       500.0    20.00         0.0
        190.14    288.78
   3    193.57    285.50      22139    1       500.0    20.00         0.0
        197.00    282.21
   4    209.14    271.34      93095    1       500.0    20.00         0.0
        221.28    260.47
   5    233.98    250.26     117639    1       500.0    20.00         0.0
        246.67    240.04
   6    259.88    230.50     140995    1       500.0    20.00         0.0
        273.09    220.96
   7    286.78    212.12     162644    1       500.0    20.00         0.0
        300.48    203.29
   8    314.61    195.18     182105    1       500.0    20.00         0.0
        328.75    187.08
   9    343.29    179.72     198939    1       500.0    20.00         0.0
        357.83    172.37
  10    372.11    166.04     203807    1       500.0    20.00         0.0
        386.40    159.71
  11    401.62    153.88     232067    2      2740.4     0.00         0.0
        416.83    148.05
  12    432.34    143.03     256600    2      2789.0     0.00         0.0
        447.84    138.01
  13    463.58    133.80     274975    2      2812.2     0.00         0.0
        479.32    129.60
  14    495.26    126.22     286742    2      2807.4     0.00         0.0
        511.21    122.85
  15    527.30    120.31     291566    2      2772.0     0.00         0.0
        543.40    117.77
  16    551.70    116.80     149289    2      2726.3     0.00         0.0
        560.00    115.83
  17    576.25    114.57     286254    2      2666.3     0.00         0.0
        592.49    113.32
  18    601.25    113.00     149888    2      2596.3     0.00         0.0
        610.00    112.67
  19    617.08    112.59     118099    2      2538.9     0.00         0.0
        624.17    112.51
  20    640.46    112.94     257266    2      2432.8     0.00         0.0
        656.75    113.37
```

21	672.99	114.64	232149	2	2253.3	0.00	0.0
	689.23	115.92					
22	705.39	118.05	200409	2	2028.2	0.00	0.0
	721.55	120.18					
23	737.57	123.15	162483	2	1753.5	0.00	0.0
	753.59	126.11					
24	769.43	129.92	118926	2	1424.0	0.00	0.0
	785.28	133.72					
25	800.90	138.35	70398	2	1031.0	0.00	0.0
	816.53	142.98					
26	818.26	143.55	4735	2	782.3	0.00	0.0
	820.00	144.12					
27	828.52	147.08	13375	2	609.3	0.00	0.0
	837.04	150.04					
28	838.02	150.40	518	1	500.0	20.00	0.0
	839.00	150.76					
29	842.00	151.88	684	1	500.0	20.00	0.0
	845.00	153.00					

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 50
2222222222222222222222222222222222222222222222222222222222222222222222
2 Seismic Forces and Forces Due to Distributed Loads for Individual 2
2 Slices for the Second Stage of Multi-Stage Computations.         2
2 (Information is for the critical shear surface in the            2
2 case of an automatic search.)                                    2
2222222222222222222222222222222222222222222222222222222222222222222222
```

Slices No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO DISTRIBUTED LOADS Normal Force	Shear Force	X	Y
1	156.63	2021	333.20	0	0	156.63	342.05
2	178.76	4892	320.69	0	0	178.76	340.93
3	193.57	1992	312.83	0	0	193.57	340.17
4	209.14	8379	303.83	0	0	209.14	336.32
5	233.98	10588	289.53	0	0	233.98	328.80
6	259.88	12690	275.72	0	0	259.88	320.95
7	286.78	14638	262.46	0	0	286.78	312.79
8	314.61	16389	249.77	0	0	314.61	304.36
9	343.29	17905	237.70	0	0	343.29	295.67
10	372.11	18343	226.49	0	0	372.11	286.94
11	401.62	20886	213.59	0	0	401.62	277.99
12	432.34	23094	200.13	0	0	432.34	268.69
13	463.58	24748	188.79	0	0	463.58	259.22
14	495.26	25807	179.13	0	0	495.26	249.62
15	527.30	26241	170.92	0	0	527.30	239.91
16	551.70	13436	165.47	0	0	551.70	232.52
17	576.25	25763	161.12	0	0	576.25	225.61
18	601.25	13490	157.30	0	0	601.25	218.86
19	617.08	10629	155.26	0	0	617.08	214.58
20	640.46	23154	152.83	0	0	640.46	208.26
21	672.99	20893	150.18	0	0	672.99	199.47
22	705.39	18037	148.54	0	0	705.39	190.72
23	737.57	14623	147.89	0	0	737.57	182.03
24	769.43	10703	148.20	0	0	769.43	173.42
25	800.90	6336	149.49	0	0	800.90	164.91
26	818.26	426	150.53	0	0	818.26	160.22
27	828.52	1204	151.47	0	0	828.52	157.45
28	838.02	47	152.64	0	0	838.02	154.89
29	842.00	62	152.84	0	0	842.00	153.81

```
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NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 51
222222222222222222222222222222222222222222222222222222222222222
2  Information for the Iterative Solution for the Factor of  2
2  Safety and Side Force Inclination by Spencer's Procedure  2
2  Second Stage of Multi-Stage Computations                  2
222222222222222222222222222222222222222222222222222222222222222
Allowable force imbalance for convergence:  43
Allowable moment imbalance for convergence: 21330

        Trial     Trial
       Factor   Side Force     Force       Moment                   Delta
Iter-    of    Inclination   Imbalance   Imbalance    Delta-F      Theta
ation  Safety   (degrees)      (lbs.)    (ft.-lbs.)              (degrees)

   1   3.00000   -17.1887  -7.290e+005   2.147e+008
First-order corrections to F and Theta ............   -3.9625     0.1608
Reduced values - Deltas were too large ............   -0.5000     0.0203

   2   2.50000   -17.1684  -6.188e+005   1.822e+008
First-order corrections to F and Theta ............   -2.3490     0.3261
Reduced values - Deltas were too large ............   -0.5000     0.0694

   3   2.00000   -17.0990  -4.547e+005   1.340e+008
First-order corrections to F and Theta ............   -1.1497     4.9602
Reduced values - Deltas were too large ............   -0.5000     2.1571

   4   1.50000   -14.9419  -1.907e+005   6.041e+007
First-order corrections to F and Theta ............   -0.2436    -4.3990
Reduced values - Deltas were too large ............   -0.1586    -2.8648

   5   1.34139   -17.8067  -5.296e+004   1.423e+007
First-order corrections to F and Theta ............   -0.0613     0.5507
Second-order corrections to F and Theta ...........   -0.0586     0.4880

   6   1.28282   -17.3187   9.855e+001  -2.057e+004
First-order corrections to F and Theta ............    0.0001    -0.0026
Second-order corrections to F and Theta ...........    0.0001    -0.0026

   7   1.28293   -17.3214  -8.004e-007   3.373e-005
First-order corrections to F and Theta ............   -0.0000     0.0000
```

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 55
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************

Summation of Horizontal Forces: 2.42782e-010

Summation of Vertical Forces: 2.85587e-010

Summation of Moments: -1.43070e-008

Mohr Coulomb Shear Force/Shear Strength Check Summation: 9.15175e-011
```

```
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Conditions\Section D\Final\Section D Seismic.dat

NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 58
*************************************************************************
* Final Results for Stresses Along the Shear Surface                    *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.283     Side Force Inclination: -17.32
```

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	156.63	324.35	435.7	435.7	513.4
2	178.76	300.45	1342.6	1342.6	770.6
3	193.57	285.50	1945.8	1945.8	941.7
4	209.14	271.34	2422.0	2422.0	1076.9
5	233.98	250.26	3099.8	3099.8	1269.2
6	259.88	230.50	3746.9	3746.9	1452.7
7	286.78	212.12	4354.6	4354.6	1625.1
8	314.61	195.18	4914.9	4914.9	1784.1
9	343.29	179.72	5420.0	5420.0	1927.4
10	372.11	166.04	5854.8	5854.8	2050.8
11	401.62	153.88	6484.8	6484.8	2136.0
12	432.34	143.03	7282.0	7282.0	2173.9
13	463.58	133.80	7926.0	7926.0	2192.0
14	495.26	126.22	8405.3	8405.3	2188.3
