Engineering Design Report

Eatonville Landfill

Ecology Facility Site ID No. 85933/Cleanup Site ID No. 15271

February 25, 2025

Prepared for:

Weyerhaeuser

Town of Eatonville

Prepared by:

GSI Water Solutions, Inc.

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Abbreviations and Acronyms

BMP	Best Management Practice
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
CMMP	Contaminated Media Management Plan
COC	contaminant of concern
Contractor	selected construction contractor
COPC	contaminant of potential concern
CPR	cardiopulmonary resuscitation
CSWGP	Construction Stormwater General Permit
CUL	cleanup level
DRO	diesel-range organics
Ecology	Washington Department of Ecology
EDR	Engineering Design Report
Engineer	Engineer of Record
Foresight	Foresight Surveying, Inc.
FS	Feasibility Study
GPS	global positioning system
GRO	gasoline-range organics
GSI	GSI Water Solutions, Inc.
H:V	horizontal distance : vertical distance
HASP	Health and Safety Plan
HAZWOPER	hazardous waste operations and emergency response
HPA	Hydraulic Project Approval
IC	institutional control
IDP	Inadvertent Discovery Plan
JARPA	Joint Aquatic Resources Permit Application
Landfill Area	the former municipal waste landfill on the Site
OMMP	Operations, Maintenance, and Monitoring Plan
ORO	oil-range organics
OSHA	Occupational Safety and Health Administration
PDI	Pre-Design Investigation
POC	point of compliance
Property	a 6.3-acre rectangular parcel of land owned by Weyerhaeuser Company (Tax Parcel No. 0416201007)

RCW	Revised Code of Washington
RI	Remedial Investigation
RTK	real time kinematics
Site	the Eatonville Landfill and the area where the cleanup action will occur
State Parks	Washington State Parks and Recreation Commission
SWPPP	Stormwater Pollution Prevention Plan
TPH	total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
WAC	Washington Administrative Code
WDA	Waste Disposal Authorization
WDFW	Washington Department of Fish and Wildlife
Wetland Area	the area beyond the toe of the landfill on the Site
Weyerhaeuser	Weyerhaeuser Company

Executive Summary

This Engineering Design Report (EDR) describes the basis of the cleanup action at the Eatonville Landfill (Site) located in Pierce County near Eatonville, Washington.[1] A Consent Decree (CD) issued by the Washington Department of Ecology (Ecology) will direct the cleanup action. Weyerhaeuser Company (Weyerhaeuser) and the Town of Eatonville (Town) are parties to the CD.

The EDR describes the Site background, summarizes details of the Cleanup Action Plan (CAP), and describes the assumptions and basis of the cleanup actions design. Construction of the cleanup action is planned for summer 2025.

The Site is located within and around a 6.3-acre rectangular parcel of land owned by Weyerhaeuser (Property) adjoining Nisqually State Park land. Weyerhaeuser acquired the land encompassing what is now Nisqually State Park by 1915. The Town of Eatonville leased the Property from Weyerhaeuser until 1980 for use as a municipal landfill. The former landfill itself is approximately 2 acres. The landfill contains primarily municipal solid waste and a variety of other domestic wastes, including appliances, car bodies, and tires.

A remedial investigation (RI) and feasibility study (FS) identified pollutants associated with the former landfill and screened and recommended remedial actions for the Site. Pollutants associated with the Site have been detected in soil, surface water, and shallow perched groundwater in the "Landfill Area" and in a downgradient "Wetland Area" soil. Contaminants of concern include metals, semivolatile organic compounds, and petroleum hydrocarbons. The FS identifies alternative remedial actions, and the CAP describes the cleanup action selected by Ecology.

Ecology proposes the following cleanup actions at the Site:

In the Landfill Area:

- Fully remove all waste (approximately 22,000 cubic yards).
- Fully remove contaminated soil (approximately 3,000 cubic yards).
- Collect large trash and debris from the ground surface beyond the primary landfill waste prism.
- Monitoring surface water.
- Restore habitat.

In the Wetland Area:

- Remove as much waste as possible (approximately 500 cubic yards) without disrupting the healthy and high value wetland ecosystem.
- Monitor natural recovery of soil.

Site Wide:

- Monitor natural recovery of groundwater.

[1] Certain previous documents refer to the Site as the "'Former'" Eatonville Landfill." This document refers to the Site and Property as the "Eatonville Landfill," while retaining reference to previous operation at the "former landfill."

Ecology will also require institutional controls to prevent human exposure to contamination, including restricting access to the Wetland Area and restricting drinking and skin contact with both groundwater and surface water until levels of COCs are reduce to the cleanup levels (CULs).