15	527.30	120.31	8708.2	8708.2	2160.7
16	551.70	116.80	8830.5	8830.5	2125.1
17	576.25	114.57	8837.2	8837.2	2078.3
18	601.25	113.00	8776.9	8776.9	2023.7
19	617.08	112.59	8666.3	8666.3	1979.0
20	640.46	112.94	8384.7	8384.7	1896.3
21	672.99	114.64	7822.9	7822.9	1756.4
22	705.39	118.05	7017.8	7017.8	1580.9
23	737.57	123.15	5952.0	5952.0	1366.8
24	769.43	129.92	4605.0	4605.0	1109.9
25	800.90	138.35	2951.0	2951.0	803.6
26	818.26	143.55	1910.7	1910.7	609.8
27	828.52	147.08	1206.9	1206.9	474.9
28	838.02	150.40	751.6	751.6	603.0
29	842.00	151.88	548.4	548.4	545.3

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NNSWC Landfill Evaluation - Section D Seismic
#122625

TABLE NO. 59
```
***********************************************************************
* Final Results for Side Forces and Stresses Between Slices           *
* (Results are for the critical shear surface in the case of a search.) *
***********************************************************************
```

--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	167.38	1728	331.84	0.671	113.8	-1.5
2	190.14	21287	304.03	0.296	-89.0	877.2
3	197.00	30003	298.72	0.286	-141.7	1133.0
4	221.28	66533	282.48	0.305	-150.1	1910.3
5	246.67	110227	267.31	0.321	-90.5	2569.1
6	273.09	158193	252.96	0.333	0.2	3146.6
7	300.48	207508	239.45	0.343	111.2	3649.4
8	328.75	255307	226.84	0.352	239.8	4074.0
9	357.83	298866	215.20	0.360	387.6	4411.7
10	386.40	334331	205.02	0.369	551.1	4643.1
11	416.83	367286	194.92	0.374	682.1	4913.3
12	447.84	397513	185.15	0.374	738.7	5285.8
13	479.32	420966	176.13	0.373	760.4	5677.4
14	511.21	434354	168.09	0.371	769.8	6031.2
15	543.40	435255	161.16	0.370	780.1	6307.2
16	560.00	430375	158.05	0.370	787.5	6409.7
17	592.49	409856	152.90	0.367	729.4	6522.8
18	610.00	392806	150.65	0.366	703.9	6520.1
19	624.17	376036	149.10	0.365	687.0	6481.8
20	656.75	328085	146.43	0.365	664.3	6257.6
21	689.23	269244	145.02	0.368	667.2	5826.7
22	721.55	203359	144.88	0.373	704.0	5163.1
23	753.59	135770	146.01	0.386	790.5	4235.0
24	785.28	73440	148.39	0.414	959.5	3000.1
25	816.53	25162	151.49	0.480	1196.0	1516.0
26	820.00	21107	151.97	0.502	1306.5	1270.9
27	837.04	6403	152.65	0.511	1278.7	1114.6
28	839.00	4651	152.80	0.529	1348.9	950.0
29	845.00	-0	153.00	0.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (v…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

41.785465

Time Horizon

Return period in years

2475

Longitude

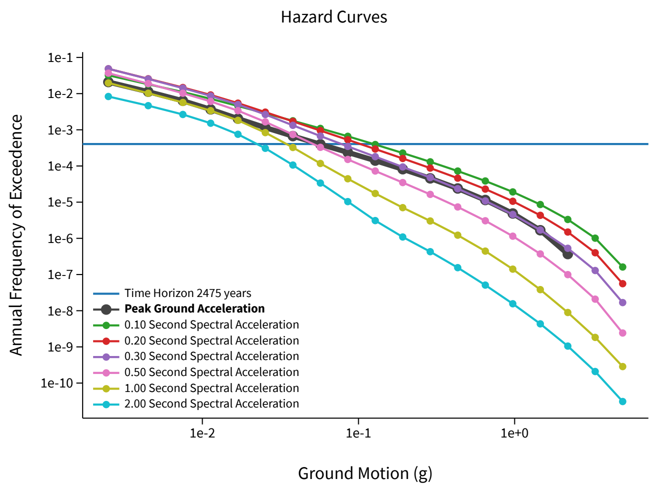
Decimal degrees, negative values for western longitudes

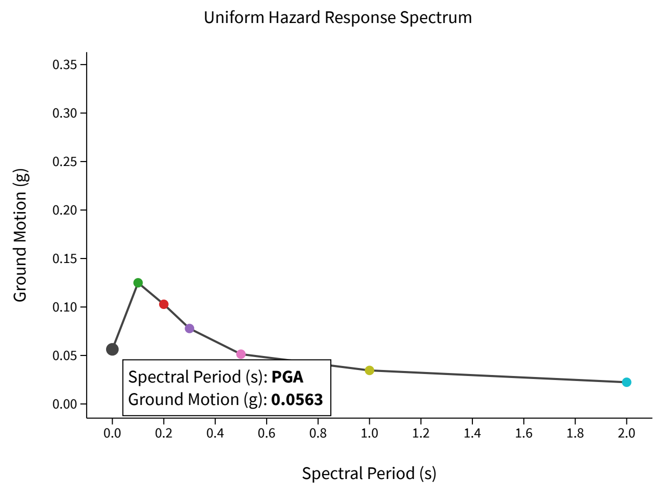
-97.0916

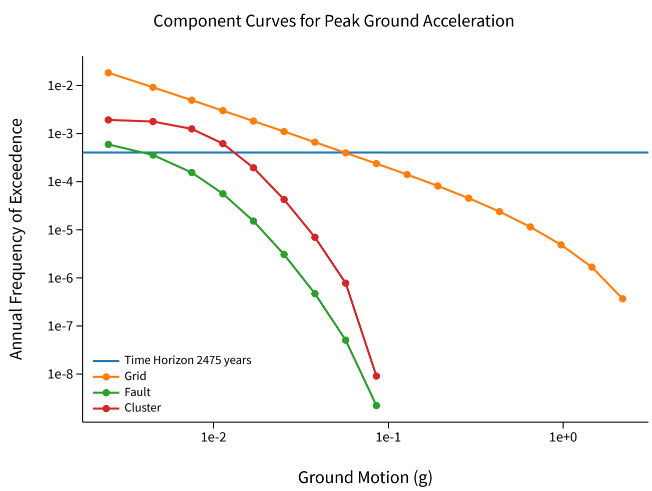
Site Class

760 m/s (B/C boundary)

Hazard Curve





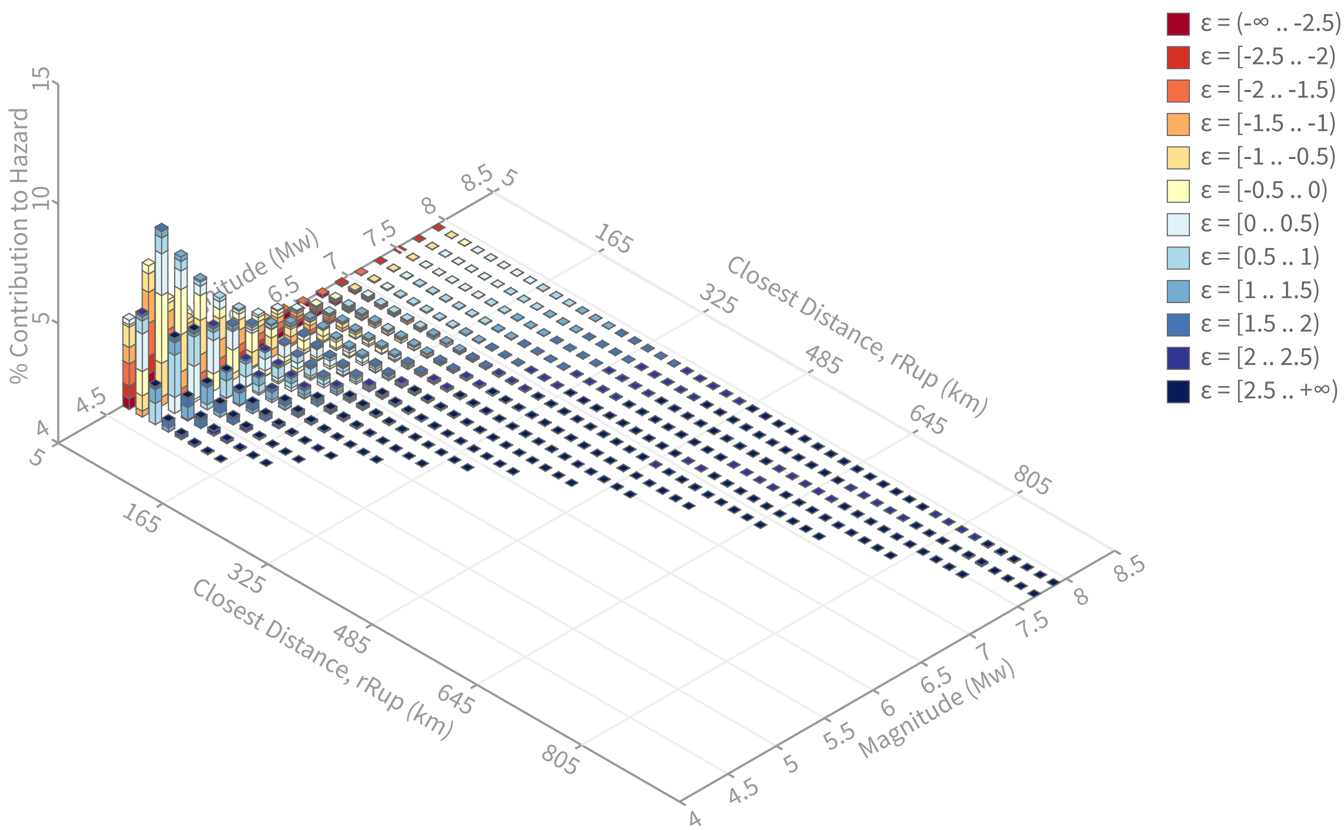


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.056319493 g

Recovered targets

Return period: 2475.3467 yrs
Exceedance rate: 0.00040398381 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 1.87 %

Mean (over all sources)

m: 5.47
r: 58.9 km
ε_0: -0.33 σ

Mode (largest m-r bin)

m: 4.9
r: 29.48 km
ε_0: -0.14 σ
Contribution: 7.34 %

Mode (largest m-r-ε_0 bin)

m: 4.9
r: 29.13 km
ε_0: -0.25 σ
Contribution: 2.84 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

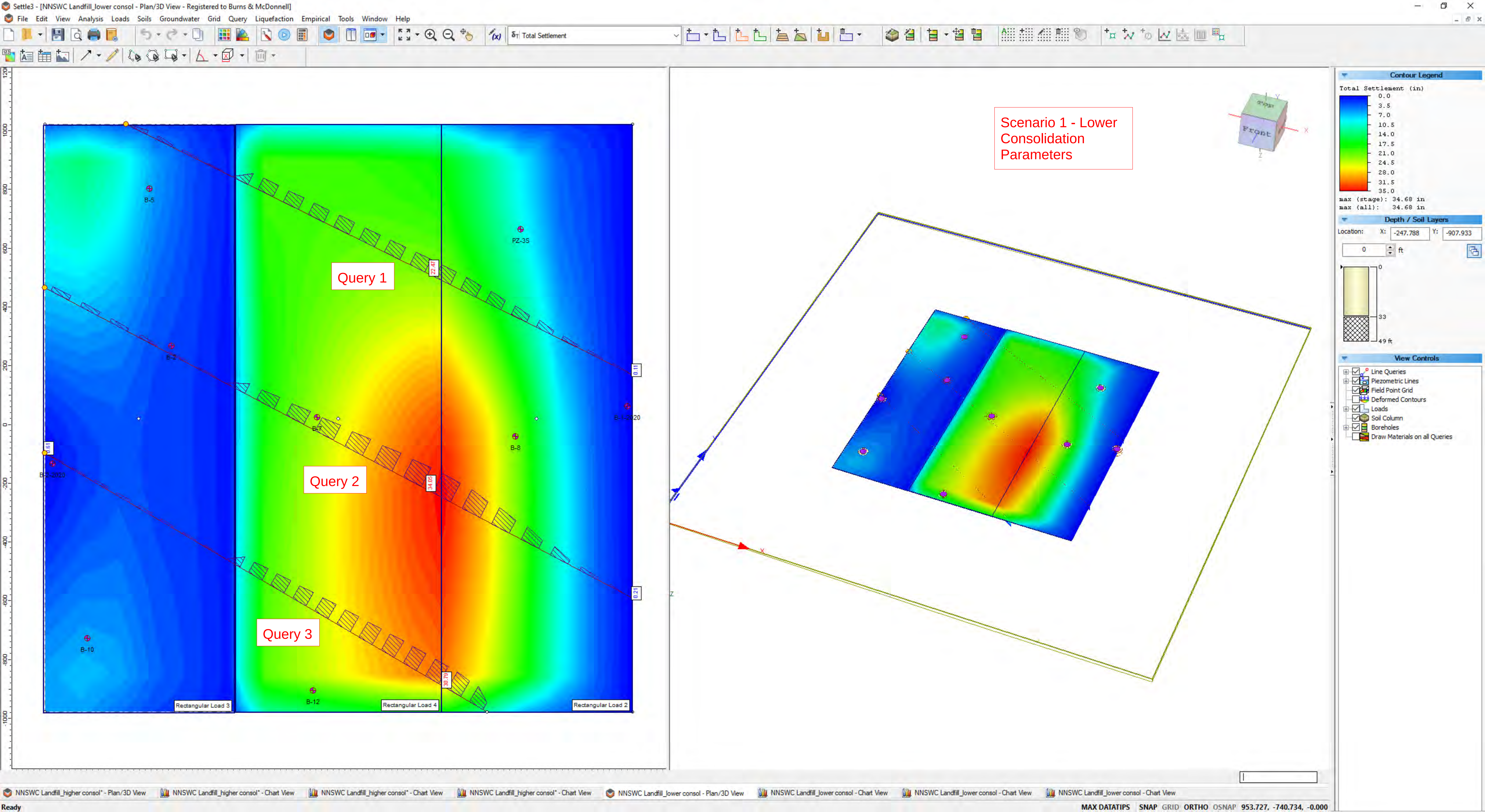
Epsilon keys

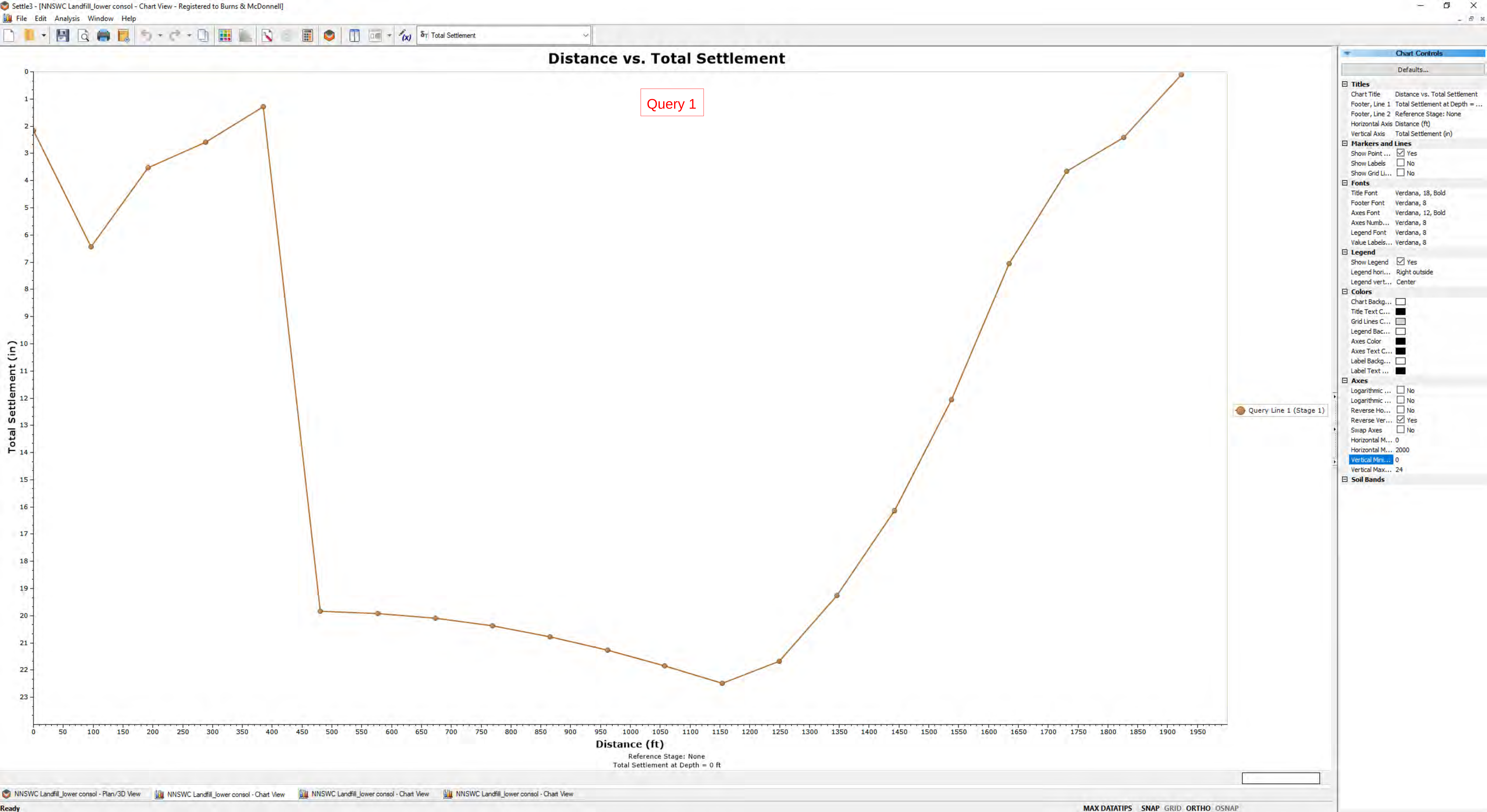
ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

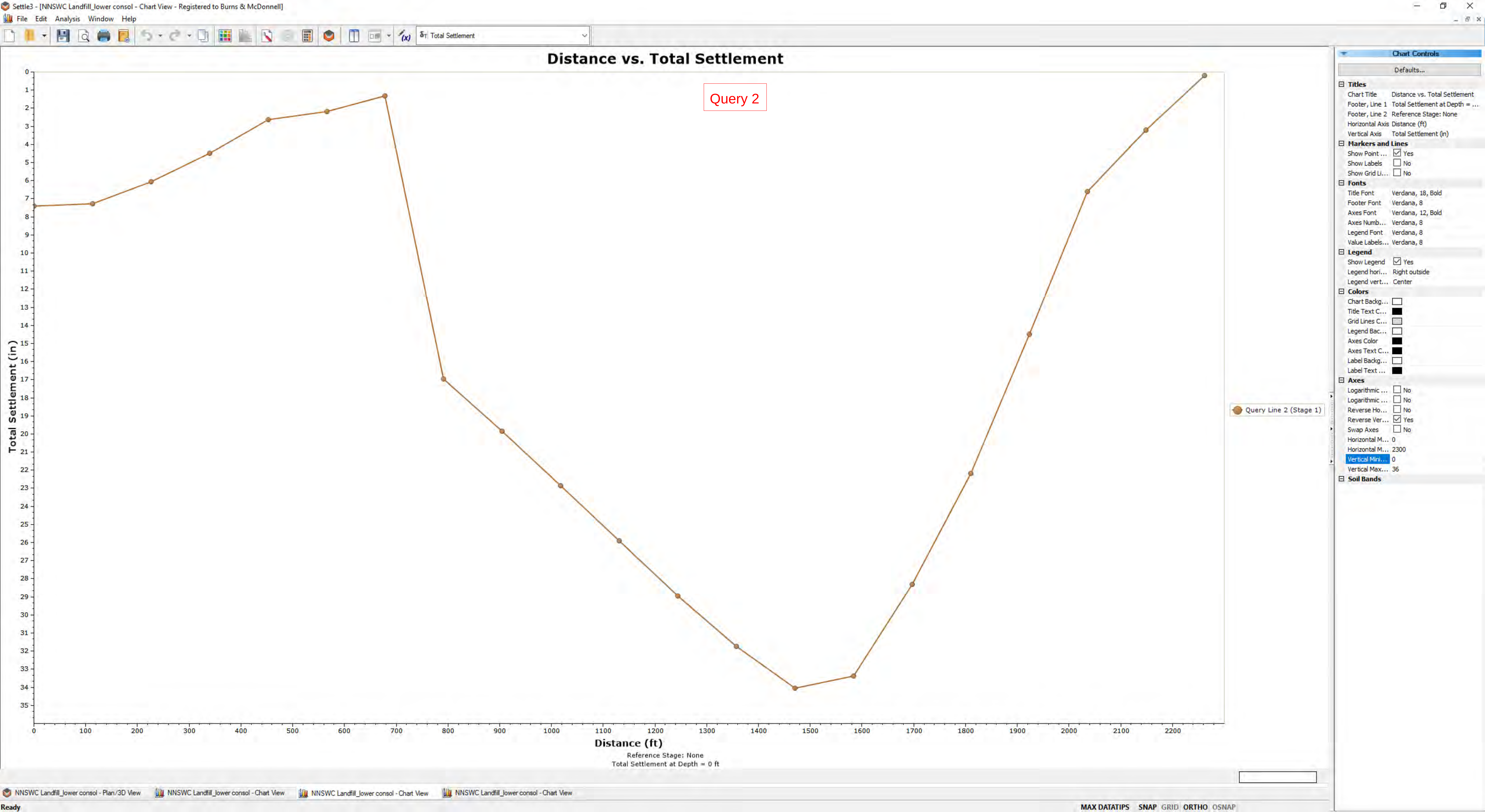
Deaggregation Contributors

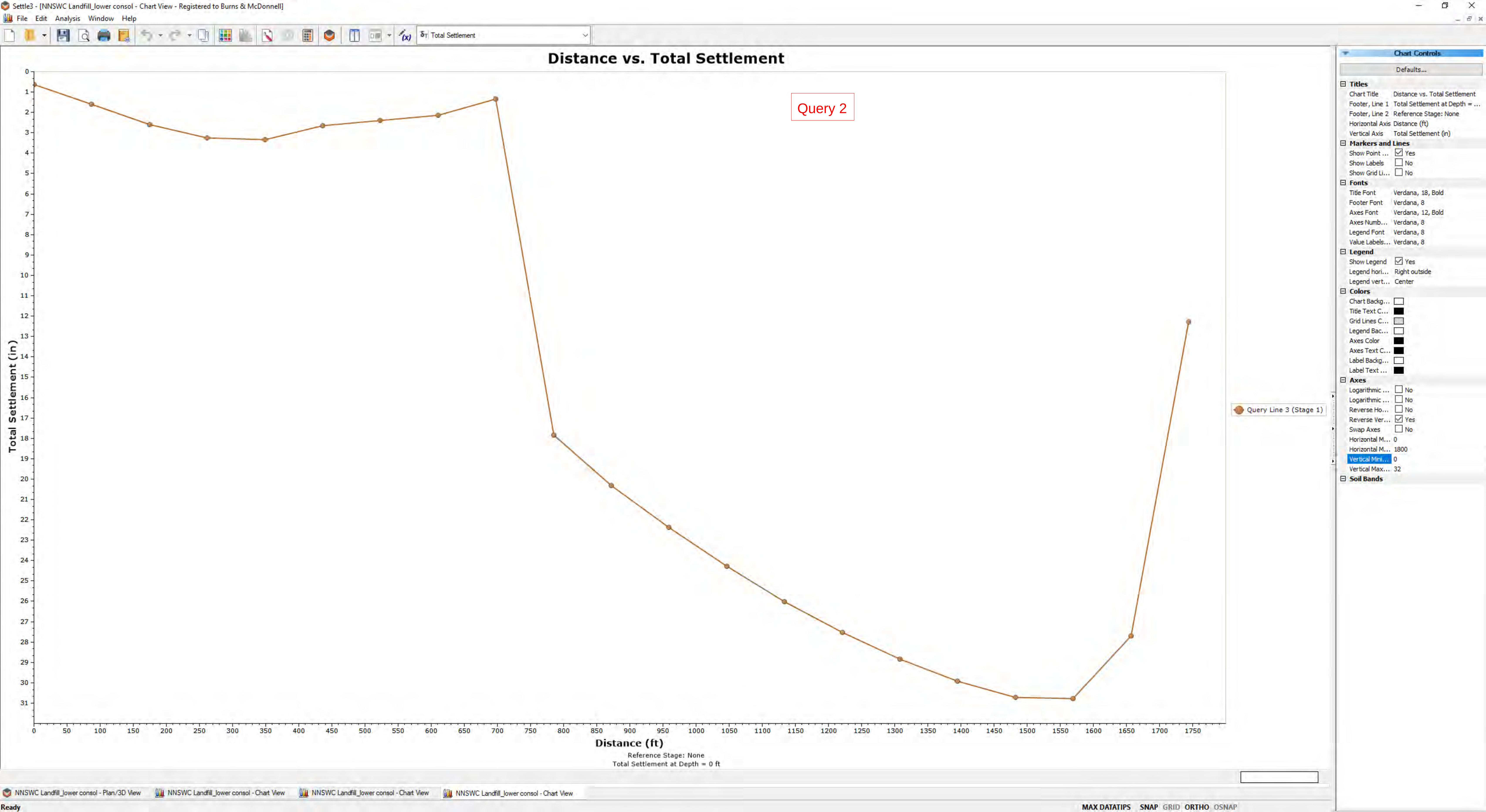
Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
USGS Fixed Smoothing Zone 1 (opt)	Grid							38.34
PointSourceFinite: -97.092, 42.033		27.64	5.23	-0.67	97.092°W	42.033°N	360.00	4.16
PointSourceFinite: -97.092, 42.078		32.51	5.27	-0.43	97.092°W	42.078°N	360.00	3.12
PointSourceFinite: -97.092, 41.988		22.80	5.19	-0.98	97.092°W	41.988°N	360.00	3.10
PointSourceFinite: -97.092, 41.943		18.00	5.16	-1.39	97.092°W	41.943°N	360.00	2.88
PointSourceFinite: -97.092, 41.898		13.31	5.14	-1.95	97.092°W	41.898°N	360.00	2.52
PointSourceFinite: -97.092, 42.123		37.38	5.32	-0.23	97.092°W	42.123°N	360.00	2.49
PointSourceFinite: -97.092, 42.168		42.25	5.36	-0.07	97.092°W	42.168°N	360.00	2.31
PointSourceFinite: -97.092, 42.213		47.11	5.41	0.07	97.092°W	42.213°N	360.00	2.19
PointSourceFinite: -97.092, 41.853		8.92	5.13	-2.65	97.092°W	41.853°N	360.00	2.07
PointSourceFinite: -97.092, 42.258		51.97	5.46	0.19	97.092°W	42.258°N	360.00	1.67
PointSourceFinite: -97.092, 42.303		56.82	5.50	0.30	97.092°W	42.303°N	360.00	1.35
PointSourceFinite: -97.092, 42.393		66.51	5.60	0.46	97.092°W	42.393°N	360.00	1.12
SSCn Fixed Smoothing Zone 1 (opt)	Grid							38.34
PointSourceFinite: -97.092, 42.033		27.64	5.23	-0.67	97.092°W	42.033°N	360.00	4.16
PointSourceFinite: -97.092, 42.078		32.51	5.27	-0.43	97.092°W	42.078°N	360.00	3.12
PointSourceFinite: -97.092, 41.988		22.80	5.19	-0.98	97.092°W	41.988°N	360.00	3.10
PointSourceFinite: -97.092, 41.943		18.00	5.16	-1.39	97.092°W	41.943°N	360.00	2.88
PointSourceFinite: -97.092, 41.898		13.31	5.14	-1.95	97.092°W	41.898°N	360.00	2.52
PointSourceFinite: -97.092, 42.123		37.38	5.32	-0.23	97.092°W	42.123°N	360.00	2.49
PointSourceFinite: -97.092, 42.168		42.25	5.36	-0.07	97.092°W	42.168°N	360.00	2.31
PointSourceFinite: -97.092, 42.213		47.11	5.41	0.07	97.092°W	42.213°N	360.00	2.19
PointSourceFinite: -97.092, 41.853		8.92	5.13	-2.65	97.092°W	41.853°N	360.00	2.07
PointSourceFinite: -97.092, 42.258		51.97	5.46	0.19	97.092°W	42.258°N	360.00	1.67
PointSourceFinite: -97.092, 42.303		56.82	5.50	0.30	97.092°W	42.303°N	360.00	1.35
PointSourceFinite: -97.092, 42.393		66.51	5.60	0.46	97.092°W	42.393°N	360.00	1.12
USGS Adaptive Smoothing Zone 1 (opt)	Grid							11.55
SSCn Adaptive Smoothing Zone 1 (opt)	Grid							11.55

Attachment E - Settlement


Settle3 - [NNSWC Landfill_lower consol - Plan/3D View - Registered to Burns & McDonnell]
File Edit View Analysis Loads Soils Groundwater Grid Query Liquefaction Empirical Tools Window Help
Total Settlement
Query 1
Query 2
Query 3
B-5
PZ-3S
B-2
B-7
B-8
B-10
B-12
Rectangular Load 3
Rectangular Load 4
Rectangular Load 2
Scenario 1 - Lower Consolidation Parameters
Contour Legend
Total Settlement (in)
0.0
3.5
7.0
10.5
14.0
17.5
21.0
24.5
28.0
31.5
35.0
max (stage): 34.68 in
max (all): 34.68 in
Depth / Soil Layers
Location:
View Controls
Line Queries
Piezometric Lines
Field Point Grid
Deformed Contours
Loads
Soil Column
Boreholes
Draw Materials on all Queries
NNSWC Landfill_higher consol* - Plan/3D View
NNSWC Landfill_higher consol* - Chart View
NNSWC Landfill_lower consol - Plan/3D View
NNSWC Landfill_lower consol - Chart View
Ready
MAX DATATIPS SNAP GRID ORTHO OSNAP 953.727, -740.734, -0.000


Settle3 - [NNSWC Landfill_lower consol - Chart View - Registered to Burns & McDonnell]
File Edit Analysis Window Help
Total Settlement
Distance vs. Total Settlement
Query 1
Total Settlement (in)
Distance (ft)
Reference Stage: None
Total Settlement at Depth = 0 ft
Query Line 1 (Stage 1)
Chart Controls
Defaults...
Titles
Chart Title Distance vs. Total Settlement
Footer, Line 1 Total Settlement at Depth = ...
Footer, Line 2 Reference Stage: None
Horizontal Axis Distance (ft)
Vertical Axis Total Settlement (in)
Markers and Lines
Show Point ... Yes
Show Labels No
Show Grid Li... No
Fonts
Title Font Verdana, 18, Bold
Footer Font Verdana, 8
Axes Font Verdana, 12, Bold
Axes Numb... Verdana, 8
Legend Font Verdana, 8
Value Labels... Verdana, 8
Legend
Show Legend Yes
Legend hori... Right outside
Legend vert... Center
Colors
Chart Backg...
Title Text C...
Grid Lines C...
Legend Bac...
Axes Color
Axes Text C...
Label Backg...
Label Text ...
Axes
Logarithmic ... No
Logarithmic ... No
Reverse Ho... No
Reverse Ver... Yes
Swap Axes No
Horizontal M... 0
Horizontal M... 2000
Vertical Mini... 0
Vertical Max... 24
Soil Bands
NNSWC Landfill_lower consol - Plan/3D View
NNSWC Landfill_lower consol - Chart View
NNSWC Landfill_lower consol - Chart View
NNSWC Landfill_lower consol - Chart View
Ready
MAX DATATIPS SNAP GRID ORTHO OSNAP


Settle3 - [NNSWC Landfill_lower consol - Chart View - Registered to Burns & McDonnell]
File
Edit
Analysis
Window
Help
Total Settlement
Distance vs. Total Settlement
Query 2
Total Settlement (in)
Distance (ft)
Reference Stage: None
Total Settlement at Depth = 0 ft
Query Line 2 (Stage 1)
Chart Controls
Defaults...
Titles
Chart Title
Distance vs. Total Settlement
Footer, Line 1
Total Settlement at Depth = ...
Footer, Line 2
Reference Stage: None
Horizontal Axis
Distance (ft)
Vertical Axis
Total Settlement (in)
Markers and Lines
Show Point ...
Yes
Show Labels
No
Show Grid Li...
No
Fonts
Title Font
Verdana, 18, Bold
Footer Font
Verdana, 8
Axes Font
Verdana, 12, Bold
Axes Numb...
Verdana, 8
Legend Font
Verdana, 8
Value Labels...
Verdana, 8
Legend
Show Legend
Yes
Legend hori...
Right outside
Legend vert...
Center
Colors
Chart Backg...
Title Text C...
Grid Lines C...
Legend Bac...
Axes Color
Axes Text C...
Label Backg...
Label Text ...
Axes
Logarithmic ...
No
Logarithmic ...
No
Reverse Ho...
No
Reverse Ver...
Yes
Swap Axes
No
Horizontal M...
0
Horizontal M...
2300
Vertical Mini...
0
Vertical Max...
36
Soil Bands
NNSWC Landfill_lower consol - Plan/3D View
NNSWC Landfill_lower consol - Chart View
NNSWC Landfill_lower consol - Chart View
NNSWC Landfill_lower consol - Chart View
Ready
MAX DATATIPS
SNAP
GRID
ORTHO
OSNAP


Settle3 - [NNSWC Landfill_lower consol - Chart View - Registered to Burns & McDonnell]
File Edit Analysis Window Help
Total Settlement
Distance vs. Total Settlement
Query 2
Total Settlement (in)
Distance (ft)
Reference Stage: None
Total Settlement at Depth = 0 ft
Query Line 3 (Stage 1)
Chart Controls
Defaults...
Titles
Chart Title Distance vs. Total Settlement
Footer, Line 1 Total Settlement at Depth = ...
Footer, Line 2 Reference Stage: None
Horizontal Axis Distance (ft)
Vertical Axis Total Settlement (in)
Markers and Lines
Show Point ... Yes
Show Labels No
Show Grid Li... No
Fonts
Title Font Verdana, 18, Bold
Footer Font Verdana, 8
Axes Font Verdana, 12, Bold
Axes Numb... Verdana, 8
Legend Font Verdana, 8
Value Labels... Verdana, 8
Legend
Show Legend Yes
Legend hori... Right outside
Legend vert... Center
Colors
Chart Backg...
Title Text C...
Grid Lines C...
Legend Bac...
Axes Color
Axes Text C...
Label Backg...
Label Text ...
Axes
Logarithmic ... No
Logarithmic ... No
Reverse Ho... No
Reverse Ver... Yes
Swap Axes No
Horizontal M... 0
Horizontal M... 1800
Vertical Mini... 0
Vertical Max... 32
Soil Bands
NNSWC Landfill_lower consol - Plan/3D View
NNSWC Landfill_lower consol - Chart View
NNSWC Landfill_lower consol - Chart View
NNSWC Landfill_lower consol - Chart View
Ready
MAX DATATIPS SNAP GRID ORTHO OSNAP

Settle3 Analysis Information
NNSWC Landfill

Project Settings

Document Name	NNSWC Landfill_lower consol
Project Title	NNSWC Landfill
Author	Textor
Company	Burns & McDonnell
Date Created	9/28/2020, 1:47:46 PM
Stress Computation Method	Boussinesq
Minimum settlement ratio for subgrade modulus	0.9

Use average properties to calculate layered stresses

Improve consolidation accuracy

Ignore negative effective stresses in settlement calculations

Stage Settings

Stage #	Name
1	Stage 1

Results

Time taken to compute: 0.827822 seconds

Stage: Stage 1

Data Type	Minimum	Maximum
Total Settlement [in]	0	34.679
Total Consolidation Settlement [in]	0	34.679
Virgin Consolidation Settlement [in]	0	29.6952
Recompression Consolidation Settlement [in]	0	5.02985
Immediate Settlement [in]	0	0
Loading Stress ZZ [ksf]	-0.149402	11.201
Loading Stress XX [ksf]	-3.32198	21.6191
Loading Stress YY [ksf]	-7.25564	17.1292
Effective Stress ZZ [ksf]	-0.149375	14.18
Effective Stress XX [ksf]	-3.14441	21.6191
Effective Stress YY [ksf]	-7.25564	17.1292
Total Stress ZZ [ksf]	-0.149375	16.4676
Total Stress XX [ksf]	-3.14441	21.6191
Total Stress YY [ksf]	-7.25564	17.1292
Modulus of Subgrade Reaction (Total) [ksf/ft]	-1.05011	240.53
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-1.05011	240.53
Total Strain	-0.0108322	0.12451
Pore Water Pressure [ksf]	0	2.4336
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	5.2	14.1791
Over-consolidation Ratio	1	9589.5
Void Ratio	0.663431	0.920581
Hydroconsolidation Settlement [in]	0	0
Undrained Shear Strength	0	1.38203

Loads

1. Rectangular Load: "Rectangular Load 2"

Length	650 ft
Width	2000 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	1.3e+06 ft^2
Depth	0 ft
Installation Stage	Stage 1

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
187.93	-980.156	11.2
837.93	-980.156	0
837.93	1019.84	0
187.93	1019.84	11.2

2. Rectangular Load: "Rectangular Load 3"

Length	650 ft
Width	2000 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	1.3e+06 ft^2
Depth	0 ft
Installation Stage	Stage 1

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
-1166.41	-981.797	11.2
-516.406	-981.797	0
-516.406	1018.2	0
-1166.41	1018.2	11.2

3. Rectangular Load: "Rectangular Load 4"

Length	700 ft
Width	2000 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	1.4e+06 ft^2
Load	11.2 ksf
Depth	0 ft
Installation Stage	Stage 1

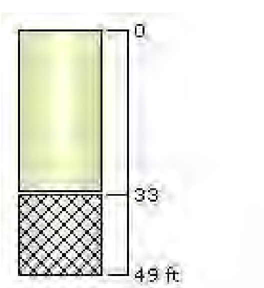
Coordinates

X [ft]	Y [ft]
-512.07	-980.156
187.93	-980.156
187.93	1019.84
-512.07	1019.84

Soil Layers

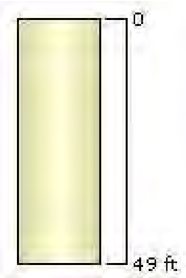
B-1-2020: (822.496, 60.2182)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	33	0



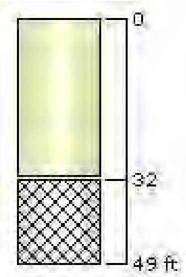
B-8: (441.284, -42.893)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	49	0



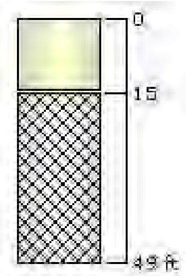
B-7: (-233.341, 22.6781)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	32	0



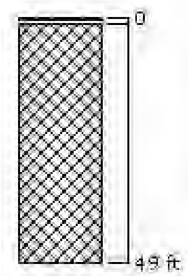
B-2: (-729.306, 264.932)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	15	0



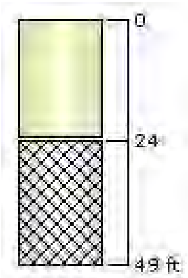
B-2-2020: (-1133.55, -134.67)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	1	0



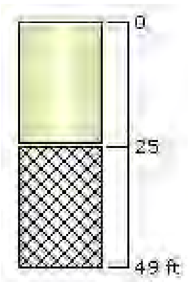
PZ-3S: (459.995, 661.964)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	24	0



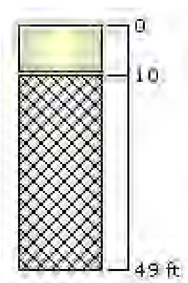
B-5: (-805.35, 800.205)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	25	0



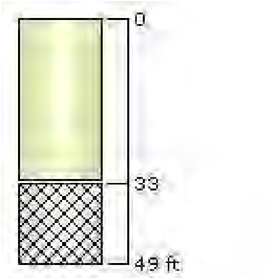
B-10: (-1016.43, -729.047)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	10	0



B-12: (-247.788, -907.933)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	33	0



Soil Properties

Property	Loess
Color	
Unit Weight [kips/ft^3]	0.114
Saturated Unit Weight [kips/ft^3]	0.114
K0	1
Primary Consolidation	Enabled
Material Type	Non-Linear
Cc	0.25
Cr	0.03
e0	0.9
Pc [ksf]	5.2
Undrained Su A [kips/ft2]	0
Undrained Su S	0.2
Undrained Su m	0.8
Piezo Line ID	1

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	0.0624 kips/ft^3

Piezometric Line Entities

ID	Depth (ft)
1	10 ft

Query Lines

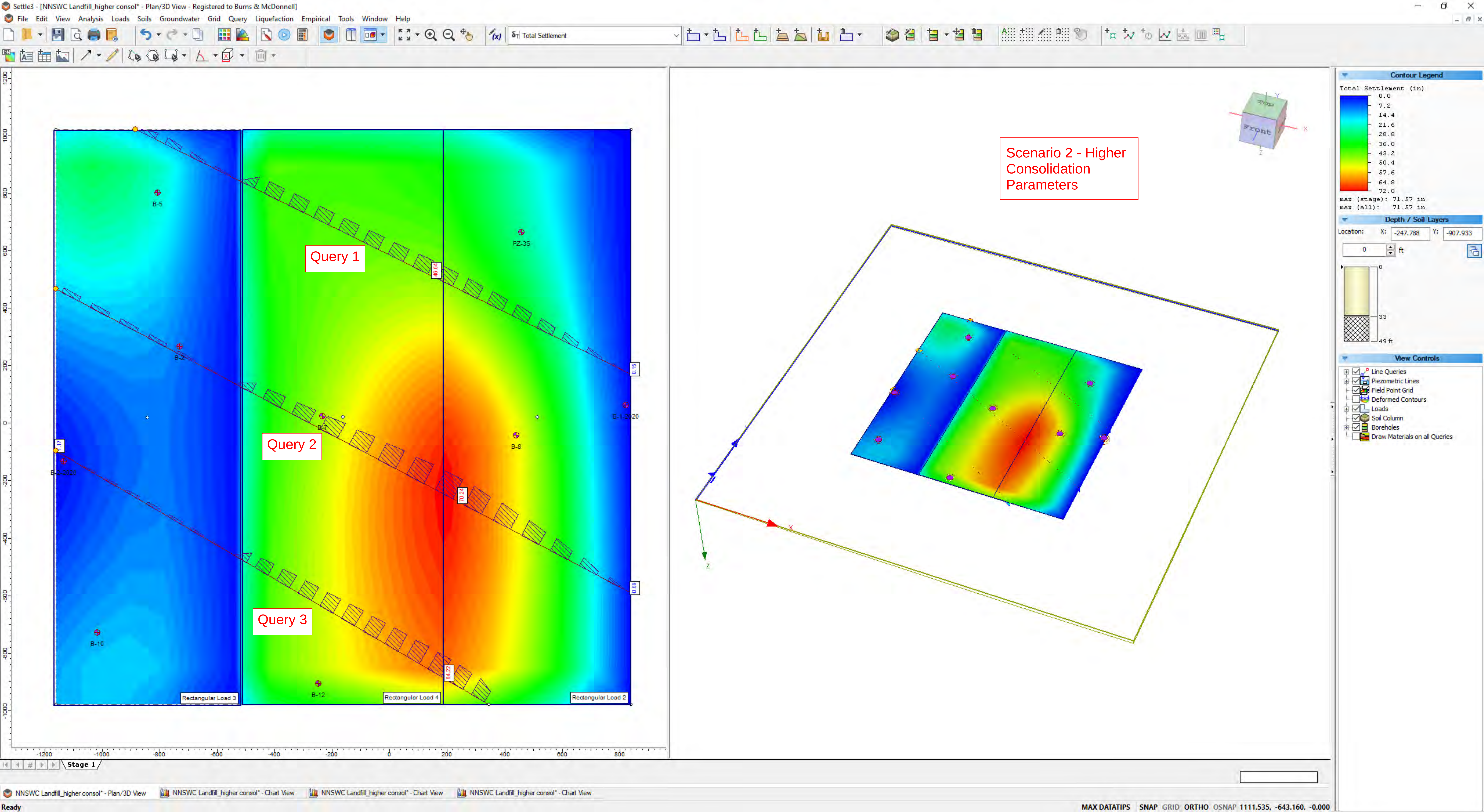
Line #	Query Line Name	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	Query Line 1	-885.244, 1021.43	838.629, 169.144	20	Auto: 49
2	Query Line 2	-1161.37, 465.727	838.629, -591.478	20	Auto: 37
3	Query Line 3	-1161.37, -97.1745	343.454, -978.572	20	Auto: 31

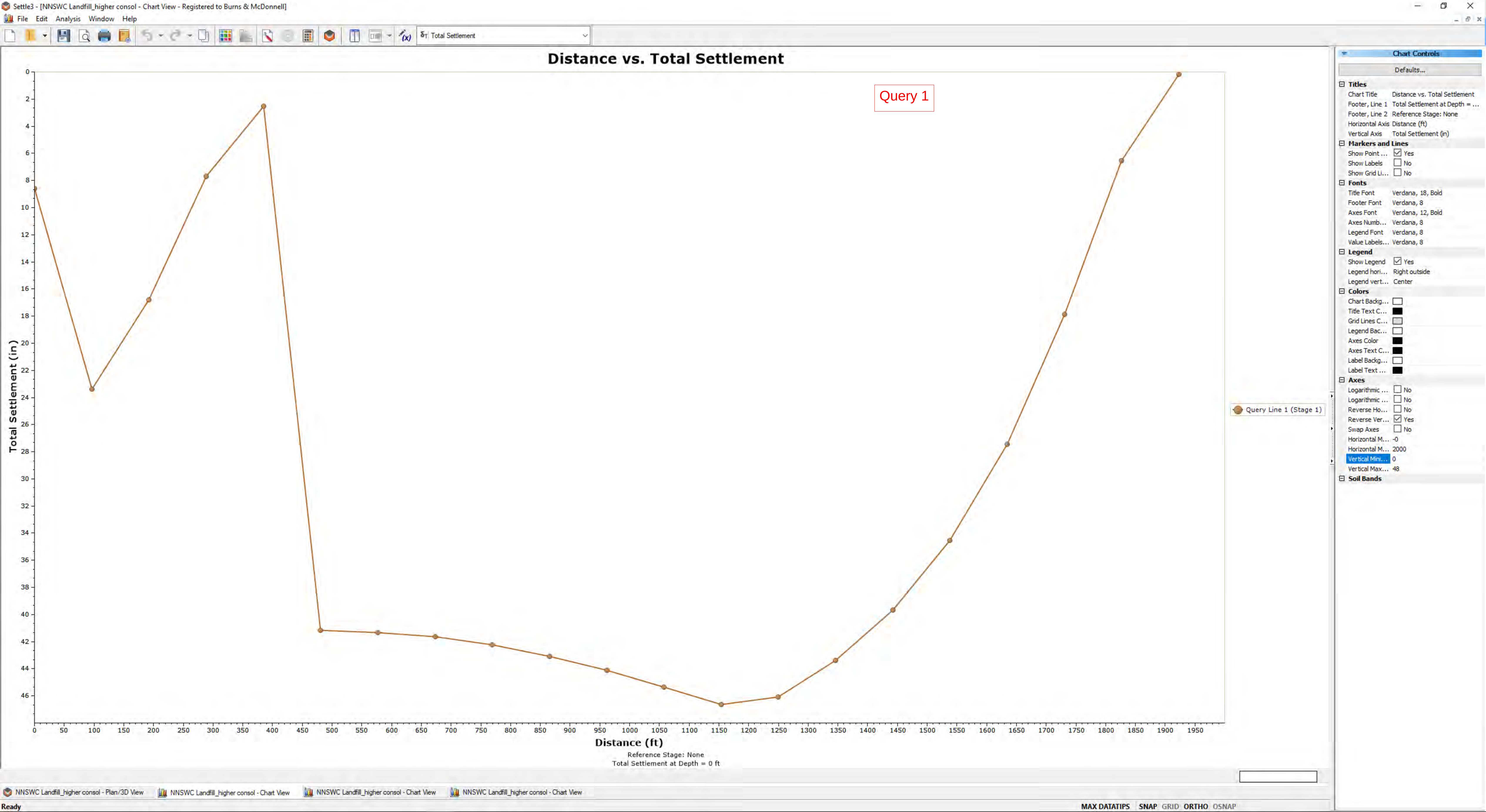
Field Point Grid

Number of points	373
Expansion Factor	1

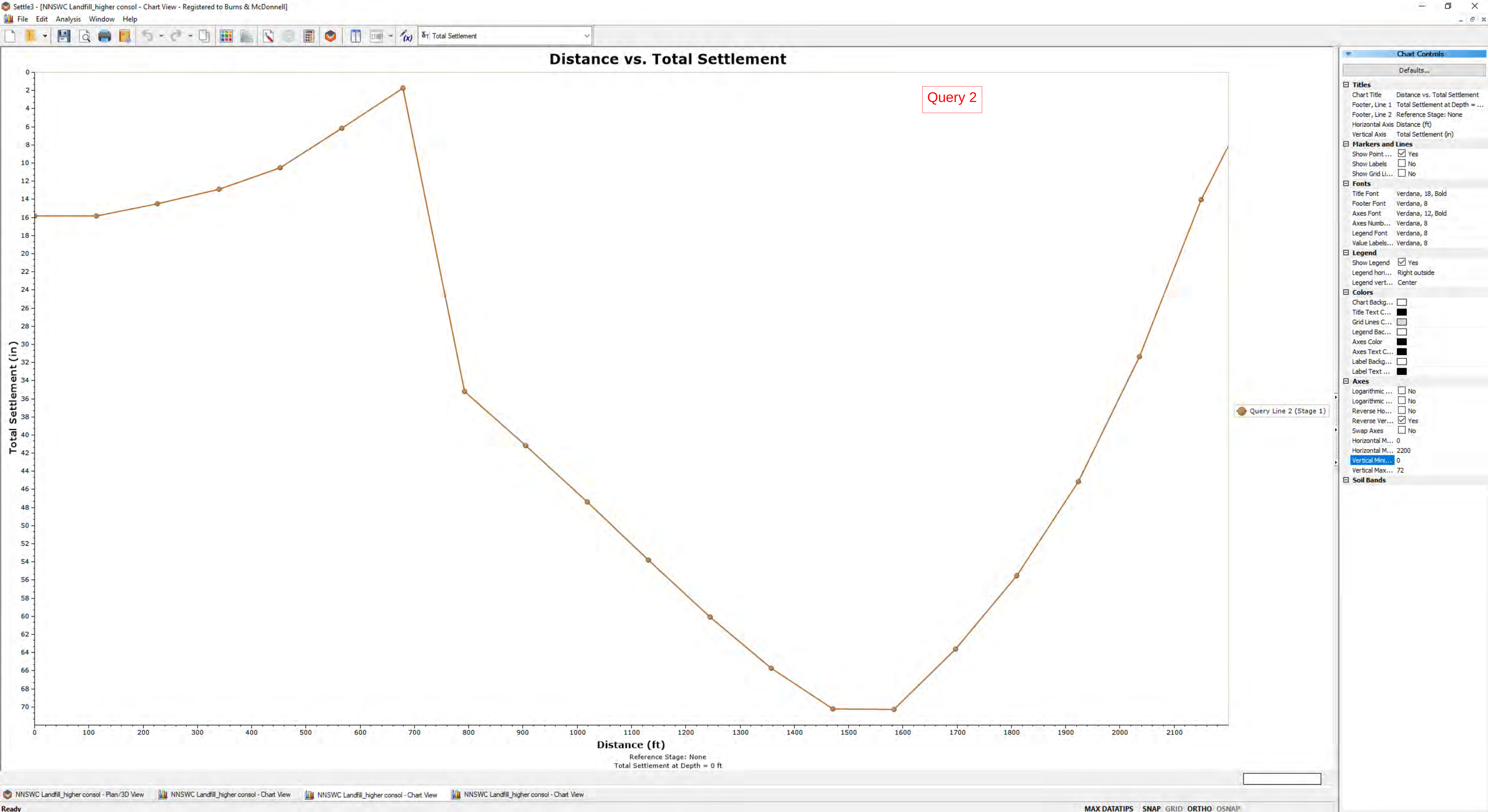
Grid Coordinates

X [ft]	Y [ft]
1837.93	2019.84
1837.93	-1981.8
-2166.41	-1981.8
-2166.41	2019.84


Settle3 - [NNSWC Landfill_higher consol* - Plan/3D View - Registered to Burns & McDonnell]
File Edit View Analysis Loads Soils Groundwater Grid Query Liquefaction Empirical Tools Window Help
Total Settlement
Query 1
Query 2
Query 3
B-5
PZ-3S
B-2
B-7
B-8
B-10
B-12
Rectangular Load 3
Rectangular Load 4
Rectangular Load 2
Scenario 2 - Higher Consolidation Parameters
Contour Legend
Total Settlement (in)
0.0
7.2
14.4
21.6
28.8
36.0
43.2
50.4
57.6
64.8
72.0
max (stage): 71.57 in
max (all): 71.57 in
Depth / Soil Layers
Location: X: -247.788 Y: -907.933
View Controls
Line Queries
Piezometric Lines
Field Point Grid
Deformed Contours
Loads
Soil Column
Boreholes
Draw Materials on all Queries
Stage 1
NNSWC Landfill_higher consol* - Plan/3D View
NNSWC Landfill_higher consol* - Chart View
Ready
MAX DATATIPS SNAP GRID ORTHO OSNAP 1111.535, -643.160, -0.000



Settle3 - [NNSWC Landfill_higher consol - Chart View - Registered to Burns & McDonnell]
File Edit Analysis Window Help
Total Settlement
Distance vs. Total Settlement
Query 1
Total Settlement (in)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950
Distance (ft)
Reference Stage: None
Total Settlement at Depth = 0 ft
Query Line 1 (Stage 1)
Chart Controls
Defaults...