The EDR describes permitting requirements and substantive regulatory requirements to implement the cleanup action, including CULs; points of compliance; and local, state, and federal permits or their substantive requirements. The design basis is the assumptions and the technical and regulatory framework to produce a cleanup action design that meets the regulatory requirements and objectives. The EDR describes requirements of cultural resource protection, geotechnical stability, stormwater management, waste management, and restoration. The cleanup actions implementation will protect cultural resources as determined by a cultural resources survey and a cultural resources determination by Ecology.

The cleanup action design is intended to provide geotechnically stable slopes in the Landfill Area during and after construction. The cleanup action will excavate waste and contaminated soil from the Landfill Area to achieve the CULs. The excavated waste and soil will be disposed of at a permitted offsite facility. Stormwater management will be in accordance with a construction stormwater general permit and a storm water pollution prevention plan to control erosion and prevent discharge of potentially contaminated stormwater to waters of the State. The cleanup action will temporarily disturb vegetation and soil during excavation of the landfill and by grading to achieve stable slopes. The graded slopes will be restored to their pre-landfilling ecological condition with healthy, native plants, in accordance with a restoration plan.

The 50% design sheets attached to the EDR show elements of the design at the 50% level of completion. The 50% design, the EDR, and its appendices demonstrate the constructability of the project and allow for adaptation to agency and stakeholder comments on the EDR. Confirmation monitoring will demonstrate whether the cleanup action has achieved the CULs and met other requirements in the CD. An annual report or a 5-year review will recommend regulatory closure when appropriate.

1 Introduction

This Engineering Design Report (EDR) describes the cleanup action at the Eatonville Landfill (Site) located in Pierce County near Eatonville, Washington. GSI Water Solutions, Inc. (GSI) prepared this report for Weyerhaeuser Company (Weyerhaeuser) and the Town of Eatonville (Town), who are the parties responsible for the cleanup action under a Consent Decree to be issued by the Washington Department of Ecology (Ecology). Ecology identifies the Site as Facility Site ID No. 85933 and Cleanup Site ID No. 15271. This document refers to the “Site” as the Eatonville Landfill and the area where the cleanup action will occur.

The Site is located within and around a 6.3-acre rectangular parcel of land owned by Weyerhaeuser (Tax Parcel No. 0416201007) (the Property) adjoining Nisqually State Park property. The Washington State Parks and Recreation Commission (State Parks) manages Nisqually State Park property. A small portion of the Site crosses the southern Property line on to State Parks’ land. Figures 1 and 2 show the location of the Site and its setting within Nisqually State Park. Combined, the Property and portions of the Nisqually State Park that will be impacted by the cleanup action constitute the Site.

An EDR is required as part of the site cleanup process under Washington Administrative Code (WAC) Chapter 173-340, Model Toxics Control Act Cleanup Regulations. The purpose of the EDR is to provide the basis of the design and preliminary details of the remedy presented in the Cleanup Action Plan (CAP) (Ecology, 2024a). Construction of the cleanup action is planned for summer 2025.

2 Background

The following sections discuss the Site background, geologic setting, nature and extent of contamination, and Site ownership. The Remedial Investigation (RI) and Feasibility Study (FS) (GSI, 2024a) and the CAP (Ecology, 2024a) provide additional details of previous site investigations and selection of the cleanup action.

2.1 Site Setting and History

The Site is situated within the Nisqually River watershed (Figures 1 and 2). The Site is on a bluff north of the Mashel River. Wetlands adjacent to the Site transition to the floodplain of the Mashel River. The Site itself is largely on the Property; however, areas of grading will extend off the Property.

The Nisqually Indian Tribe—and its ancestors, the Squalli-absch—have lived in the area for more than 10,000 years. There was a major village near the Mashel River (Nisqually Indian Tribe, 2021).

The Weyerhaeuser Timber Company acquired the land encompassing what is now Nisqually State Park by 1915. The Site was largely undisturbed before the 1950s, except for the intermittent harvesting of timber from 1915 onward. The Town leased the Property from Weyerhaeuser from approximately November 1950 to March 1, 1980, for use as a municipal landfill (TPCHD, 2010; Weyerhaeuser, 2014; Ecology, 2021). The Site has been undeveloped since the informal closure of the landfill in 1980 (Parametrix, 1996; TPCHD, 2010). Weyerhaeuser sold the surrounding land to State Parks in 2010 (AINW, 2021). Site development beyond the cleanup action is not currently planned.

2.2 Geologic Setting, Hydrogeology, and Natural Hazards

The Site is on a bluff north of the Mashel River. The steep bluff transitions to flat ground, wetlands, and eventually the Mashel River floodplain and riverbanks. The top of the bluff is approximately 150 feet higher than the wetlands at the base of the landfill.