Titles
Chart Title Distance vs. Total Settlement
Footer, Line 1 Total Settlement at Depth = ...
Footer, Line 2 Reference Stage: None
Horizontal Axis Distance (ft)
Vertical Axis Total Settlement (in)
Markers and Lines
Show Point ... Yes
Show Labels No
Show Grid Li... No
Fonts
Title Font Verdana, 18, Bold
Footer Font Verdana, 8
Axes Font Verdana, 12, Bold
Axes Numb... Verdana, 8
Legend Font Verdana, 8
Value Labels... Verdana, 8
Legend
Show Legend Yes
Legend hori... Right outside
Legend vert... Center
Colors
Chart Backg...
Title Text C...
Grid Lines C...
Legend Bac...
Axes Color
Axes Text C...
Label Backg...
Label Text ...
Axes
Logarithmic ... No
Logarithmic ... No
Reverse Ho... No
Reverse Ver... Yes
Swap Axes No
Horizontal M... -0
Horizontal M... 2000
Vertical Mini... 0
Vertical Max... 48
Soil Bands
NNSWC Landfill_higher consol - Plan/3D View
NNSWC Landfill_higher consol - Chart View
NNSWC Landfill_higher consol - Chart View
NNSWC Landfill_higher consol - Chart View
Ready
MAX DATATIPS SNAP GRID ORTHO OSNAP


Settle3 - [NNSWC Landfill_higher consol - Chart View - Registered to Burns & McDonnell]
File Edit Analysis Window Help
Total Settlement
Distance vs. Total Settlement
Query 2
Total Settlement (in)
Distance (ft)
Reference Stage: None
Total Settlement at Depth = 0 ft
Query Line 2 (Stage 1)
Chart Controls
Defaults...
Titles
Chart Title Distance vs. Total Settlement
Footer, Line 1 Total Settlement at Depth = ...
Footer, Line 2 Reference Stage: None
Horizontal Axis Distance (ft)
Vertical Axis Total Settlement (in)
Markers and Lines
Show Point ... Yes
Show Labels No
Show Grid Li... No
Fonts
Title Font Verdana, 18, Bold
Footer Font Verdana, 8
Axes Font Verdana, 12, Bold
Axes Numb... Verdana, 8
Legend Font Verdana, 8
Value Labels... Verdana, 8
Legend
Show Legend Yes
Legend hori... Right outside
Legend vert... Center
Colors
Chart Backg...
Title Text C...
Grid Lines C...
Legend Bac...
Axes Color
Axes Text C...
Label Backg...
Label Text ...
Axes
Logarithmic ... No
Logarithmic ... No
Reverse Ho... No
Reverse Ver... Yes
Swap Axes No
Horizontal M... 0
Horizontal M... 2200
Vertical Mini... 0
Vertical Max... 72
Soil Bands
NNSWC Landfill_higher consol - Plan/3D View
NNSWC Landfill_higher consol - Chart View
NNSWC Landfill_higher consol - Chart View
NNSWC Landfill_higher consol - Chart View
Ready
MAX DATATIPS SNAP GRID ORTHO OSNAP

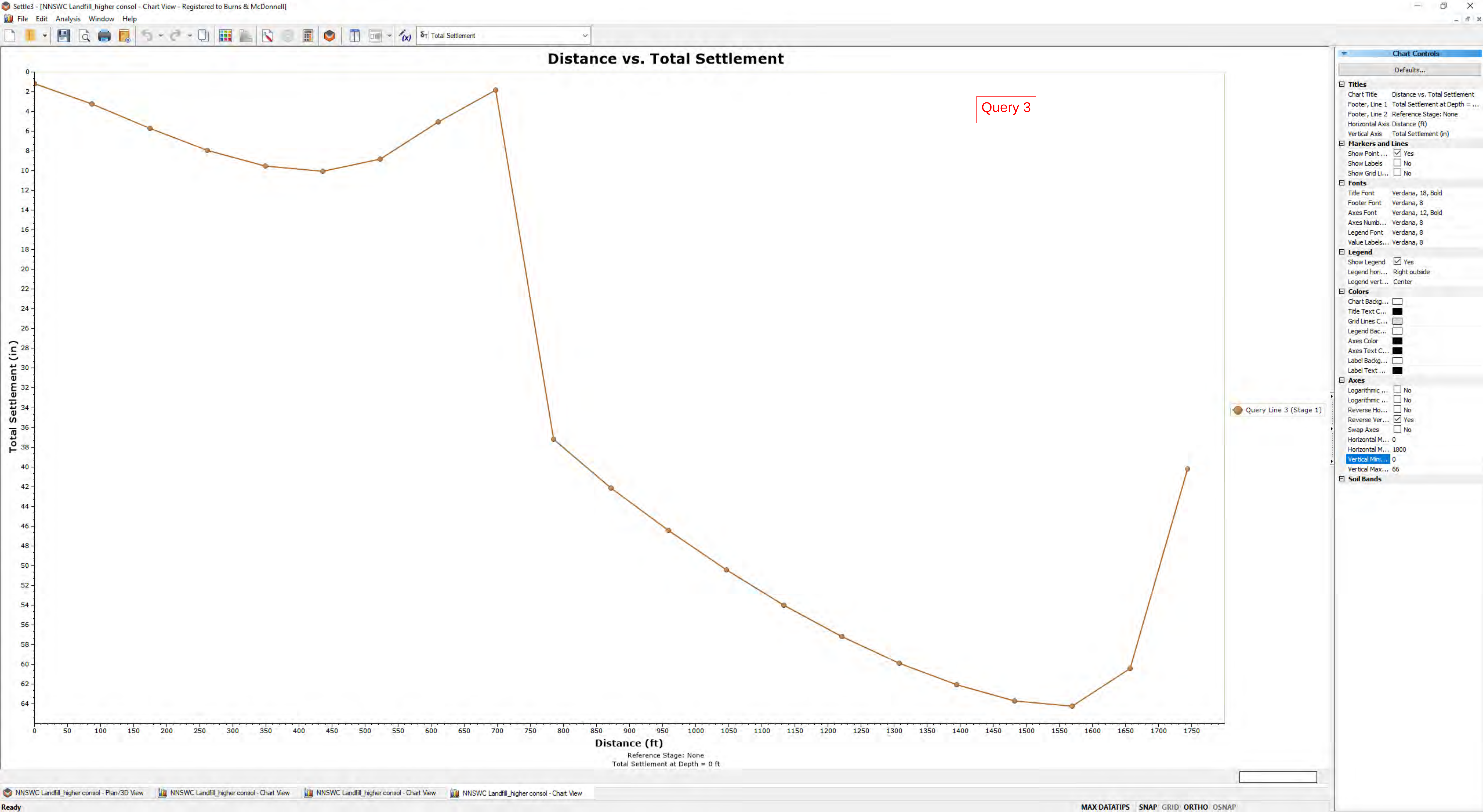

Settle3 - [NNSWC Landfill_higher consol - Chart View - Registered to Burns & McDonnell]
File Edit Analysis Window Help
Total Settlement
Distance vs. Total Settlement
Query 3
Total Settlement (in)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750
Distance (ft)
Reference Stage: None
Total Settlement at Depth = 0 ft
Query Line 3 (Stage 1)
Chart Controls
Defaults...
Titles
Chart Title Distance vs. Total Settlement
Footer, Line 1 Total Settlement at Depth = ...
Footer, Line 2 Reference Stage: None
Horizontal Axis Distance (ft)
Vertical Axis Total Settlement (in)
Markers and Lines
Show Point ... Yes
Show Labels No
Show Grid Li... No
Fonts
Title Font Verdana, 18, Bold
Footer Font Verdana, 8
Axes Font Verdana, 12, Bold
Axes Numb... Verdana, 8
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Chart Backg...
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Label Text ...
Axes
Logarithmic ... No
Logarithmic ... No
Reverse Ho... No
Reverse Ver... Yes
Swap Axes No
Horizontal M... 0
Horizontal M... 1800
Vertical Mini... 0
Vertical Max... 66
Soil Bands
NNSWC Landfill_higher consol - Plan/3D View
NNSWC Landfill_higher consol - Chart View
NNSWC Landfill_higher consol - Chart View
NNSWC Landfill_higher consol - Chart View
Ready
MAX DATATIPS SNAP GRID ORTHO OSNAP

Settle3 Analysis Information
NNSWC Landfill

Project Settings

Document Name	NNSWC Landfill_higher consol
Project Title	NNSWC Landfill
Author	Textor
Company	Burns & McDonnell
Date Created	9/28/2020, 1:47:46 PM
Stress Computation Method	Boussinesq
Minimum settlement ratio for subgrade modulus	0.9

Use average properties to calculate layered stresses

Improve consolidation accuracy

Ignore negative effective stresses in settlement calculations

Stage Settings

Stage #	Name
1	Stage 1

Results

Time taken to compute: 0.80128 seconds

Stage: Stage 1

Data Type	Minimum	Maximum
Total Settlement [in]	0	71.5678
Total Consolidation Settlement [in]	0	71.5678
Virgin Consolidation Settlement [in]	0	68.471
Recompression Consolidation Settlement [in]	0	3.09702
Immediate Settlement [in]	0	0
Loading Stress ZZ [ksf]	-0.149402	11.201
Loading Stress XX [ksf]	-3.32198	21.6191
Loading Stress YY [ksf]	-7.25564	17.1292
Effective Stress ZZ [ksf]	-0.149375	14.18
Effective Stress XX [ksf]	-3.14441	21.6191
Effective Stress YY [ksf]	-7.25564	17.1292
Total Stress ZZ [ksf]	-0.149375	16.4676
Total Stress XX [ksf]	-3.14441	21.6191
Total Stress YY [ksf]	-7.25564	17.1292
Modulus of Subgrade Reaction (Total) [ksf/ft]	-0.787582	125.765
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-0.787582	125.765
Total Strain	-0.014443	0.211389
Pore Water Pressure [ksf]	0	2.4336
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	2.6	14.1791
Over-consolidation Ratio	1	4794.75
Void Ratio	0.498361	0.927442
Hydroconsolidation Settlement [in]	0	0
Undrained Shear Strength	0	0.793766

Loads

1. Rectangular Load: "Rectangular Load 2"

Length	650 ft
Width	2000 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	1.3e+06 ft^2
Depth	0 ft
Installation Stage	Stage 1

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
187.93	-980.156	11.2
837.93	-980.156	0
837.93	1019.84	0
187.93	1019.84	11.2

2. Rectangular Load: "Rectangular Load 3"

Length	650 ft
Width	2000 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	1.3e+06 ft^2
Depth	0 ft
Installation Stage	Stage 1

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
-1166.41	-981.797	11.2
-516.406	-981.797	0
-516.406	1018.2	0
-1166.41	1018.2	11.2

3. Rectangular Load: "Rectangular Load 4"

Length	700 ft
Width	2000 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	1.4e+06 ft^2
Load	11.2 ksf
Depth	0 ft
Installation Stage	Stage 1

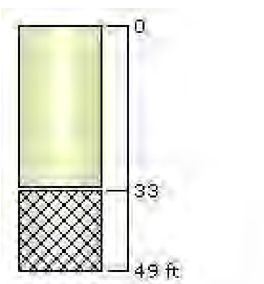
Coordinates

X [ft]	Y [ft]
-512.07	-980.156
187.93	-980.156
187.93	1019.84
-512.07	1019.84

Soil Layers

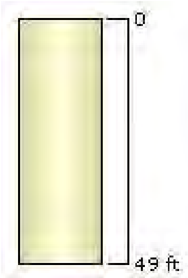
B-1-2020: (822.496, 60.2182)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	33	0



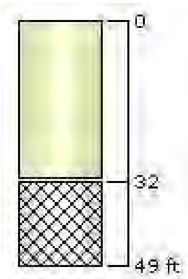
B-8: (441.284, -42.893)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	49	0



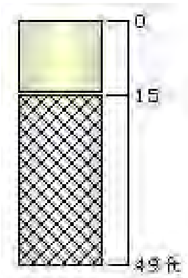
B-7: (-233.341, 22.6781)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	32	0



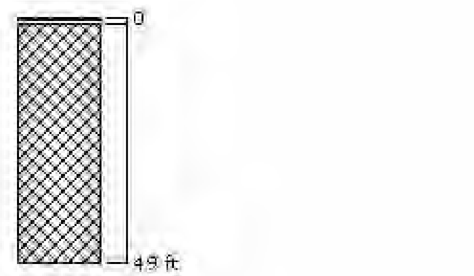
B-2: (-729.306, 264.932)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	15	0



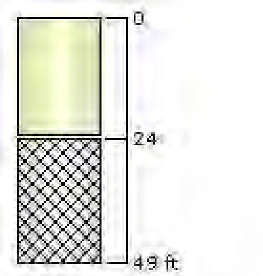
B-2-2020: (-1133.55, -134.67)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	1	0



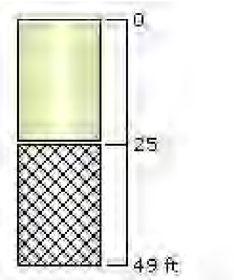
PZ-3S: (459.995, 661.964)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	24	0



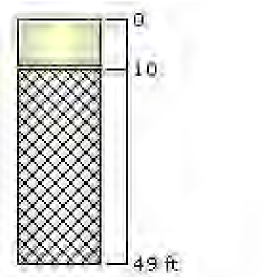
B-5: (-805.35, 800.205)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	25	0



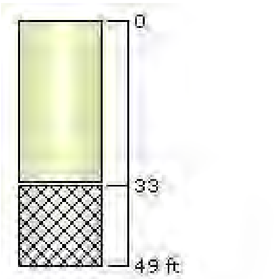
B-10: (-1016.43, -729.047)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	10	0



B-12: (-247.788, -907.933)

Layer #	Type	Thickness [ft]	Depth [ft]
1	Loess	33	0



Soil Properties

Property	Loess
Color	
Unit Weight [kips/ft^3]	0.114
Saturated Unit Weight [kips/ft^3]	0.114
K0	1
Primary Consolidation	Enabled
Material Type	Non-Linear
Cc	0.33
Cr	0.04
e0	0.9
Pc [ksf]	2.6
Undrained Su A [kips/ft2]	0
Undrained Su S	0.2
Undrained Su m	0.8
Piezo Line ID	1

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	0.0624 kips/ft^3

Piezometric Line Entities

ID	Depth (ft)
1	10 ft

Query Lines

Line #	Query Line Name	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	Query Line 1	-885.244, 1021.43	838.629, 169.144	20	Auto: 49
2	Query Line 2	-1161.37, 465.727	838.629, -591.478	20	Auto: 37
3	Query Line 3	-1161.37, -97.1745	343.454, -978.572	20	Auto: 31

Field Point Grid

Number of points	373
Expansion Factor	1

Grid Coordinates

X [ft]	Y [ft]
1837.93	2019.84
1837.93	-1981.8
-2166.41	-1981.8
-2166.41	2019.84

Lower Consolidation

Query 1

Station	Original EL (ft)	Settlement (in)	Settlement (ft)	Final EL (ft)	Slope	
0	650	22	1.83	648.17		
100	648	22	1.83	646.17	-0.020	
200	646	22	1.83	644.17	-0.020	
300	644	21	1.75	642.25	-0.019	
400	642	18	1.50	640.50	-0.018	
500	640	15	1.25	638.75	-0.018	
600	638	11	0.92	637.08	-0.017	
700	636	6	0.50	635.50	-0.016	
800	634	4	0.33	633.67	-0.018	
900	632	1	0.08	631.92	-0.018	-0.018

Query 2

Station	Original EL (ft)	Settlement (in)	Settlement (ft)	Final EL (ft)	Slope	
0	650	24	2.00	648.00		
100	648	26	2.17	645.83	-0.022	
200	646	29	2.42	643.58	-0.023	
300	644	32	2.67	641.33	-0.023	
400	642	34	2.83	639.17	-0.022	
500	640	35	2.92	637.08	-0.021	
600	638	34	2.83	635.17	-0.019	
700	636	30	2.50	633.50	-0.017	
800	634	23	1.92	632.08	-0.014	
900	632	18	1.50	630.50	-0.016	
1000	630	12	1.00	629.00	-0.015	-0.019

Query 3

Station	Original EL (ft)	Settlement (in)	Settlement (ft)	Final EL (ft)	Slope	
0	650	23	1.92	648.08		
100	648	26	2.17	645.83	-0.023	
200	646	27	2.25	643.75	-0.021	
300	644	29	2.42	641.58	-0.022	
400	642	30	2.50	639.50	-0.021	
500	640	31	2.58	637.42	-0.021	
600	638	30	2.50	635.50	-0.019	
700	636	24	2.00	634.00	-0.015	-0.020

Higher Consolidation

Query 1

Station	Original EL (ft)	Settlement (in)	Settlement (ft)	Final EL (ft)	Slope	
0	650	45	3.75	646.25		
100	648	46	3.83	644.17	-0.021	
200	646	46	3.83	642.17	-0.020	
300	644	44	3.67	640.33	-0.018	
400	642	42	3.50	638.50	-0.018	
500	640	38	3.17	636.83	-0.017	
600	638	31	2.58	635.42	-0.014	
700	636	23	1.92	634.08	-0.013	
800	634	15	1.25	632.75	-0.013	
900	632	4	0.33	631.67	-0.011	-0.016

Station	Original EL (ft)	Settlement (in)	Settlement (ft)	Final EL (ft)	Slope	
0	650	46	3.83	646.17		
100	648	52	4.33	643.67	-0.025	
200	646	58	4.83	641.17	-0.025	
300	644	64	5.33	638.67	-0.025	
400	642	68	5.67	636.33	-0.023	
500	640	70	5.83	634.17	-0.022	
600	638	70	5.83	632.17	-0.020	
700	636	62	5.17	630.83	-0.013	
800	634	57	4.75	629.25	-0.016	
900	632	49	4.08	627.92	-0.013	
1000	630	36	3.00	627.00	-0.009	-0.019

Query 3

Station	Original EL (ft)	Settlement (in)	Settlement (ft)	Final EL (ft)	Slope	
0	650	50	4.17	645.83		
100	648	54	4.50	643.50	-0.023	
200	646	57	4.75	641.25	-0.023	
300	644	60	5.00	639.00	-0.023	
400	642	62	5.17	636.83	-0.022	
500	640	64	5.33	634.67	-0.022	
600	638	62	5.17	632.83	-0.018	
700	636	54	4.50	631.50	-0.013	-0.020

APPENDIX G – LANDFILL VOLUME AND SOIL CALCULATIONS

ATTACHMENT 1 4/9/2021
Northeast Nebraska Solid Waste Coalition by:PRF
Remaining Airspace Projections w/ Expansion - No Waste Change ck:LAR

MSW/Industrial Tonnage (Assumed) =	112,000	tons	Remaining Area Capacity	
Predicted Future Generation Growth =	1.00%		Area 1/2/3/4/5	2,210,000
Aispace Utilization Factor (AUF) =	1,296	lb/cy	Area 6 PH 1	2,060,000
Ultimate Capacity without final cover and protective soil layer (waste + soil) =	17,530,000	cy	Area 6 PH 2	4,180,000
			Area 7	3,900,000
			Area 8	970,000
			Total	13,320,000

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (cy)	Waste Remaining Expansion Ultimate Capacity (cy)	Year End Remaining Cell Capacity	Active Area
2021	112,000	172,840	13,147,160	2,037,160	Area 1/2/3/4/5
2022	113,120	174,568	12,972,593	1,862,593	
2023	114,251	176,314	12,796,279	1,686,279	
2024	115,394	178,077	12,618,202	3,568,202	Area 6 PH 1
2025	116,548	179,857	12,438,345	3,388,345	
2026	117,713	181,656	12,256,689	3,206,689	
2027	118,890	183,473	12,073,216	3,023,216	
2028	120,079	185,307	11,887,909	2,837,909	
2029	121,280	187,160	11,700,748	2,650,748	
2030	122,493	189,032	11,511,716	2,461,716	
2031	123,718	190,922	11,320,794	2,270,794	
2032	124,955	192,832	11,127,962	2,077,962	
2033	126,204	194,760	10,933,203	1,883,203	
2034	127,466	196,707	10,736,495	1,686,495	
2035	128,741	198,675	10,537,821	1,487,821	
2036	130,029	200,661	10,337,159	1,287,159	
2037	131,329	202,668	10,134,491	1,084,491	
2038	132,642	204,695	9,929,797	879,797	
2039	133,969	206,742	9,723,055	673,055	
2040	135,308	208,809	9,514,246	464,246	
2041	136,661	210,897	9,303,349	253,349	
2042	138,028	213,006	9,090,343	40,343	
2043	139,408	215,136	8,875,207	4,005,207	Area 6 PH 2
2044	140,802	217,287	8,657,920	3,787,920	
2045	142,210	219,460	8,438,459	3,568,459	
2046	143,632	221,655	8,216,804	3,346,804	
2047	145,069	223,871	7,992,933	3,122,933	
2048	146,519	226,110	7,766,823	2,896,823	
2049	147,985	228,371	7,538,452	2,668,452	
2050	149,464	230,655	7,307,797	2,437,797	
2051	150,959	232,962	7,074,835	2,204,835	
2052	152,469	235,291	6,839,544	1,969,544	
2053	153,993	237,644	6,601,900	1,731,900	
2054	155,533	240,021	6,361,879	1,491,879	
2055	157,089	242,421	6,119,459	1,249,459	
2056	158,660	244,845	5,874,614	1,004,614	
2057	160,246	247,293	5,627,320	757,320	
2058	161,849	249,766	5,377,554	507,554	
2059	163,467	252,264	5,125,290	255,290	
2060	165,102	254,787	4,870,503	503	
2061	166,753	257,334	4,613,169	3,643,169	Area 7
2062	168,420	259,908	4,353,261	3,383,261	
2063	170,104	262,507	4,090,754	3,120,754	
2064	171,806	265,132	3,825,622	2,855,622	
2065	173,524	267,783	3,557,839	2,587,839	

2066	175,259	270,461	3,287,378	2,317,378	
2067	177,011	273,166	3,014,212	2,044,212	
2068	178,782	275,897	2,738,315	1,768,315	
2069	180,569	278,656	2,459,658	1,489,658	
2070	182,375	281,443	2,178,215	1,208,215	
2071	184,199	284,257	1,893,958	923,958	
2072	186,041	287,100	1,606,858	636,858	
2073	187,901	289,971	1,316,887	346,887	
2074	189,780	292,871	1,024,017	54,017	
2075	191,678	295,799	728,217	728,217	Area 8
2076	193,595	298,757	429,460	429,460	
2077	195,531	301,745	127,715	127,715	
2078	197,486	304,762	-177,047	-177,047	Life Depleted May 2078
2079	199,461	307,810	-484,857	-484,857	
2080	201,455	310,888	-795,745	-795,745	

ATTACHMENT 2
Northeast Nebraska Solid Waste Coalition
Remaining Airspace Projections w/ Expansion - 20% Waste Decrease

4/9/2021
by:PRF
ck:LAR

MSW/Industrial Tonnage (Assumed) =	89,600	tons
Predicted Future Generation Growth =	1.00%	
Aispace Utilization Factor (AUF) =	1,296	lb/cy
Ultimate Capacity without final cover and protective soil layer (waste + soil) =	17,530,000	cy

Remaining Area Capacity	
Area 1/2/3/4/5	2,210,000
Area 6 PH 1	2,060,000
Area 6 PH 2	4,180,000
Area 7	3,900,000
Area 8	970,000
Total	13,320,000

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (cy)	Waste Remaining Expansion Ultimate Capacity (cy)	Year End Remaining Cell Capacity	Active Area
2021	89,600	138,272	13,181,728	2,071,728	Area 1/2/3/4/5
2022	90,496	139,654	13,042,074	1,932,074	
2023	91,401	141,051	12,901,023	1,791,023	
2024	92,315	142,461	12,758,562	3,708,562	Area 6 PH 1
2025	93,238	143,886	12,614,676	3,564,676	
2026	94,171	145,325	12,469,351	3,419,351	
2027	95,112	146,778	12,322,573	3,272,573	
2028	96,063	148,246	12,174,327	3,124,327	
2029	97,024	149,728	12,024,599	2,974,599	
2030	97,994	151,226	11,873,373	2,823,373	
2031	98,974	152,738	11,720,635	2,670,635	
2032	99,964	154,265	11,566,370	2,516,370	
2033	100,964	155,808	11,410,562	2,360,562	
2034	101,973	157,366	11,253,196	2,203,196	
2035	102,993	158,940	11,094,256	2,044,256	
2036	104,023	160,529	10,933,727	1,883,727	
2037	105,063	162,134	10,771,593	1,721,593	
2038	106,114	163,756	10,607,837	1,557,837	
2039	107,175	165,393	10,442,444	1,392,444	
2040	108,247	167,047	10,275,397	1,225,397	
2041	109,329	168,718	10,106,679	1,056,679	
2042	110,422	170,405	9,936,275	886,275	
2043	111,527	172,109	9,764,166	714,166	
2044	112,642	173,830	9,590,336	540,336	
2045	113,768	175,568	9,414,767	364,767	
2046	114,906	177,324	9,237,444	187,444	
2047	116,055	179,097	9,058,346	8,346	
2048	117,216	180,888	8,877,458	4,007,458	Area 6 PH 2
2049	118,388	182,697	8,694,761	3,824,761	
2050	119,572	184,524	8,510,237	3,640,237	
2051	120,767	186,369	8,323,868	3,453,868	
2052	121,975	188,233	8,135,635	3,265,635	
2053	123,195	190,115	7,945,520	3,075,520	
2054	124,427	192,016	7,753,503	2,883,503	
2055	125,671	193,937	7,559,567	2,689,567	
2056	126,928	195,876	7,363,691	2,493,691	
2057	128,197	197,835	7,165,856	2,295,856	
2058	129,479	199,813	6,966,043	2,096,043	
2059	130,774	201,811	6,764,232	1,894,232	
2060	132,081	203,829	6,560,403	1,690,403	
2061	133,402	205,868	6,354,535	1,484,535	
2062	134,736	207,926	6,146,609	1,276,609	
2063	136,084	210,006	5,936,603	1,066,603	
2064	137,444	212,106	5,724,498	854,498	
2065	138,819	214,227	5,510,271	640,271	

2066	140,207	216,369	5,293,902	423,902	
2067	141,609	218,533	5,075,370	205,370	
2068	143,025	220,718	4,854,652	3,884,652	Area 7
2069	144,455	222,925	4,631,727	3,661,727	
2070	145,900	225,154	4,406,572	3,436,572	
2071	147,359	227,406	4,179,166	3,209,166	
2072	148,833	229,680	3,949,487	2,979,487	
2073	150,321	231,977	3,717,510	2,747,510	
2074	151,824	234,297	3,483,213	2,513,213	
2075	153,342	236,639	3,246,574	2,276,574	
2076	154,876	239,006	3,007,568	2,037,568	
2077	156,425	241,396	2,766,172	1,796,172	
2078	157,989	243,810	2,522,362	1,552,362	
2079	159,569	246,248	2,276,114	1,306,114	
2080	161,164	248,710	2,027,404	1,057,404	
2081	162,776	251,198	1,776,206	806,206	
2082	164,404	253,710	1,522,497	552,497	
2083	166,048	256,247	1,266,250	296,250	
2084	167,708	258,809	1,007,441	37,441	
2085	169,385	261,397	746,044	746,044	Area 8
2086	171,079	264,011	482,032	482,032	
2087	172,790	266,651	215,381	215,381	
2088	174,518	269,318	-53,937	-53,937	Life Depleted October 2088
2089	176,263	272,011	-325,948	-325,948	
2090	178,026	274,731	-600,679	-600,679	

ATTACHMENT 3
Northeast Nebraska Solid Waste Coalition
Remaining Airspace Projections w/ Expansion - 20% Waste Increase

4/9/2021
by:PRF
ck:LAR

MSW/Industrial Tonnage (Assumed) =	134,400	tons
Predicted Future Generation Growth =	1.00%	
Aispace Utilization Factor (AUF) =	1,296	lb/cy
Ultimate Capacity without final cover and protective soil layer (waste + soil) =	17,530,000	cy

Remaining Area Capacity	
Area 1/2/3/4/5	2,210,000
Area 6 PH 1	2,060,000
Area 6 PH 2	4,180,000
Area 7	3,900,000
Area 8	970,000
Total	13,320,000

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (cy)	Waste Remaining Expansion Ultimate Capacity (cy)	Year End Remaining Cell Capacity	Active Area
2021	134,400	207,407	13,112,593	2,002,593	Area 1/2/3/4/5
2022	135,744	209,481	12,903,111	1,793,111	
2023	137,101	211,576	12,691,535	1,581,535	
2024	138,472	213,692	12,477,843	3,427,843	Area 6 PH 1
2025	139,857	215,829	12,262,014	3,212,014	
2026	141,256	217,987	12,044,027	2,994,027	
2027	142,668	220,167	11,823,859	2,773,859	
2028	144,095	222,369	11,601,491	2,551,491	
2029	145,536	224,593	11,376,898	2,326,898	
2030	146,991	226,838	11,150,060	2,100,060	
2031	148,461	229,107	10,920,953	1,870,953	
2032	149,946	231,398	10,689,555	1,639,555	
2033	151,445	233,712	10,455,843	1,405,843	
2034	152,960	236,049	10,219,794	1,169,794	
2035	154,489	238,409	9,981,385	931,385	
2036	156,034	240,794	9,740,591	690,591	
2037	157,595	243,201	9,497,390	447,390	
2038	159,171	245,634	9,251,756	201,756	
2039	160,762	248,090	9,003,666	4,133,666	Area 6 PH 2
2040	162,370	250,571	8,753,095	3,883,095	
2041	163,994	253,076	8,500,019	3,630,019	
2042	165,633	255,607	8,244,412	3,374,412	
2043	167,290	258,163	7,986,249	3,116,249	
2044	168,963	260,745	7,725,504	2,855,504	
2045	170,652	263,352	7,462,151	2,592,151	
2046	172,359	265,986	7,196,165	2,326,165	
2047	174,082	268,646	6,927,520	2,057,520	
2048	175,823	271,332	6,656,187	1,786,187	
2049	177,582	274,046	6,382,142	1,512,142	
2050	179,357	276,786	6,105,356	1,235,356	
2051	181,151	279,554	5,825,802	955,802	
2052	182,962	282,349	5,543,453	673,453	
2053	184,792	285,173	5,258,280	388,280	
2054	186,640	288,025	4,970,255	100,255	
2055	188,506	290,905	4,679,350	3,709,350	Area 7
2056	190,391	293,814	4,385,536	3,415,536	
2057	192,295	296,752	4,088,784	3,118,784	
2058	194,218	299,720	3,789,065	2,819,065	
2059	196,160	302,717	3,486,348	2,516,348	
2060	198,122	305,744	3,180,604	2,210,604	
2061	200,103	308,801	2,871,803	1,901,803	
2062	202,104	311,889	2,559,913	1,589,913	
2063	204,125	315,008	2,244,905	1,274,905	
2064	206,167	318,158	1,926,747	956,747	
2065	208,228	321,340	1,605,407	635,407	

2066	210,311	324,553	1,280,853	310,853	
2067	212,414	327,799	953,055	953,055	Area 8
2068	214,538	331,077	621,978	621,978	
2069	216,683	334,388	287,590	287,590	
2070	218,850	337,732	-50,141	-50,141	Life Depleted November 2070
2071	221,039	341,109	-391,250	-391,250	
2072	223,249	344,520	-735,770	-735,770	

ATTACHMENT 4
Northeast Nebraska Solid Waste Coalition
Expansion Soil Balance Calculations

4/9/2021
by:PRF
ck:LAR

Available Soil		
NW Borrow Soil Volume (from surface)	309,481	CY
Soil Volume to be Excavated from Area 6 thru 8	1,839,091	CY
Total Available Soil =	**2,148,571**	**CY**

Net Fill Volume Total - cy

Soil Required		
Remaining Fill Volume (Areas 1-8)	13,320,000	CY
Remaining Daily and Intermediate Cover to be Placed (4:1 waste:soil ratio)	**2,648,111.33**	CY
Final Cover Volume (includes sand layer)	**576,145**	CY
Final Cover Placed to Date	0	CY
Sand Layer Final Cover Volume (to be imported)	**-82,306**	CY
Protective Cover Remaining to be Placed (Area 6 thru Area 8)	**117,939**	CY
Total Soil Required =	**3,259,889**	**CY**

Total Soil Available =	2,148,571	CY
Total Soil Required for life of Landfill =	3,259,889	CY
Total Site Soil Balance =	**(1,111,318)**	**CY**

ATTACHMENT 5
Northeast Nebraska Solid Waste Coalition
Remaining Soil Projections w/ Expansion - No Waste Change

4/9/2021
by:PRF
ck:LAR

MSW/Industrial Tonnage (Assumed) = 112,000 tons
Predicted Future Generation Growth = 1.00%
Aispace Utilization Factor (AUF) = 1,296 lb/cy

[3]Remaining Final Cover Soil (CY)	
Area 1-6 PH1	125,862
Area 6 PH 2	110,473
Area 7	164,832
Area 8	92,671
Total	493,839

[2]Remaining Protective Cover Soil (CY)	
Area 1/2/3/4/5	0
Area 6 PH 1	22,514
Area 6 PH 2	46,276
Area 7	33,830
Area 8	15,319
Total	117,939

Remaining Available Soil (CY)	
NW Borrow	309,481
Area 1/2/3/4/5	0
Area 6 PH 1	187,578
Area 6 PH 2	788,070
Area 7	764,895
Area 8	98,547
Total	2,148,571

1. Required daily and intermediate cover assumes a 4:1 waste:soil ratio.
2. Protective cover to be placed at the time of construction of the new Area. Reference remaining airspace projection calculations for Area construction timing details.