Ongoing erosion and mass wasting on the slopes of the bluff have resulted in natural slopes as steep as 1.5 feet horizontal (H) to 1 foot vertical (V) (H:V). Landfill deposits on top of the erosional slope are as steep as 1H:1V, with evidence of slope instability and debris runout.

The Site is located within the Vashon Formation, a Pleistocene-age deposit of glacial drift. Glacial till of the Vashon Formation is dense and has low permeability (Savage, et al., 2000; and Harp et al., 2006). Three units characteristic of the Vashon Formation are present beneath the former landfill. The depth and thickness of the strata vary with landscape position. The data is limited but adequate to describe the following generalized stratigraphic model.

- **Surficial Gravel and Sand Unit.** Gravel and sand with some silt extends from the ground surface to approximately 30 feet below the ground surface (bgs). Although the shallow gravel unit is relatively dry, perched groundwater overlies the underlying till, consistent with the elevation of a natural spring present at the northwest corner of the landfill. The uppermost unit is characteristic of recessional outwash resulting in variable but overall higher hydraulic conductivities, as compared to the underlying intercalated till (Savage, et al., 2000).

- **Intercalated Silt, Clay and Sand Unit.** Vashon till, consisting of very dense to dense silt, sand, and clay, extends from approximately 30 to 90 feet bgs. The Vashon till is very dense to dense with low hydraulic conductivity (Savage, et al., 2000).

- **Gravel and Sand Unit.** A water-bearing gravel and sand unit underlies the till from approximately 85 to 100 feet bgs on the bluff above the landfill. As indicated in Figure 3, the continuity of the Gravel and Sand Unit is uncertain, given limited data. Water levels in piezometers in the sand/gravel are shallower than the contact between the sand/gravel and the overlying till, indicating confined conditions. Confined conditions are consistent with the dense and low hydraulic conductivity of the overlying till and probably indicative of an upward hydraulic gradient from the sand/gravel into the till.

- **Mashel Formation.** The Mashel Formation underlies the Gravel and Sand Unit. The Mashel Formation is a dense and thick stratum of silts, sands, and clays, and underlies the Gravel and Sand Unit. The Mashel formation is considered to be an aquiclude to deeper vertical movement of groundwater.

Groundwater relevant to the cleanup action is shallow and perched on the low-permeability till (see Figure 3-2 of the RI/FS [GSI, 2024a]). The conceptual hydrogeologic model reflects conditions observed during drilling and as described in the technical literature. The conceptual hydrogeologic model assumes that the shallow perched groundwater encountered in PZ-05 expresses as a spring (see location on Figure 4). Shallow groundwater may also flow on top of the till and through the glacial outwash of the Vashon Formation, possibly in contact with contaminants leached from the landfill.

At the base of the bluff, shallow groundwater and surface water perch on the low-permeability subsoil (likely the Vashon till, but possibly the Mashel Formation or other low permeability strata) to create the wetlands at the toe of the landfill. Other seeps and springs are present near the toe of the landfill and likely originate from surface water infiltration above the landfill or over the landfill itself, or from groundwater in contact with waste.

The conceptual hydrogeologic model (GSI, 2024c), built on information presented in the RI and published by Savage et al. (2000), indicates that groundwater in the deeper Gravel and Sand Unit is confined by the low permeability till above. Groundwater in the Gravel and Sand Unit flows to the south-southwest toward the Mashel River. Beneath the waste prism, the deeper groundwater is likely isolated from landfill impacts by the thick sequence of low-conductivity till above and an apparent upward vertical gradient. Closer to the toe of the landfill, the lithologic sequence and hydraulic communication between strata is less clear. Notwithstanding the uncertainty, the information supports the model that hydraulic gradients are vertically upward from the gravel and sands near the toe of the landfill, and groundwater would seep from the Sand and Gravel Unit upward, rather than downward from the waste into the Sand and Gravel Unit. Hence, the Sand and Gravel Unit is isolated from the landfill and not relevant to the cleanup action.

The Site conditions pose natural hazards. Consideration of these natural hazards informs the design of the cleanup action. The existing slopes adjacent to the Site are very steep and marginally stable, as indicated by geotechnical analysis and observations of a possible head scarp from a historical landslide near the crest of the slope to the east of the former landfill. The addition of landfill waste over the steep slopes creates an unstable condition where waste is periodically driven downslope by a combination of gravity and precipitation.

Heavy precipitation may erode the slope and lead to increased flow along the springs flow path, exposing waste or mobilizing impacted soils. Landslide risk also increases with precipitation. Climate change may increase these hazards. Other climate indicators, including wildfire potential and temperature extremes, were considered, but the impacts of these indicators were relatively low at the Site (U.S. Federal Government, 2023).