3. Final cover placement is sequenced to match construction of the new Area to maximize the usage of excavated soils.

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (CY)	Daily and Int. Cover Placed (CY)[1]	Final Cover Placed (CY)[3]	Protective Cover Placed (CY)[2]	Ultimate Remaining Available Soil	Year End Remaining Available Soil	Borrow Source
2021	112,000	172,840	34,362			2,114,209	153,216	Area 6 PH 1 Excavation
2022	113,120	174,568	34,705			2,079,504	118,511	
2023	114,251	176,314	35,052		22,514	2,021,937	60,944	Stockpile Remaining Area 6 PH 1 Excavation at NW Borrow
2024	115,394	178,077	35,403			1,986,534	335,022	NW Borrow
2025	116,548	179,857	35,757			1,950,777	299,265	
2026	117,713	181,656	36,115			1,914,663	263,150	
2027	118,890	183,473	36,476			1,878,187	226,674	
2028	120,079	185,307	36,840			1,841,347	189,834	
2029	121,280	187,160	37,209			1,804,138	152,625	
2030	122,493	189,032	37,581			1,766,557	115,044	
2031	123,718	190,922	37,957			1,728,600	77,087	
2032	124,955	192,832	38,336			1,690,264	38,751	
2033	126,204	194,760	38,720			1,651,544	788,102	Area 6 PH 2 Excavation
2034	127,466	196,707	39,107			1,612,437	748,995	
2035	128,741	198,675	39,498			1,572,939	709,497	
2036	130,029	200,661	39,893			1,533,047	669,604	
2037	131,329	202,668	40,292			1,492,755	629,312	
2038	132,642	204,695	40,695			1,452,060	588,618	

2039	133,969	206,742	41,102			1,410,958	547,516	
2040	135,308	208,809	41,513			1,369,446	506,003	
2041	136,661	210,897	41,928			1,327,518	464,075	
2042	138,028	213,006	42,347	125,862	46,276	1,113,033	249,590	Stockpile Remaining Area 6 PH 2 Excavation Off-Site
2043	139,408	215,136	42,771			1,070,262	722,125	Area 7 Excavation
2044	140,802	217,287	43,198			1,027,064	678,926	
2045	142,210	219,460	43,630			983,433	635,296	
2046	143,632	221,655	44,067			939,367	591,230	
2047	145,069	223,871	44,507			894,860	546,722	
2048	146,519	226,110	44,952			849,907	501,770	
2049	147,985	228,371	45,402			804,505	456,368	
2050	149,464	230,655	45,856			758,650	410,512	
2051	150,959	232,962	46,314			712,335	364,198	
2052	152,469	235,291	46,778			665,558	317,420	
2053	153,993	237,644	47,245			618,312	270,175	
2054	155,533	240,021	47,718			570,594	222,457	
2055	157,089	242,421	48,195			522,399	174,262	
2056	158,660	244,845	48,677			473,723	125,585	
2057	160,246	247,293	49,164			424,559	76,422	
2058	161,849	249,766	49,655			374,904	26,766	
2059	163,467	252,264	50,152			324,752	226,205	Area 6 PH 2 Excavation Stockpile
2060	165,102	254,787	50,653	110,473	33,830	129,795	31,248	
2061	166,753	257,334	51,160			78,635	78,635	Area 8 Excavation
2062	168,420	259,908	51,672			26,964	26,964	
2063	170,104	262,507	52,188			-25,225	-25,225	Soil Depleted July 2063
2064	171,806	265,132	52,710			-77,935	-77,935	
2065	173,524	267,783	53,237			-131,172	-131,172	
2066	175,259	270,461	53,770			-184,941	-184,941	
2067	177,011	273,166	54,307			-239,249	-239,249	
2068	178,782	275,897	54,850			-294,099	-294,099	
2069	180,569	278,656	55,399			-349,498	-349,498	
2070	182,375	281,443	55,953			-405,451	-405,451	
2071	184,199	284,257	56,512			-461,963	-461,963	
2072	186,041	287,100	57,078			-519,041	-519,041	
2073	187,901	289,971	57,648			-576,689	-576,689	
2074	189,780	292,871	58,225	164,832	15,319	-815,065	-815,065	
2075	191,678	295,799	58,807			-873,872	-873,872	
2076	193,595	298,757	59,395			-933,267	-933,267	
2077	195,531	301,745	59,989			-993,256	-993,256	
2078	197,486	304,762	25,391	92,671		-1,111,318	-1,111,318	Life Depleted May 2078

ATTACHMENT 6
Northeast Nebraska Solid Waste Coalition
Remaining Soil Projections w/ Expansion - 20% Waste Decrease

4/9/2021
by:PRF
ck:LAR

MSW/Industrial Tonnage (Assumed) = 89,600 tons
Predicted Future Generation Growth = 1.00%
Aispace Utilization Factor (AUF) = 1,296 lb/cy

Remaining Final Cover Soil (CY)[3]	
Area 1-6 PH1	125,862
Area 6 PH 2	110,473
Area 7	164,832
Area 8	92,671
Total	493,839

Remaining Protective Cover Soil (CY)[2]	
Area 1/2/3/4/5	0
Area 6 PH 1	22,514
Area 6 PH 2	46,276
Area 7	33,830
Area 8	15,319
Total	117,939

Remaining Available Soil	
NW Borrow	309,481
Area 1/2/3/4/5	0
Area 6 PH 1	187,578
Area 6 PH 2	788,070
Area 7	764,895
Area 8	98,547
Total	2,148,571

1. Required daily and intermediate cover assumes a 4:1 waste:soil ratio.
2. Protective cover to be placed at the time of construction of the new Area. Reference remaining airspace projection calculations for Area construction timing details.
3. Final cover placement is sequenced to match construction of the new Area to maximize the usage of excavated soils.

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (CY)	Daily and Int. Cover Placed (CY)[1]	Final Cover Placed (CY)[3]	Protective Cover Placed (CY)[2]	Ultimate Remaining Available Soil	Year End Remaining Available Soil	Borrow Source
2021	89,600	138,272	27,489			2,121,082	160,088	Area 6 PH 1 Excavation
2022	90,496	139,654	27,764			2,093,317	132,324	
2023	91,401	141,051	28,042		22,514	2,042,761	81,768	Stockpile Remaining Area 6 PH 1 Excavation at NW Borrow
2024	92,315	142,461	28,322			2,014,439	362,926	NW Borrow
2025	93,238	143,886	28,606			1,985,833	334,320	
2026	94,171	145,325	28,892			1,956,942	305,429	
2027	95,112	146,778	29,181			1,927,761	276,248	
2028	96,063	148,246	29,472			1,898,289	246,776	
2029	97,024	149,728	29,767			1,868,522	217,009	
2030	97,994	151,226	30,065			1,838,457	186,944	
2031	98,974	152,738	30,365			1,808,092	156,579	
2032	99,964	154,265	30,669			1,777,422	125,910	
2033	100,964	155,808	30,976			1,746,447	94,934	
2034	101,973	157,366	31,285			1,715,161	63,649	
2035	102,993	158,940	31,598			1,683,563	32,050	
2036	104,023	160,529	31,914			1,651,649	788,206	Area 6 PH 2 Excavation
2037	105,063	162,134	32,233			1,619,415	755,973	
2038	106,114	163,756	32,556			1,586,859	723,417	

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2039	107,175	165,393	32,881			1,553,978	690,536	
2040	108,247	167,047	33,210			1,520,768	657,325	
2041	109,329	168,718	33,542			1,487,226	623,783	
2042	110,422	170,405	33,878			1,453,348	589,905	
2043	111,527	172,109	34,216			1,419,131	555,689	
2044	112,642	173,830	34,559			1,384,573	521,130	
2045	113,768	175,568	34,904			1,349,669	486,226	
2046	114,906	177,324	35,253			1,314,415	450,973	
2047	116,055	179,097	35,606	125,862	46,276	1,106,671	243,229	Stockpile Remaining Area 6 PH 2 Excavation Off-Site
2048	117,216	180,888	35,962			1,070,710	728,933	Area 7 Excavation
2049	118,388	182,697	36,321			1,034,388	692,612	
2050	119,572	184,524	36,685			997,703	655,927	
2051	120,767	186,369	37,052			960,652	618,876	
2052	121,975	188,233	37,422			923,230	581,454	
2053	123,195	190,115	37,796			885,434	543,657	
2054	124,427	192,016	38,174			847,259	505,483	
2055	125,671	193,937	38,556			808,703	466,927	
2056	126,928	195,876	38,942			769,762	427,986	
2057	128,197	197,835	39,331			730,431	388,655	
2058	129,479	199,813	39,724			690,707	348,930	
2059	130,774	201,811	40,122			650,585	308,809	
2060	132,081	203,829	40,523			610,062	268,286	
2061	133,402	205,868	40,928			569,134	227,358	
2062	134,736	207,926	41,337			527,797	186,021	
2063	136,084	210,006	41,751			486,047	144,270	
2064	137,444	212,106	42,168			443,878	102,102	
2065	138,819	214,227	42,590			401,289	59,513	
2066	140,207	216,369	43,016			358,273	16,497	
2067	141,609	218,533	43,446	110,473	33,830	170,524	71,977	Area 6 PH 2 Excavation Stockpile
2068	143,025	220,718	43,880			126,644	28,097	
2069	144,455	222,925	44,319			82,325	82,325	Area 8 Excavation
2070	145,900	225,154	44,762			37,562	37,562	
2071	147,359	227,406	45,210			-7,648	-7,648	Soil Depleted November 2071
2072	148,833	229,680	45,662			-53,310	-53,310	
2073	150,321	231,977	46,119			-99,428	-99,428	
2074	151,824	234,297	46,580			-146,008	-146,008	
2075	153,342	236,639	47,046			-193,054	-193,054	
2076	154,876	239,006	47,516			-240,570	-240,570	
2077	156,425	241,396	47,991			-288,561	-288,561	
2078	157,989	243,810	48,471			-337,032	-337,032	
2079	159,569	246,248	48,956			-385,988	-385,988	
2080	161,164	248,710	49,445			-435,433	-435,433	
2081	162,776	251,198	49,940			-485,373	-485,373	
2082	164,404	253,710	50,439			-535,813	-535,813	
2083	166,048	256,247	50,944			-586,756	-586,756	

2084	167,708	258,809	51,453	164,832	15,319	-818,360	-818,360	
2085	169,385	261,397	51,968			-870,328	-870,328	
2086	171,079	264,011	52,487			-922,815	-922,815	
2087	172,790	266,651	53,012			-975,827	-975,827	
2088	174,518	269,318	42,819	92,671		-1,111,318	-1,111,318	Life Depleted October 2088

ATTACHMENT 7
Northeast Nebraska Solid Waste Coalition
Remaining Soil Projections w/ Expansion - 20% Waste Increase

4/8/2021
by:PRF
ck:LAR

MSW/Industrial Tonnage (Assumed) = 134,400 tons
Predicted Future Generation Growth = 1.00%
Aispace Utilization Factor (AUF) = 1,296 lb/cy

Remaining Final Cover Soil (CY)[3]	
Area 1-6 PH1	125,862
Area 6 PH 2	110,473
Area 7	164,832
Area 8	92,671
Total	493,839

Remaining Protective Cover Soil (CY)[2]	
Area 1/2/3/4/5	0
Area 6 PH 1	22,514
Area 6 PH 2	46,276
Area 7	33,830
Area 8	15,319
Total	117,939

Remaining Available Soil	
NW Borrow	309,481
Area 1/2/3/4/5	0
Area 6 PH 1	187,578
Area 6 PH 2	788,070
Area 7	764,895
Area 8	98,547
Total	2,148,571

1. Required daily and intermediate cover assumes a 4:1 waste:soil ratio.
2. Protective cover to be placed at the time of construction of the new Area. Reference remaining airspace projection calculations for Area construction timing details.
3. Final cover placement is sequenced to match construction of the new Area to maximize the usage of excavated soils.

Year	Total Tonnage	Waste Annual MSW/Industrial Airspace Consumed (cy)	Daily and Int. Cover Placed (CY)[1]	Final Cover Placed (CY)[3]	Protective Cover Placed (CY)[2]	Ultimate Remaining Available Soil	Year End Remaining Available Soil	Borrow Source
2021	134,400	207,407	41,234			2,107,337	146,344	Area 6 PH 1 Excavation
2022	135,744	209,481	41,646			2,065,691	104,697	
2023	137,101	211,576	42,063		22,514	2,001,113	40,120	Stockpile Remaining Area 6 PH 1 Excavation at NW Borrow
2024	138,472	213,692	42,484			1,958,630	307,117	NW Borrow
2025	139,857	215,829	42,908			1,915,721	264,209	
2026	141,256	217,987	43,337			1,872,384	220,871	
2027	142,668	220,167	43,771			1,828,613	177,100	
2028	144,095	222,369	44,209			1,784,405	132,892	
2029	145,536	224,593	44,651			1,739,754	88,241	
2030	146,991	226,838	45,097			1,694,657	43,144	
2031	148,461	229,107	45,548			1,649,109	785,667	Area 6 PH 2 Excavation
2032	149,946	231,398	46,004			1,603,105	739,663	
2033	151,445	233,712	46,464			1,556,642	693,199	
2034	152,960	236,049	46,928			1,509,714	646,271	
2035	154,489	238,409	47,398			1,462,316	598,874	
2036	156,034	240,794	47,871			1,414,445	551,002	
2037	157,595	243,201	48,350			1,366,094	502,652	
2038	159,171	245,634	48,834	125,862	46,276	1,145,123	281,680	Stockpile Remaining Area 6 PH 2 Excavation Off-Site

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2039	160,762	248,090	49,322			1,095,801	715,573	Area 7 Excavation
2040	162,370	250,571	49,815			1,045,985	665,758	
2041	163,994	253,076	50,313			995,672	615,445	
2042	165,633	255,607	50,817			944,855	564,628	
2043	167,290	258,163	51,325			893,531	513,303	
2044	168,963	260,745	51,838			841,693	461,465	
2045	170,652	263,352	52,356			789,336	409,109	
2046	172,359	265,986	52,880			736,456	356,229	
2047	174,082	268,646	53,409			683,048	302,820	
2048	175,823	271,332	53,943			629,105	248,878	
2049	177,582	274,046	54,482			574,623	194,395	
2050	179,357	276,786	55,027			519,596	139,368	
2051	181,151	279,554	55,577			464,018	83,791	
2052	182,962	282,349	56,133			407,885	27,658	
2053	184,792	285,173	56,694			351,191	252,644	Area 6 PH 2 Excavation Stockpile
2054	186,640	288,025	57,261	110,473	33,830	149,627	51,079	
2055	188,506	290,905	57,834			91,793	91,793	Area 8 Excavation
2056	190,391	293,814	58,412			33,380	33,380	
2057	192,295	296,752	58,996			-25,616	-25,616	Soil Depleted July 2057
2058	194,218	299,720	59,586			-85,203	-85,203	
2059	196,160	302,717	60,182			-145,385	-145,385	
2060	198,122	305,744	60,784			-206,169	-206,169	
2061	200,103	308,801	61,392			-267,561	-267,561	
2062	202,104	311,889	62,006			-329,567	-329,567	
2063	204,125	315,008	62,626			-392,193	-392,193	
2064	206,167	318,158	63,252			-455,445	-455,445	
2065	208,228	321,340	63,885			-519,329	-519,329	
2066	210,311	324,553	64,524	164,832	15,319	-764,004	-764,004	
2067	212,414	327,799	65,169			-829,173	-829,173	
2068	214,538	331,077	65,820			-894,993	-894,993	
2069	216,683	334,388	66,479			-961,472	-961,472	
2070	218,850	337,732	57,175	92,671		-1,111,318	-1,111,318	Life Depleted November 2070

APPENDIX H – AREA CLOSURE SEQUENCING FIGURES

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- INTERMEDIATE COVER CONTOURS
- FINAL COVER CONTOURS
- ROAD/INTERMEDIATE COVER
- PROPOSED FINAL COVER CLOSURE
- PROPOSED EXISTING FINAL COVER
- PROPOSED ACTIVE AREA

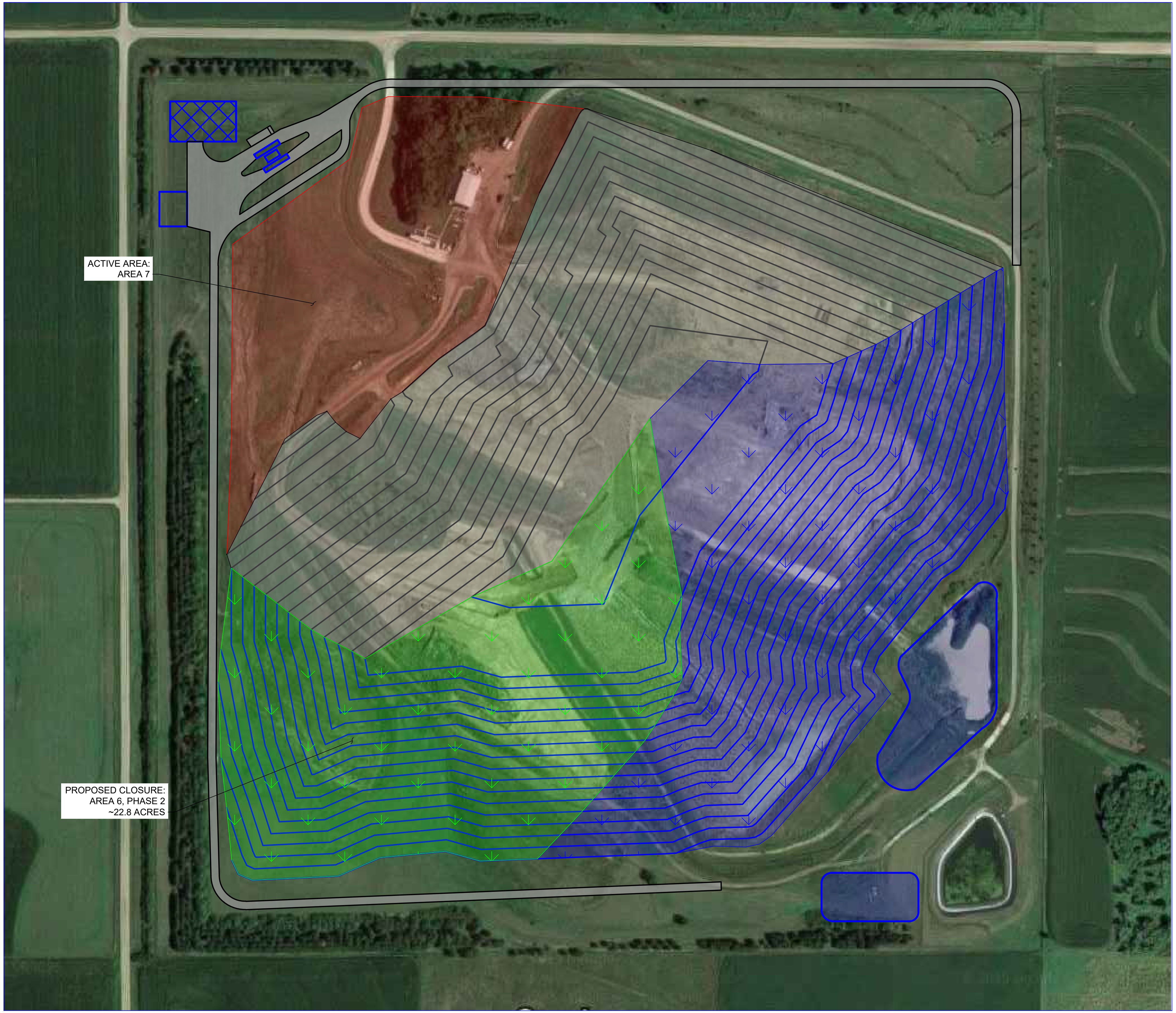
NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 1
NNSWC Regional Landfill

Area Closure Sequencing
Area 1-6, Phase 1



NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- INTERMEDIATE COVER CONTOURS
- FINAL COVER CONTOURS
- ROAD/INTERMEDIATE COVER
- PROPOSED FINAL COVER CLOSURE
- PROPOSED EXISTING FINAL COVER
- PROPOSED ACTIVE AREA

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

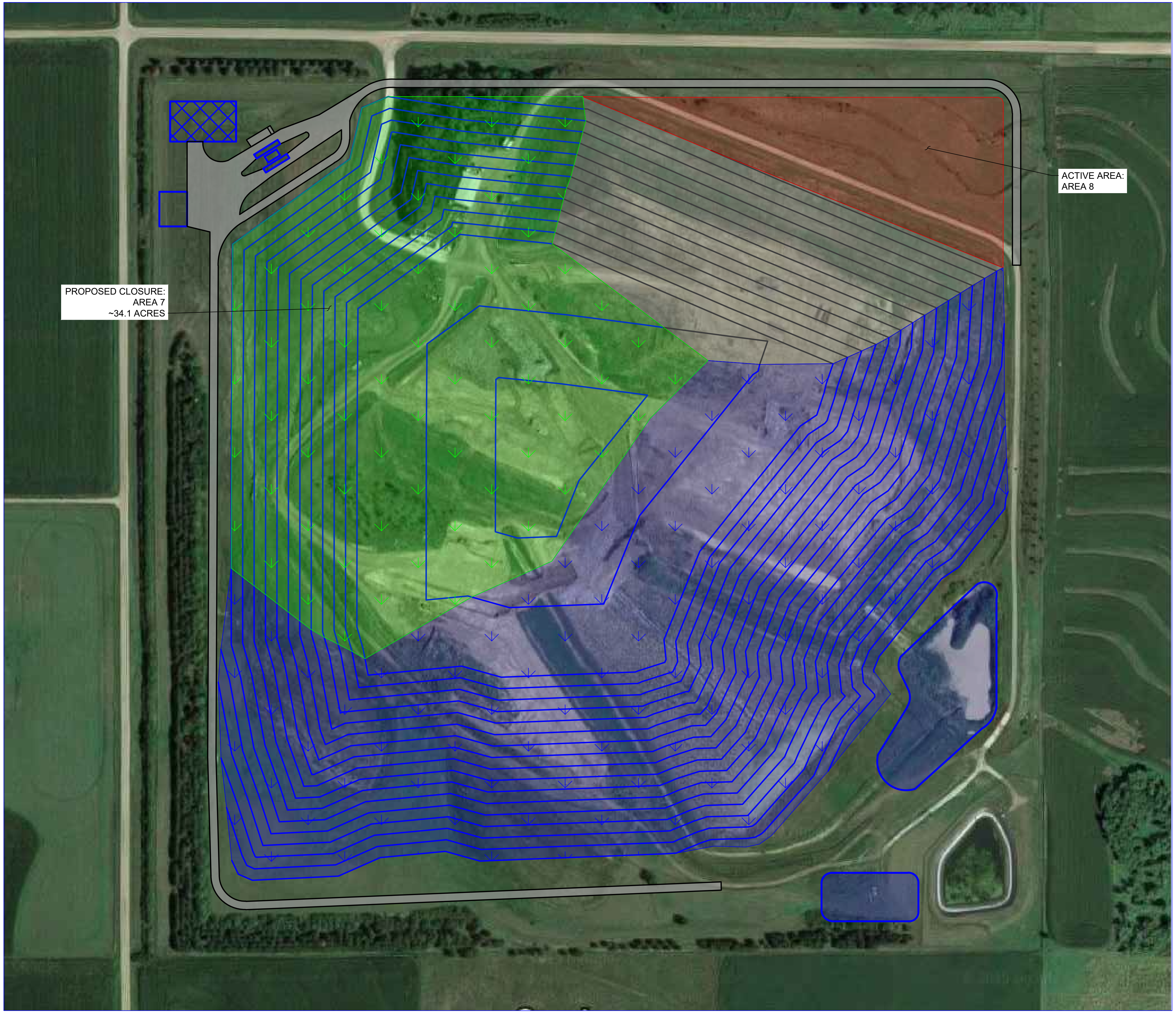
Figure 2
NNSWC Regional Landfill

Area Closure Sequencing
Area 6, Phase 2

C:\USERS\PRUIZFABIAN\ONEDRIVE - BURNS & MCDONNELL\DESKTOP\ENS\NNSWC\MASTERPLAN\TASK 7\CAD\FIGURE 2 - AREA CLOSURE SEQUENCING_AREA 6 PH 2.DWG 4/19/2021 9:29 AM PRUIZFABIAN

NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 10-FEET.



LEGEND

- INTERMEDIATE COVER CONTOURS
- FINAL COVER CONTOURS
- ROAD/INTERMEDIATE COVER
- PROPOSED FINAL COVER CLOSURE
- PROPOSED EXISTING FINAL COVER
- PROPOSED ACTIVE AREA

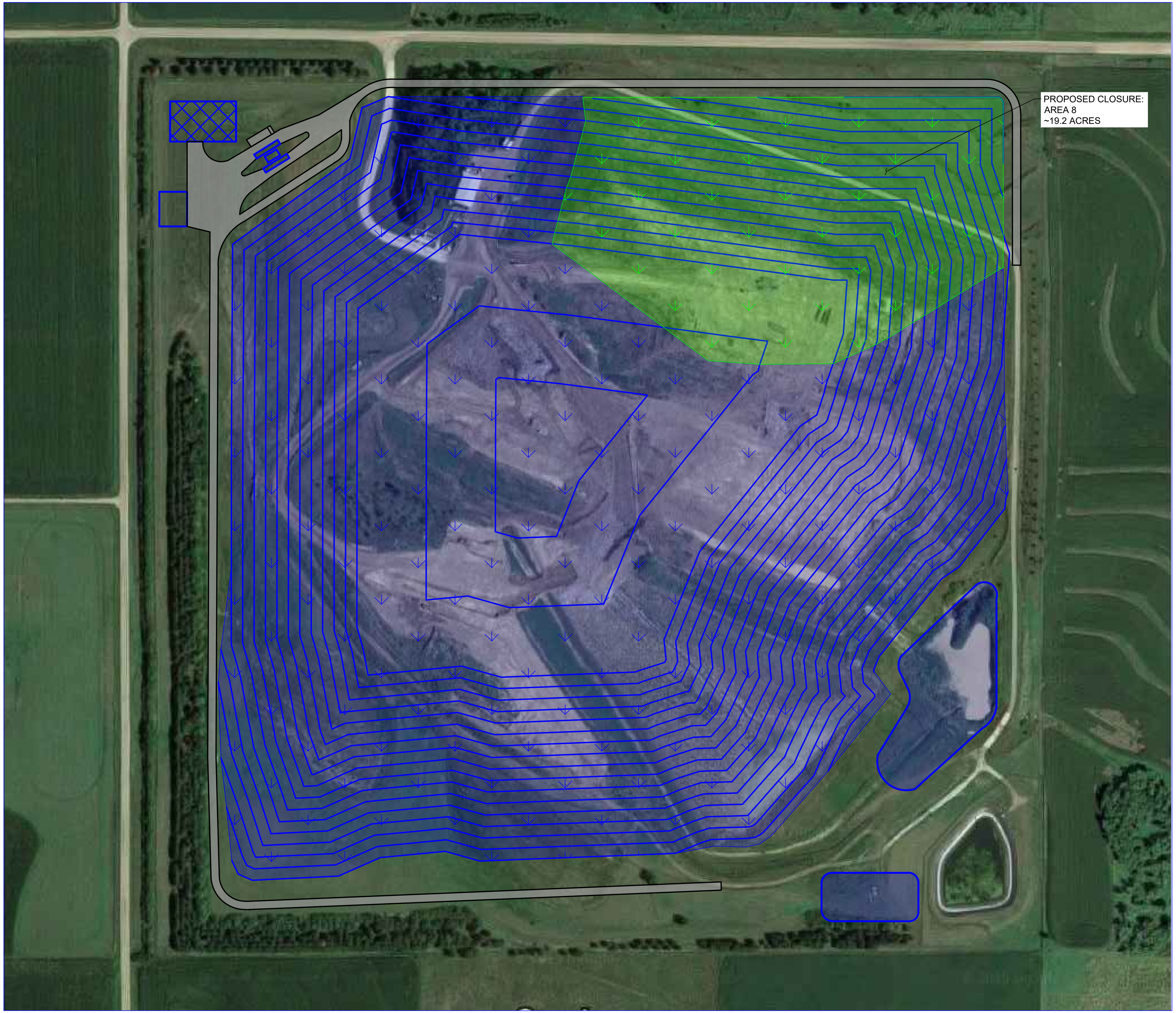
NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 3
NNSWC Regional Landfill

Area Closure Sequencing
Area 7



NOTES

1. EXISTING CONDITIONS BASED ON 2019 GOOGLE EARTH AERIAL.
2. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL COVER. CONTOUR INTERVAL IS 10-FEET.

LEGEND

- INTERMEDIATE COVER CONTOURS
- FINAL COVER CONTOURS
- ROAD/INTERMEDIATE COVER
- PROPOSED FINAL COVER CLOSURE
- PROPOSED EXISTING FINAL COVER
- PROPOSED ACTIVE AREA

NORTH

0 150' 300'
SCALE IN FEET

BURNS McDONNELL

Figure 4
NNSWC Regional Landfill

Area Closure Sequencing
Area 8

C:\USERS\PRUIZFABIAN\ONEDRIVE - BURNS & MCDONNELL\DESKTOP\ENS\NNSWC\MASTERPLAN\TASK 7\CAD\FIGURE 4 - AREA CLOSURE SEQUENCING_AREA 8.DWG 4/19/2021 9:31 AM PRUIZFABIAN

APPENDIX I – ALTERNATIVE LANDFILL COVER ACAP STUDY

U.S. EPA Contaminated Site Cleanup Information (CLU-IN)

Alternative Landfill Cover Project Profiles

Capillary Barrier ET Covers at Douglas County Recycling and Disposal Facility, Bennington, NE

Last Updated: September 5, 2008

Site Information

Site Name, Location: Douglas County Recycling and Disposal Facility, Bennington, NE USA (EPA Region 7)

Site Type: MSW landfill

Superfund Site: No

Federal Facility: No

Bottom liner: Yes Climate: Mesic climate where evapotranspiration generally exceeds precipitation. Warm summers, cool winters, and moderate rainfall. Summer rains account for 75% of annual precipitation. Average annual snowfall is 32 inches. Annual Precipitation: 28 inches

Project Information

Project Name: Capillary Barrier ET Covers at Douglas County Recycling and Disposal Facility, Bennington, NE

Project Scale: Demonstration

Demonstration Program: Alternate Cover Assessment Program (ACAP)

Project Status: Installed

Date Installed: August 2000

Project Description/ Purpose: This project compares three designs: 2 capillary barrier ET covers and 1 RCRA D (composite barrier) cover. The purpose of this project is to determine whether the percolation rates for the capillary barrier ET covers are either less than 0.12 in/year or the percolation rate for the RCRA D cover. This project is included in the ACAP.

Monitoring System: Lysimeter constructed as 33-foot by 66-foot "bathtub" lined with a linear-low density polyethylene (LLDPE) geomembrane and geocomposite drainage layer. Lysimeter connected to flow monitoring system for percolation and runoff. Water content reflectometers used to measure soil moisture. Heat dissipation units to measure soil matric potential and soil temperature. Groundwater monitoring wells are also used.

There are 2 different covers at this project.

Cover 1 Information

Per NDEE required permeability no greater than 1x10^-5 cm/s

Cover Type: Capillary Barrier Evapotranspiration

Cover Number: 1

Design of Cover: From surface downward: 6 inches of topsoil, 18 inches of moderately compacted silty clay, and 6 inches of sand

Types of Vegetation: Mixture of local warm and cool season grasses

Cover Installation: Topsoil and silty clay obtained from nearby borrow area. Soil lifts were compacted to 85% per standard Proctor.

Drainage Layer: No

Biointrusion Layer: No

Gas Collection Layer: No

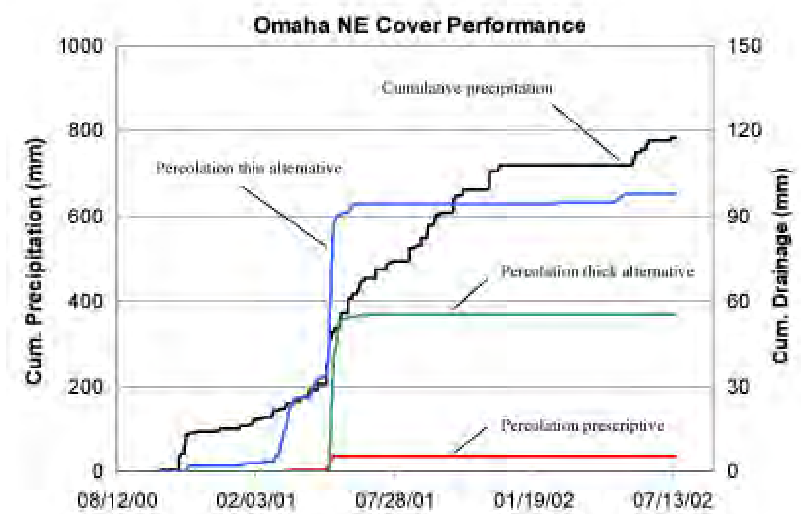
6.44 x 10^-10 cm/s

Water Balance Model: UNSAT-H

Modeling Results: Annual percolation over a 7-year period was estimated at 0.008 in/year. Annual percolation over a 7-year period for the RCRA cover was 0.0006 in/year.

Performance Data Available: Yes

Summary and Description of Performance Data: The figure below shows the actual performance results for this cover during the period from October 2000 to July 2002. The percolation (infiltration) during the first year shown was 100 mm/yr, relative to precipitation of 600 mm/yr. The infiltration during the second year shown was negligible (10 months), relative to precipitation of 200 mm/yr. This figure was excerpted from the following source document, Alternative Cover Assessment Program, 2002 Annual Report, Desert Research Institute, available at http://www.acap.dri.edu/.



3.17 x 10^-7 cm/s

Figure 29. Cover performance at Omaha NE

Comments: Below the cover is a root barrier zone, a lightweight non-woven geotextile studded with nodules that slowly release trifluralin to inhibit and redirect root growth rather than killing it. The following items will require regulatory approval: 1) an equivalence criterion of 3.0 mm/yr or the flux recorded on a prescriptive test pad, whichever is greater; 2) a 2-year test period; 3) permission to irrigate with well water or leachate.

Reference(s)

Bolen, M.M. and others. 2001. Alternative Cover Assessment Program: Phase II Report. University of Wisconsin-Madison. Geo Engineering Report 01-10. Madison, WI. September.

Personal communication between Danielle Gratton, Tetra Tech EM Inc., and Bill Albright, Desert Research Institute. February 14, 2002.

HDR Engineering, Inc., and Daniel B. Stephens & Associates. 2000. Alternative Cover Design Report for Waste Management of Nebraska, Inc., Douglas County Recycling and Disposal Facility, Bennington Nebraska. April.

Benson, C., and others. 2002. "Evaluation of Final Cover Performance: Field Data from the Alternative Cover Assessment Program (ACAP)." Proceedings, WM 2002 Conference, Tucson, AZ. February 24-28, 2002.

Cover 2 Information

Cover Type: Capillary Barrier Evapotranspiration

Cover Number: 2

Design of Cover: From surface downward: 6 inches of topsoil, 30 inches of moderately compacted silty clay, and 6 inches of sand

Types of Vegetation: Mixture of local warm and cool season grasses

Cover Installation: Topsoil and silty clay obtained from nearby borrow area. Soil lifts were compacted to 85% per standard proctor.

Drainage Layer: No

Biointrusion Layer: No

Gas Collection Layer: No

1.74 x 10^-7 cm/s

Water Balance Model: UNSAT-H

Modeling Results: Annual percolation over a 7-year period was estimated at 0.008 in/year. Annual percolation over a 7-year period for the RCRA cover was 0.0006 in/year.

Performance Data Available: Yes

Summary and Description of Performance Data: The figure below shows the actual performance results for this cover during the period from October 2000 to July 2002. The percolation (infiltration) during the first year shown was 55 mm/yr, relative to precipitation of 600 mm/yr. The infiltration during the second year shown was negligible (10 months), relative to precipitation of 200 mm/yr. This figure was excerpted from the following source document, Alternative Cover Assessment Program, 2002 Annual Report, Desert Research Institute, available at http://www.acap.dri.edu/.

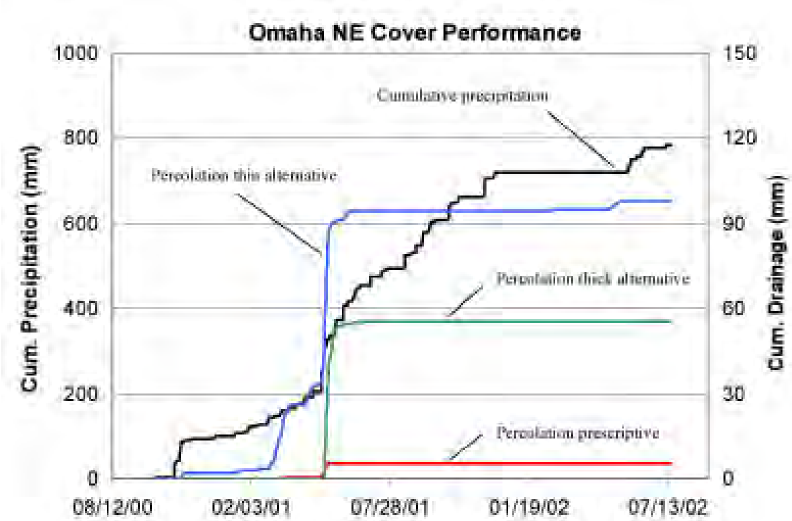


Figure 29. Cover performance at Omaha NE

Comments: Below the cover is a root barrier zone, a lightweight non-woven geotextile studded with nodules that slowly release trifluralin to inhibit and redirect root growth rather than killing it. The following items will require regulatory approval: 1) an equivalence criterion of 3.0 mm/yr or the flux recorded on a prescriptive test pad, whichever is greater; 2) a 2-year test period; 3) permission to irrigate with well water or leachate.

Reference(s) Bolen, M.M. and others. 2001. Alternative Cover Assessment Program: Phase II Report. University of Wisconsin-Madison. Geo Engineering Report 01-10. Madison, WI. September.

Personal communication between Danielle Gratton, Tetra Tech EM Inc., and Bill Albright, Desert Research Institute. February 14, 2002.

HDR Engineering, Inc., and Daniel B. Stephens & Associates. 2000. Alternative Cover Design Report for Waste Management of Nebraska, Inc., Douglas County Recycling and Disposal Facility, Bennington Nebraska. April.

Benson, C., and others. 2002. "Evaluation of Final Cover Performance: Field Data from the Alternative Cover Assessment Program (ACAP)." Proceedings, WM 2002 Conference, Tucson, AZ. February 24-28, 2002.

Point(s) of Contact

Primary Contact

Organization: Nebraska Department of Environmental Quality

Name: NDEQ Main Office

Address: 1200 "N" Street, Suite 400 PO Box 98922 Lincoln, Nebraska 68509

Phone: 402-471-2186

Fax: 402-471-2909

Email: NDEQ.moreinfo@Nebraska.gov

Web Address: www.deq.state.ne.us/

Secondary Contact

Organization: Waste Management Inc.

Name: Ken Mertl, District Manager

Address: 14320 North 216th Street, Bennington, NE 68007

Phone: 402-478-5196

Fax: 402-478-5150

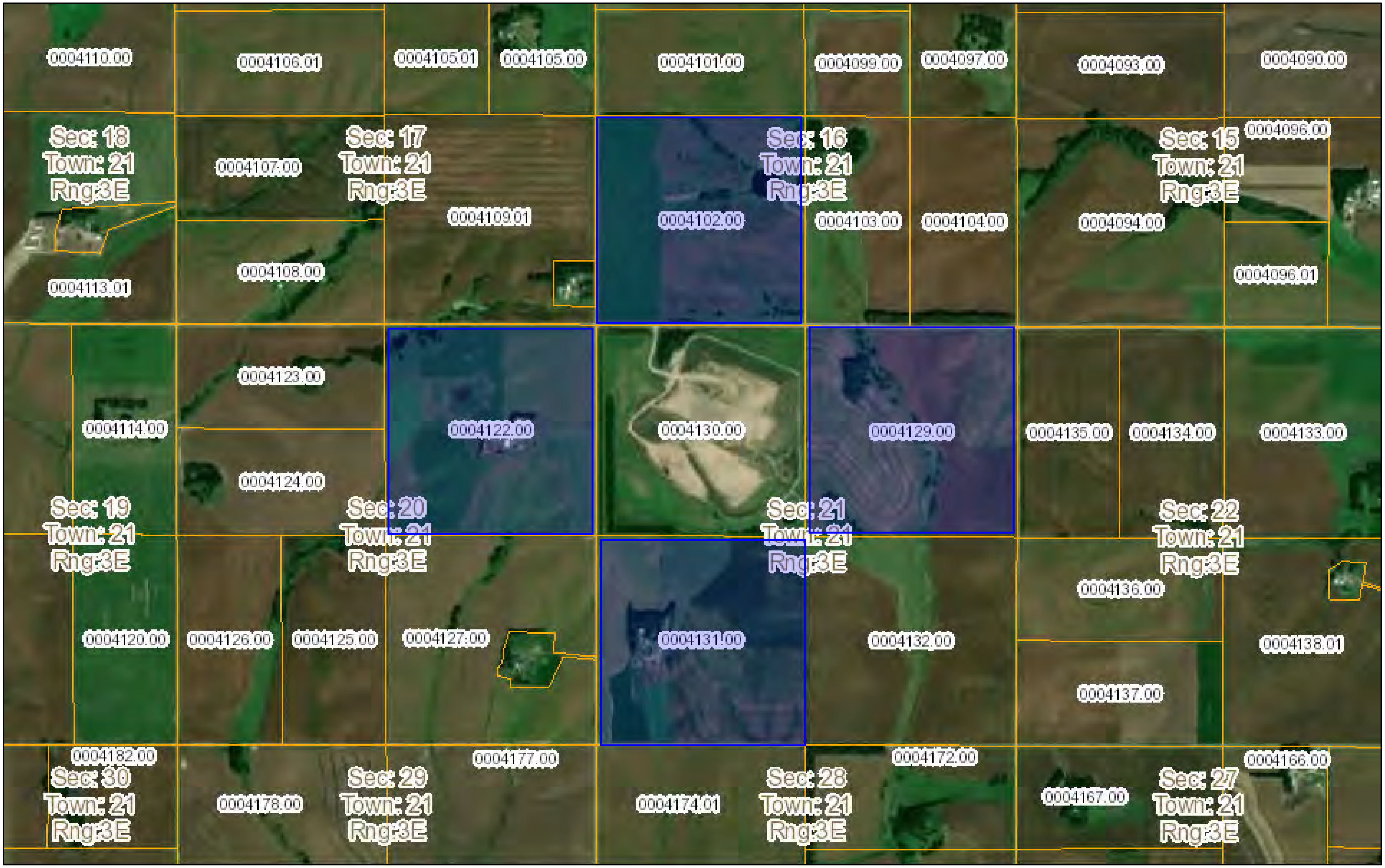
Email: Kmertl@wm.com

Web Address: www.wm.com

RETURN TO LIST

Top of Page

APPENDIX J – ADJACENT PROPERTY OWNERS



April 23, 2021

DISCLAIMER: This map is not intended for conveyances, nor is it a legal survey. The information is presented on a best-efforts basis, and should not be relied upon for making financial, survey, legal or other commitments.