The waste is currently at its angle of repose (i.e., the maximus stable slope), and shaking due to an earthquake could result in slope failure and possible runout of waste into the wetland. Historical earthquakes include the 2001 magnitude 6.8 Nisqually earthquake, the 1965 magnitude 6.7 Puget Sound earthquake, and the 1949 magnitude 6.7 Olympia earthquake. A similar earthquake near the Site could produce severe, long-duration ground shaking.

2.3 Nature and Extent of Contamination

The RI/FS (GSI, 2024a) and CAP (Ecology, 2024a) define the Landfill Area and the Wetland Area as two distinct areas of the Site to frame the cleanup action (Figure 4). The Landfill Area encompasses the waste prism (the area with appreciable waste accumulation), dispersed landfill waste and impacted soil, and the interface between the waste prism and the wetlands, including a small portion of the delineated wetlands and an area at the bottom of the landfill and beneath the waste prism that is inferred to be wetlands based on likely soil type and hydrology of the landscape position. The "Wetland Area" refers to the portions of the Site between the toe of the Landfill Area and downgradient/downhill end of the Site that is delineated as wetlands. The Wetland Area contains dispersed landfill debris and low COC concentrations in soil.

Soil in the Landfill Area is contaminated with several contaminants of concern (COCs) that pose risks to human health and the environment. In the Landfill Area, COCs are metals; semivolatile organic compounds; and total petroleum hydrocarbons (TPH), as gasoline-range organics (GRO), diesel-range organics (DRO), and oil-range organics (ORO). In the Wetland Area, soil contamination risks to human health are limited to potential exposures to TPH-GRO. The ecological risks in Wetland Area soil are limited to potential exposures to TPH-DRO/ORO.

Iron and zinc, thought to originate from the landfill, are COCs in shallow groundwater. Iron exceeds only the potable water aesthetic criterion (i.e., not a human-health based criterion).

Zinc and hexavalent chromium are COCs in surface water. The landfill is the likely source of the zinc. Sampling locations indicate that the landfill is not the source of the hexavalent chromium. Hexavalent chromium was detected in the spring flow at concentrations above the surface water cleanup level (CUL) in one 2021 water sample and below the CUL in another 2022 sample. Hexavalent chromium was detected in two shallow upgradient groundwater samples from PZ-05 (2021 and 2022). The detections indicate that the landfill is not the source of the hexavalent chromium because both the spring and PZ-05 are upgradient of the landfill.

2.4 Site Ownership

In 2010, Washington State designated 1,230 acres of land surrounding the Property as Nisqually State Park (Fields, 2010). Weyerhaeuser currently owns most of the Site, which largely falls outside of the Nisqually State Park. Weyerhaeuser anticipates owning the Property during construction.

3 Cleanup Action and Cleanup Goals

The RI/FS (GSI, 2024a) and CAP (Ecology, 2024a) describe the final cleanup actions by Site remediation area (i.e., the Landfill Area and the Wetland Area)(Figures 3 and 4). The cleanup actions for the Site remediation areas differ by CULs, points of compliance (POCs), and cleanup goals, as summarized in the following sections.

3.1 Landfill Area Cleanup Action

The cleanup action for the Landfill Area includes removal of both waste and impacted soil and post-removal confirmational monitoring with institutional controls (ICs), as necessary. Approximately 23,300 cubic yards of landfill waste and Landfill Area soil exceeding CULs beneath the waste prism will be excavated to the maximum extent practicable. After excavating the landfill waste and contaminated soil, the remaining clean soil will be cut back, as needed, to a final slope of approximately 2H:1V in the Landfill Area (Figure 3). Slopes may be steeper than 2H:1V in areas outside the former landfill prism. If analysis demonstrates that the cleanup action will destabilize adjoining slopes, the design and construction will include measures to stabilize the adjoining slopes to their existing condition or better. After grading and stabilization, imported or reclaimed topsoil will be placed and planted to restore ground surface to replicate native conditions in disturbed areas.

Sitewide ICs will prevent use of shallow groundwater and surface water as potable water unless and until monitoring shows concentrations of COCs in the surface water and groundwater at the monitoring points are below CULs.

3.2 Wetland Area Cleanup Action

The selected cleanup action in the Wetland Area includes removal of large waste (e.g., tires, auto bodies, appliances, timber, etc.), monitored natural attenuation, and ICs (Figures 3 and 4). Areas disturbed in the wetland will be restored by using clean topsoil of suitable characteristics to bring the elevation back to existing grade, and the new surface will be planted with native vegetation. Soil to be used for backfill (either reused or imported) must meet applicable Ecology requirements for soil quality.

As described in the CAP, Wetland Area soil with low concentrations of metals and TPH concentrations that exceed the CULs will remain in place to preserve the existing and high-functioning wetland ecosystem. TPH-GRO/DRO/ORO concentrations in Wetland Area soil will naturally attenuate after the Landfill Area waste and associated contaminated soil is removed. ICs in the Wetland Area will prohibit use of shallow groundwater and surface water as potable water and control access to and contact with Wetland Area soil unless and until monitoring shows concentrations of COCs are below CULs.

3.3 Cleanup Levels

Final site-specific CULs for soil, groundwater, and surface water COCs, in accordance with WAC 173-340, based on applicable receptors and exposure pathways are defined in the CAP (Ecology, 2024a). Soil CULs were developed in the RI/FS for both the Landfill Area and Wetland Area separately to account for the differences in the applicable exposure pathways (GSI, 2024a). Table 1 summarizes the CULs for soil (by Landfill Area and Wetland Area), groundwater, and surface water.

3.4 Points of Compliance

The CAP has separate POCs for the Landfill Area and in the Wetland Area. The soil POC is where the soil CULs must be attained, consistent with WAC 173-340-740(6). The POC for soil is based on human direct contact and ecological exposures. The CULs apply to soils throughout the Site (Figure 4) from the ground surface to 15 feet bgs for human exposure and from the ground surface to 6 feet bgs for ecological exposure, and throughout the entire saturated soil column for the protection of groundwater by the leaching-to-groundwater pathway.

A standard groundwater POC provides for a comprehensive assessment of COC concentrations in groundwater before and during the cleanup action and monitoring period, consistent with WAC 173-340-720(8). At the Site, shallow groundwater that perches on the low permeability strata, and may contain COCs leached from the landfill, discharges near the toe of the Landfill Area into the Wetland Area. Removal of the source of the COCs in the landfill waste and impacted soil and Wetland Area waste will decrease COC concentrations in groundwater Site wide. For the cleanup action, the groundwater POC is the location in perched shallow groundwater at the toe of the Landfill Area, and representative of COCs in groundwater site-wide, where COC concentrations must meet the CULs at the end of the cleanup restoration timeframe (i.e., source removal and natural attenuation period).

The groundwater POC monitoring locations will be four monitoring wells at or near the toe of the slope (Figure 4). Two wells upgradient of the Landfill Area will monitor background (upgradient) conditions in the sand and gravel unit. The background wells will not be POC wells and will be monitored only as part of the Confirmation Monitoring Program. This configuration of groundwater monitoring wells differs from that in the CAP (Ecology, 2024a), which proposed two wells on a bench in the middle of the Landfill Area and two wells at the toe of the slope. In consultation with Ecology, the POC monitoring wells that had been planned in the mid-slope locations will not be installed due to concerns about their constructability and utility. Section 7.4 discusses these changes.

A standard surface water POC will be in the Wetland Area near the Property boundary (Figure 4). The surface water POC is where the surface water CULs must be attained, consistent with WAC 173-340-730(6), in a location where surface water runoff may concentrate along the generalized flow path to the Mashel River. The monitoring location integrates spring and seep flows, represents surface water leaving the Site, and is an adequate indicator of potential transport of COCs in surface water to the Mashel River. The location of the POC surface water monitoring can be adjusted seasonally to sample where water accumulates under seasonal flow conditions.

3.5 Cleanup Goals

The cleanup action complies with requirements of WAC 173-340-360(2)(b). The cleanup action will remove the sources of contamination (i.e., waste and associated impacted soil from the Landfill Area and waste from the Wetland Area) and achieve cleanup standards within a reasonable restoration timeframe. After eliminating COC sources, the estimated natural recovery restoration time is 10 years. Monitoring will demonstrate that the cleanup action has attained CULs in soil, groundwater, and surface water, per WAC 173-340-400.

4 Regulatory and Permitting Requirements

The following sections describe the regulatory and permitting requirements that must be met for the timely implementation of the cleanup action.

4.1 Regulatory Requirements

Table 2 lists applicable regulatory requirements of the cleanup action, as defined in WAC 173-340-710(3). Ecology and other regulatory agencies may identify additional requirements and, if so, will assess whether modification of the cleanup action design is necessary. As required by the State Environmental Policy Act (SEPA) in WAC 197-11-310, Ecology was the lead agency and evaluated the environmental checklist prepared for the cleanup action. Ecology has issued a Determination of Non-Significance for the CAP.

State agencies and local governments were consulted to identify potentially applicable and to obtain guidance regarding the substantive requirements for permits exempted under Revised Code of Washington (RCW) 70.105D.090. Ecology has identified permits, substantive requirements, and procedural exemptions as they relate to the planned cleanup action.

4.2 Permitting and Substantive Requirements

The following sections summarize the required or relevant permits and substantive requirements.