1:27,957

0 0.225 0.45 0.9 mi

0 0.375 0.75 1.5 km

Parcels

Sections

Stanton County
gWorks.

Sections

T	R	SEC	ORIG_FID
21	3E	16	364

Parcels

PID	OwnerName	PropertyAddress	OwnerAddress	LegalDesc
0004102.00	HAMERNIK, THOMAS M & CHARLES A & MICHAEL P HAMERNIK, TIC		C/O SHIRLEY J HAMERNIK P O BOX 326 CLARKSON NE 68629-0326	16-21-3 E SW 16-21-3 MAPLE CREEK PRECINCT 160 ACRES LIFE ESTATE-SHIRLEY J HAMERNIK

Sections

T	R	SEC	ORIG_FID
21	3E	21	382

Parcels

PID	OwnerName	PropertyAddress	OwnerAddress	LegalDesc
0004129.00	DOERNEMANN, JARETT LEE & KATHLEEN A, JTWROS, ETAL	57270 825 RD HOWELLS	P O BOX 221 CLARKSON NE 68629	21-21-3 E NE 21-21-3 MAPLE CREEK PRECINCT 160 ACRES UND 1/2 INT=WELLS CREEK FARM,LLC

Sections

T	R	SEC	ORIG_FID
21	3E	21	382

Parcels

PID	OwnerName	PropertyAddress	OwnerAddress	LegalDesc
0004131.00	VRBICKY, THOMAS	57217 824 RD CLARKSON	57217 824 RD CLARKSON NE 68629-2970	21-21-3 E SW 21-21-3 MAPLE CREEK PRECINCT 160 ACRES

Sections

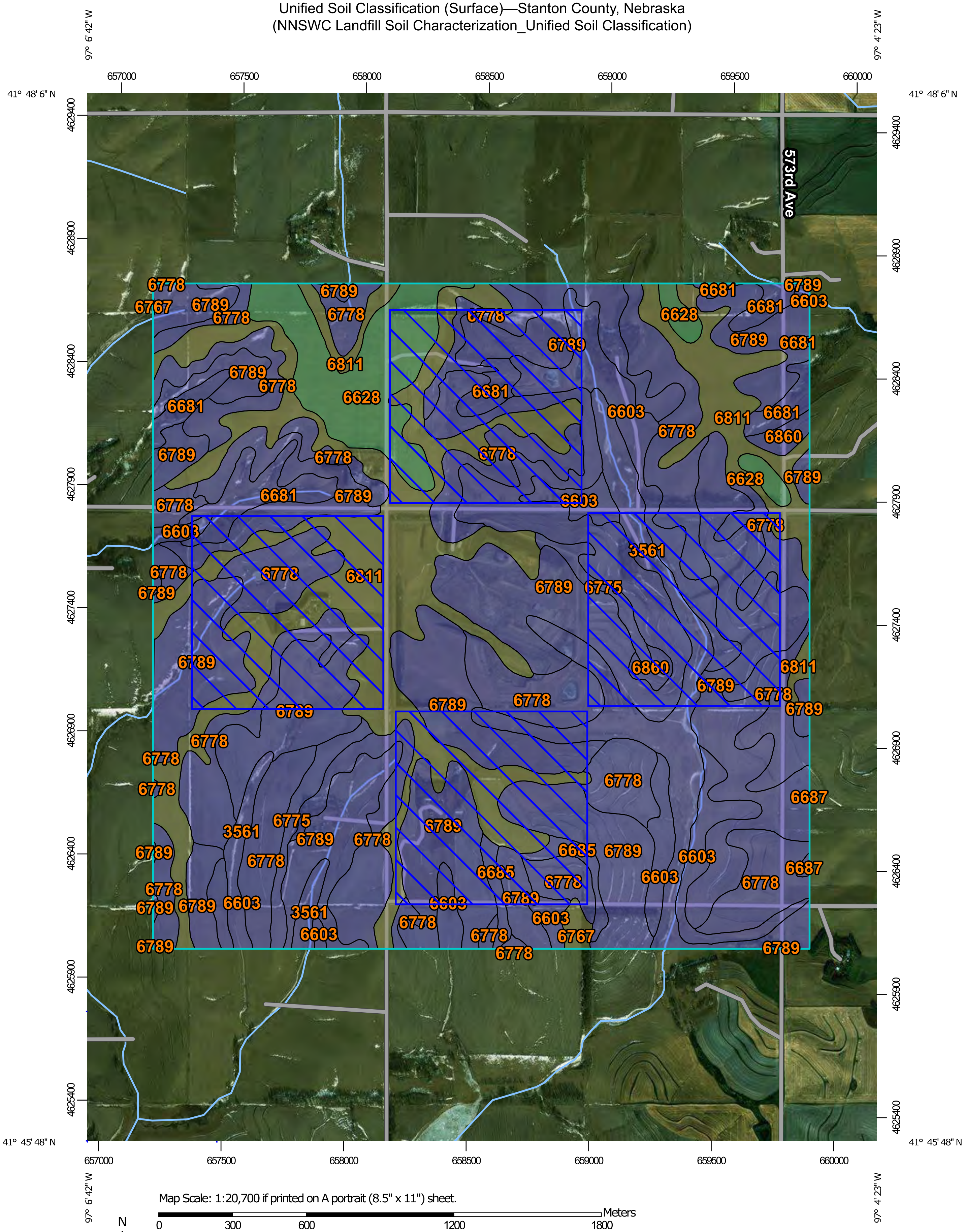
T	R	SEC	ORIG_FID
21	3E	20	383

Parcels

PID	OwnerName	PropertyAddress	OwnerAddress	LegalDesc
0004122.00	KING, AMBER L	82471 572 AVE CLARKSON	C/O MARY VRBICKY 82471 572 AVE CLARKSON NE 68629	20-21-3 E NE 20-21-3 MAPLE CREEK PRECINCT 160 ACRES LIFE ESTATE TO MARY P VRBICKY

APPENDIX K – NRCS SOILS MAP AND CLASSIFICATIONS

Unified Soil Classification (Surface)—Stanton County, Nebraska
(NNSWC Landfill Soil Characterization_Unified Soil Classification)



Map Scale: 1:20,700 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 300, 600, 1200, 1800
Feet: 0, 1000, 2000, 4000, 6000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Soil Rating Lines

- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Soil Rating Points

- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

MAP INFORMATION

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Stanton County, Nebraska
Survey Area Data: Version 20, Jun 10, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 19, 2015—Mar 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Unified Soil Classification (Surface)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3561	Hobbs silt loam, 0 to 2 percent slopes, occasionally flooded, cool	CL	105.7	5.9%
6603	Alcester silty clay loam, 2 to 6 percent slopes	CL	113.2	6.3%
6628	Belfore silty clay loam, 0 to 2 percent slopes	CH	86.1	4.8%
6681	Crofton silt loam, 17 to 30 percent slopes, eroded	CL	54.0	3.0%
6685	Crofton silt loam, 2 to 6 percent slopes, eroded	CL	12.8	0.7%
6687	Crofton silt loam, 6 to 11 percent slopes, eroded	CL	0.9	0.0%
6767	Nora silty clay loam, 6 to 11 percent slopes	MH	4.6	0.3%
6775	Nora-Crofton complex, 2 to 6 percent slopes, eroded	CL	23.1	1.3%
6778	Nora-Crofton complex, 6 to 11 percent slopes, eroded	CL	400.5	22.3%
6789	Crofton-Nora complex, 11 to 17 percent slopes, eroded	CL	680.9	37.9%
6811	Moody silty clay loam, 2 to 6 percent slopes	MH	302.4	16.8%
6860	Crofton silt loam, 8 to 17 percent slopes, eroded	CL	10.4	0.6%
Totals for Area of Interest			**1,794.7**	**100.0%**

Description

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

APPENDIX L – RNG FEASIBILITY EVALUATION

Memorandum

BURNS & McDONNELL

Date: 7/26/2021

To: Rob Mercer

From: Luke Rodig, PE

Subject: NNSWC Landfill Master Plan
RNG Feasibility Evaluation
Project No. 124922

1.0 Renewable Natural Gas Feasibility Evaluation

As part of the development of this Master Plan, the NNSWC requested that Burns & McDonnell perform a high level feasibility evaluation to determine if using landfill gas (LFG) to produce Renewable Natural Gas (RNG) could be an economically viable option in the future. The RNG would potentially be used for commercial purposes (sale to a gas utility for subsequent sale to their customer base as renewable natural gas), or as a transportation fuel as part of the United States Environmental Protection Agency's (EPA's) Renewable Fuel Standards (RFS) Program. Injection into a local utility pipeline was assumed to be required for both potential end markets. Upgrading LFG to RNG has potential to generate considerable revenue from multiple streams but will require investment in new infrastructure and ongoing operating costs, as described herein.

As a baseline, Burns & McDonnell assumed a LFG collection rate of 1,000 standard cubic feet per minute (scfm). For the Landfill, LFG collection at or above 1,000 scfm occurs in the year 2049 based on current projections of waste and LFG generation. For reference, the estimated LFG collection rate for 2021 is approximately 558 scfm.

Since this baseline scenario occurs approximately 30 years from the development of this Master Plan, it is important to acknowledge that valuations of RNG and associated incentives are dynamic in nature. Ten years ago, there were only a handful of RNG projects that were in operation and today there are over 160 projects in operation, with many more in various stages of development. We recommend that the NNSWC revisit this analysis in the next 3-5 years, given the dynamic nature of the RNG markets.

The overall analysis including capital costs, operations costs, and revenues have been developed assuming this project starts in 2021 with the assumption that there is 1,000 scfm available, as there is not a good way to accurately project what market conditions will look like in 2049.

1.1 Concept Plant Site and Pipeline

According to the National Pipeline Mapping System (NPMS), the nearest potential transmission pipeline tie-in location is estimated to be approximately 13.5 miles northwest of the Landfill in the city of Stanton, Nebraska. The plant would likely be located on the northwest corner of the site since that area has been allocated to a blower flare skid in the future. Further analysis regarding the best pipeline route and connection option will require discussions and negotiations with the natural gas pipeline company or companies. Preliminary routes will need to be developed to minimize land acquisition, with installation occurring within previously established public right-of-ways to the extent practicable.

A virtual pipeline could also be evaluated as an option to transport the RNG. A virtual pipeline involves compressing or liquefying RNG into mobile containers which are then loaded onto transport trucks. The RNG is then transported to the nearest pipeline tie-in location and the RNG can be decompressed or gasified to necessary pipeline standards. This system could reduce capital costs but would increase operation costs because of the need for additional operators and specialized equipment.

1.2 Financial Analysis

The following sections summarize capital costs, annual operational costs, and the annual operating revenue, the primary components of a preliminary 10-year pro forma developed for the project. It should be noted that numerous assumptions and variables were used to develop the financial information presented herein. Given the early stage of the concept development, the financial analysis presented herein should be considered as a preliminary order of magnitude assessment.

1.3 Capital Costs

Estimated costs for a typical RNG processing equipment is based on recent quotations for similar sized projects. Burns & McDonnell's construction design-build estimators prepared opinions of probable construction costs for the new pipeline, other components of the system, and the balance of plant construction. Indirect costs were also applied as a percent of the construction costs as shown in Table 1 below. Due to several components of the system that could vary greatly depending on several factors that have yet to be determined, a low-end estimate and a high-end estimate are presented in Table 1. The low and high-cost values presented should not be viewed as a range but rather two distinct scenarios, both with a +/- 50% cost confidence, as typical for this level of project definition.

Table 1: Capital Cost Opinion

Capital Cost Opinion	Low	High
Biogas Upgrading System	$2,295,000	$2,295,000
Nitrogen Reduction Unit	$1,000,000	$3,250,000
De-Oxygenation Catalyst	$500,000	$995,000
Regenerative Thermal Oxidizer	$195,000	$195,000
Compressor Station, Meter Station & Pipeline	$18,240,147	$18,240,147
Balance of Plant	$1,956,000	$1,956,000
Estimated Construction Costs	**$24,186,147**	**$26,931,147**
Startup (2.5%)	$604,654	$673,279
Engineering (10%)	$2,418,615	$2,693,115
Construction Management (12%)	$2,902,338	$3,231,738
Contingency (10% Low, 30% High)	$2,418,615	$8,079,344
Total Capital Costs	**$32,530,368**	**$41,608,622**

*Capital costs assume a landfill gas collection and control system will be installed by 2049.

1.4 Operating Costs

Operating costs include plant labor, utilities, plant maintenance costs, pipeline tariff, and professional services. Operating costs have been estimated at just over $1.1M in 2021 USD per year starting in year 2049 and increasing with inflation.

1.5 Operating Revenue

When compared to other end markets, the transportation fuel market currently generates the highest revenues associated with RNG. The operating revenues assume NNSWC would market the RNG for transportation fuel in the future. It should be noted that the current subsidies that are creating the renewable fuel market may not exist in their current form in the future, but there are likely to be incentives available for beneficial use of LFG.

The NNSWC's estimated operating revenue for this project consists of three potential streams including the sale of the gas commodity itself to the natural gas pipeline owner, the sale of Renewable Identification Numbers (RINs) associated with the RNG (as part of the RFS program), and the state credits associated with the use of the RNG as a transportation fuel. In this evaluation, the RNG is assumed to be used as a transportation fuel in California with revenue realized through the California Low Carbon Fuel Standard (LCFS) Program. A brief background description of the RFS and LCFS programs are provided below:

- The Renewable Fuel Standard (RFS): The RFS is a federal program administered by the United States Environmental Protection Agency (EPA) that requires a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel. EPA uses RINs to track renewable transportation fuels. The RIN is attached to the physical gallon of renewable fuel as it is transferred to a fuel blender. Landfill gas is considered a cellulosic biofuel under this program.

- The California low-carbon fuel standard (LCFS): The LCFS is a program administered by the California Air Resources Board (CARB) to reduce greenhouse gas emissions in transportation fuels. Landfill gas produced at the facility qualifies as an eligible source provided it is used as a transportation fuel in California.

The projected annual revenue in year one of operation (assumed to be 2049) is estimated at $5.5M and remains somewhat constant assuming no change in current market prices. A breakdown of the year one projected amount by revenue stream is given below.

- Sale of Gas: $560K
- Sale of RINs: $3.3M
- LCFS Credits: $1.6M

1.7 Preliminary Pro Forma

Using the values described above projected over a 10-year period, Burns & McDonnell developed a simple economic model that allows consideration of various cost and price point variables. Tables 2 and 3 below show the net cash flow for the "Low" Capital Cost Scenario and the "High" Capital Cost Scenario, respectively with RIN and LCFS credit prices at approximately current rates. Tables 2 and 3 below show a simple payback matrix for the "Low" capital cost scenario and the "High" capital cost scenario, respectively. These tables are intended to demonstrate the degree of sensitivity of the project financial results to RIN values and LCFS credit values, key variables of the model. The maximum, minimum, median, and mean values indicated in the tables are based on the monthly prices over the last 2 years. Scenarios in which payback was not achieved in the 10-year duration of the model reflect a >10 value, indicating greater than 10 years.

Table 2: Simple Payback Matrix ("Low" Capital Cost Scenario)

*values shown are in years to payback

		LCFS Credit Values				
		$206.00	$190.00	$196.50	$196.66	$0.00
RIN Values		2-Yr Max.	2-Yr Min.	2-Yr Median	2-Yr Mean	None
$2.61	2-year Max.	4.2	4.3	4.2	4.2	5.3
$0.65	2-year Min.	>10.0	>10.0	>10.0	>10.0	>10.0
$1.34	2-year Median	7.3	7.5	7.4	7.4	>10.0
$1.43	2-year Mean	6.9	7.1	7.0	7.0	>10.0
$0.00	None	>10.0	>10.0	>10.0	>10.0	>10.0

Table 3: Simple Payback Matrix ("High" Capital Cost Scenario)

*values shown are in years to payback

		LCFS Credit Values				
		$206.00	$190.00	$196.50	$196.66	$0.00
RIN Values		2-Yr Max.	2-Yr Min.	2-Yr Median	2-Yr Mean	None
$2.61	2-year Max.	5.3	5.4	5.4	5.4	6.7
$0.65	2-year Min.	>10.0	>10.0	>10.0	>10.0	>10.0
$1.34	2-year Median	9.3	9.5	9.4	9.4	>10.0
$1.43	2-year Mean	8.8	9.0	9.0	9.0	>10.0
$0.00	None	>10.0	>10.0	>10.0	>10.0	>10.0

1.8 Summary and Recommendations

The preliminary pro forma indicated this project has potential to be financially beneficial for the NNSWC. In the "Low" capital cost scenario payback is possible in around 7.4 years and is under 10 years for the "High" scenario assuming there is a 1,000 scfm of LFG available. Based on current estimated LFG flow rate, the estimated project payback period is greater than 10 years.

The revenue stream estimates are also critical to the preliminary financial analysis. The RFS administrative decisions made by the EPA have a significant impact on RIN prices. Recent indications are that the RFS program will be extended for several years, however as with most financial markets, RIN price futures remain uncertain. The California LCFS credit prices have been on a steady incline over the last two years and although no indications point to changes for the program, credit prices are likewise susceptible to impact by government policy and market forces. Natural gas is a widely used commodity for which demand appears stable in the near term while supply and pricing are susceptible to variation in market conditions. Given the volatility of the RNG market, it is in the best interest of the NNSWC to re-evaluate the development of a RNG project in three to five years.

*Burns & McDonnell's cost estimates, analyses, and recommendations presented in this study are based on our professional experience and judgment, as well as external sources and assumptions. The low and high cost values presented should not be viewed as a range but rather two distinct scenarios, both with a +/- 50% cost confidence as typical for this level of project definition. Burns & McDonnell does not guarantee that actual values or scenarios will not differ from those presented upon implementation. Further evaluation of certain information, assumptions, and scenarios is recommended.

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