4.2.1 Washington Department of Ecology Construction Stormwater General Permit

Coverage under Ecology's Construction Stormwater General Permit (CSWGP) is a requirement of the cleanup action. Water management, erosion, and sediment control will be in accordance with the following:

- Provisions of Chapter 90.48 RCW (State of Washington Water Pollution Control Act)
- Title 33 United States Code, Section 1251 et seq.
- The Federal Water Pollution Control Act (Clean Water Act) as described in the National Pollutant Discharge Elimination System CSWGP
- The construction Stormwater Pollution Prevention Plan (SWPPP) being prepared for the Site

A CSWGP is required for construction that includes clearing, grading, and/or excavation of an area that results in the disturbance of one or more acres and discharges stormwater to surface waters of the State. Permittees are required to meet the conditions specified in the CSWGP pertaining to planning, monitoring, sampling, reporting, and recordkeeping, and the implementation of Best Management Practices (BMPs) consistent with the *Stormwater Management Manual for Western Washington* (Ecology, 2024b) or other Ecology-approved methods. The SWPPP details how erosion and sediment control BMPs will be implemented during construction to meet permit requirements. A Notice of Intent for the CSWGP application was submitted on August 1, 2024 (Application ID 48509). GSI is working with Ecology to develop the SWPPP to support the CSWGP. The CSWGP and the SWPPP for the Site will be included as attachments to the Construction Plans and Specifications.

4.2.2 Joint Aquatic Resources Permit Application and Nationwide Permit 38

A Joint Aquatic Resources Permit Application (JARPA) is a joint application for federal, state, and local water quality permits. In response to a JARPA, the U.S. Army Corps of Engineers (USACE) issues permits under

Section 404 of the Clean Water Act to regulate discharges to waters of the U.S. and wetlands, including Nationwide Permits that are generally applicable to certain types of projects, and Ecology issues a Section 401 Water Quality Certification per Section 401 of the Clean Water Act to affirm that permitted activities meet state water quality standards to protect surface waters of the state.

Weyerhaeuser submitted a JARPA for the Eatonville project on February 16, 2024, and submitted updated drawings ("Former Eatonville Landfill Conceptual Mitigation Plan") in June 2024 to describe removal of the landfill and impacted soil. In response to the JARPA, the USACE issued coverage under the Nationwide Permit 38 to authorize activities related to containment, stabilization, or removal of hazardous and toxic waste under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. USACE's December 9, 2024, authorization letter (USACE, 2024) and attachments describe requirements of the Nationwide Permit 38 for the planned work. Annual monitoring reports must document performance monitoring and as-built reports and drawings will document the cleanup action results. USACE determined that the project complies with the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the National Historic Preservation Act, provided that the work follows the general and specific conditions of the permit. In addition, USACE determined that the cleanup action complies with Ecology's Water Quality Certification requirements and Coastal Zone Management consistency determination, and no further consultation with Ecology is required.

4.2.3 Washington Department of Fish and Wildlife Hydraulic Project Approval

RCW 77.55 requires a Hydraulic Project Approval (HPA) from the Washington Department of Fish and Wildlife (WDFW) for projects that will occur in or near waters of the State. The HPA approval is intended to protect fish and aquatic habitats. The cleanup action is exempt from the procedural requirement of obtaining an HPA, but the cleanup action will follow the substantive requirements because the Site is near the Mashel River, and there is an intermittent connection between the Landfill Area and the River. Weyerhaeuser held a pre-application meeting with WDFW. WDFW will provide a letter acknowledging substantive requirements (Portia Leigh, WDFW, email to Benjamin Johnson, GSI, October 9, 2024).

4.2.4 Pierce County Fill and Grade Permit

A Pierce County Fill and Grade Permit regulates work done without a site development permit. Remediation projects are exempted by the County for this type of permit. However, Pierce County will be engaged in a discussion of the cleanup action and determine whether any County requirements can be accommodated in the SWPPP. A substantive requirements acknowledgement letter for this purpose can be requested, upon Ecology request.

5 Investigations

The following sections describe pertinent Site investigations.

5.1 Remedial Investigation and Feasibility Study

The RI occurred between 2021 and 2022. This section summarizes the results of the RI that informed the FS, as described in the *Draft Remedial Investigation/Feasibility Study* (GSI, 2024a). The objectives of the RI were to identify the nature and extent of contamination and to collect data sufficient to evaluate and recommend cleanup action alternatives in the FS. The FS considered alternatives to address the objectives of the cleanup action. The CAP summarizes the FS the selected cleanup action. This EDR summarizes relevant site details and incorporates elements of the FS and CAP to develop the assumptions and the basis of the design of the cleanup action.

Two sitewide sampling events in 2021 and 2022 evaluated contaminants of potential concern (COPCs) in soil, groundwater, and surface water. A subsequent 2022 soil investigation further delineated metals concentrations in wetland soil. Other investigations in 2021 and 2022 included landfill soil gas measurements, a geotechnical evaluation of the waste prism, a geophysical survey (to determine waste thickness), a land/elevation survey, a wetland delineation, and a terrestrial ecological evaluation.

Landfill-related COPCs were evaluated using Ecology-approved screening levels. The COPCs with detectable concentrations exceeding human health and/or ecological screening levels are COCs. The CULs consider complete human health and ecological exposure pathways. The proposed CULs were developed for the COCs and for the different Site media. Standard POCs were proposed for Site media. The FS considered and recommended cleanup action alternatives for the Landfill Area and the Wetland Area.

5.2 Pre-Design Investigations

Pre-Design Investigations (PDIs), including a topographic survey, spring flow rate gauging, and geotechnical investigation support development of the 50% design for the Site. The following sections summarize the investigations. Appendices A1 through A3 present these PDI data.

5.2.1 Survey

Foresight Surveying, Inc. (Foresight), of Chehalis, Washington, conducted a land survey of the Site between July 8 and 11, 2024. The survey collected topographic data with a minimum 1-foot spatial resolution for the Site and relevant portions of adjoining State Parks' land; identified surveyed and digital property boundaries; identified significant above-ground features in Work Areas; and established surveyed control points. Section 7.1.1 describes Work Areas. The specific scope of the land survey included the following:

- Establish the boundaries of the Property.
- Collect topographic and surface feature data for the east and west Nisqually State Park access points from adjoining public roadways to the utility corridor road leading to the Property, the full length of the utility corridor road leading to the Property and proposed construction staging area, and the connecting access from the utility corridor road to the Landfill Area.
- Collect topographic and surface feature data for the Landfill Area, including the location of a naturally occurring spring that daylights on the northwest portion of this area.
- Visually identify and survey the extents of waste within the Wetland Area and collect topographic and surface feature data to further delineate the Wetland Area.

- Establish monuments and control points for future use at the Site.

The surveyors used standard closed traverse and radial survey and global positioning system (GPS) network real time kinematics (RTK) GPS methods. Horizontal and vertical measurements were compared against relevant controls to demonstrate the survey accuracy. Some portions of the Work Areas were not surveyed due to access limitations, and there is some uncertainty surrounding surface topography in these areas. Foresight completed the survey scope based on their understanding of the expected extents of earthwork impacts for the cleanup action at the time. Based on the 50% grading plans, earthwork impacts may extend onto additional portions of adjoining State Parks' land (Figure 5), and supplemental surveys of these areas will be needed to support the final grading plan. Appendix A1 is the Survey Report.

5.2.2 Spring Flow Rate Gauging

GSI collected flow measurements on July 8, August 20 and 21, and September 30, 2024, from the naturally occurring spring that daylights near the top of the Landfill Area near the northwest corner of the Site (Figure 4). The measurements are used to design temporary and permanent conveyance of the spring flow.

Flow rates were measured at the same location near its discharge to provide a consistent point of reference. Measurements were collected by routing as much of the spring discharge as possible to a 5-gallon bucket and measuring bucket fill time. Several methods were used to concentrate the flow and reroute the spring flow to the measuring point. The percentage of flow not captured was estimated visually, and these estimates were incorporated into the flow-rate calculations. Appendix A2 is the Spring Flow Gauging Results. Measured flow rates varied from approximately 33.5 gallons per minute in July to 14.9 gallons per minute in September, indicating that spring flow decreases during the dry season. Maximum spring discharge may be higher in the wet season. The temporary and final spring rerouting designs will account for possible higher flows and contributions from precipitation/runoff.

5.2.3 Geotechnical Investigation

Greenfield Geotechnical, LLC., (Greenfield) of Portland, Oregon, conducted a pre-design geotechnical investigation on August 20 and 21, 2024. Greenfield investigated characteristics of near-surface native soils outside of the waste prism to supplement geotechnical data collected during the RI and to support the design of temporary and final slopes. The 2024 investigation is summarized below, and the Geotechnical Investigation Results memorandum (Appendix A3) provides details.

Subsurface conditions around the margins of the landfill were explored by advancing 19 shallow hand auger borings (HA-11 through HA-21 and HP-1 through HP-6) and collecting 1 grab sample (G-1) from the Site. Soil conditions observed in the borings were logged and select soil samples (G-1, HA-14W, HA-15B, HA-19) were analyzed for geotechnical parameters, including percent moisture and fines content.

Observations during the geotechnical investigation combined with boring logs and soil/groundwater data from previous investigations refined the understanding of Site geology and its potential effect on Site grading during the cleanup action.

Soil conditions were generally consistent with previous investigations. Some apparent landfill waste was observed in borings HP-3, HA-14, and HA-20. Additionally, a possible landslide head scarp was observed at the top of the slope to the east of the landfill, indicating that the existing slopes in this area may be unstable. The potential instability of existing slopes at the Site must be considered when developing grading plans for the Site.

5.2.4 Cultural Resources Survey

A September 2024 study assessed the potential presence of cultural resources in the cleanup action area and support areas (AAR, 2024). The design process has expanded the grading area of the cleanup action (Figure 5). The expanded area may require amendment of the 2024 survey. Ecology will update their cultural resource determination based on the analysis and conclusions presented in the Cultura Resource Report.

In general, the survey found that no cultural resource monitoring will be required during the cleanup action in the Landfill Area if the Inadvertent Discovery Plan (IDP) for the project is followed (AAR, 2024). The level of investigation conducted throughout other cleanup action use Areas 1 through 4 and 6, was sufficient, and archaeological resources would have been found if they were present (Figure 5) (AAR, 2024) No additional archaeological investigations are necessary in these areas, or in the potential cleanup action use area, which was assessed as having low potential to contain archaeological resources (Figure 5) (AAR, 2024). Based on the findings of the final report, Ecology may refine the Area of Potential Effect and requirements for cultural resource monitoring in an updated cultural resource determination and IDP.

6 Design Basis

The design basis is the goals and assumptions that guide the design. The following sections describe the basis of the design for the cleanup action.

6.1 Current and Future State Parks' Land Use

Neither Weyerhaeuser nor State Parks uses the Property for any purpose. However, due to the possible future use of the Property by State Parks, the design will consider possible access by the public after the cleanup is complete. Currently, Nisqually State Park is zoned for park and recreational use and the Property is zoned as rural 10.

6.2 Cleanup Action

The cleanup action will excavate the landfill to maximum extent practicable to remove the source of the COCs and then restore the land. Per the CAP (Ecology, 2024a), after the cleanup action is complete and the final surface is regraded, the disturbed areas will be planted with a mix of native vegetation for restoration.

The CAP includes removing the landfill waste to the maximum extents practicable and an estimated 1 foot of potentially impacted soil beneath the landfill waste. The actual depth of impacted soil is not known. Performance monitoring (see Section 8) during the removal will assess attainment of the soil CULs.

The wetlands and wetland buffers (a 150-foot border around delineated and inferred wetlands) will be temporarily impacted by the construction, and these areas will be restored to their previous condition or better. The Restoration Plan is Appendix B. Confirmation monitoring and 5-year reviews will evaluate attainment of the CULs and establishment of restoration plantings.

6.3 Cultural Resource Protection

The cleanup action will protect cultural resources. A 2021 preliminary cultural assessment found a high probability of encountering pre-contact archaeological resources on the top of the terrace (above the Landfill Area) and from the toe of the terrace to the river (Wetland Area), but there was low probability of precontact resources on the face of the steep bluff (Landfill Area) (AINW, 2021).

Ecology concludes that the Site is high risk for the discovery of pre-contact artifacts (Ecology, 2024b). Ecology's determination may be updated based on the PDI Cultural Resource Survey and Cultural Resource Report. Pending Ecology's determination, the IDP will be updated to account for the construction, consistent with WAC 173-340-815, and an AMP will be developed if warranted by the findings of the Cultural Resource Survey (Ecology, 2020).

6.4 Geotechnical Stability

The cleanup action will be designed to provide geotechnically stable slopes at the Site during and after construction. Field observations indicate that gravity and precipitation move waste downslope. Stability analyses and observations indicate that the steepest slopes of the waste are likely unstable, and the waste is near its angle of repose. Such conditions and processes will continue if the Landfill Area slope is unmitigated.

The natural condition of slopes beneath and surrounding the landfill is unstable due to lithology, soil conditions, and landscape position. There is visual evidence and literature documentation of instability (sloughs and landslides) on the steep slopes of the Mashel river channel (USGS, 2018; Edwin et al., 2006).

The geotechnical design objective for the Landfill Area is stable slopes during construction, and the construction must not exacerbate the instability of existing slopes adjacent to the Site. Grading the Landfill Area to shallower slopes and installing slope stabilizing measures as part of construction will stabilize the slopes in the Landfill Area. However, the design and construction are not intended to improve the stability of the natural slopes surrounding and beyond the Landfill Area. Future instability (including possible landslides) in the natural slopes surrounding the Landfill Area is likely permanent.

The final slope design is based on the potential for shallow surficial sliding of the newly excavated slope, the presence of possible seepage at the toe of the landfill, and the possibility of historical landslide. The design objective is stable slopes in the Landfill Area.

Steep slopes and surface conditions limited access to characterize lithology in the Landfill Area, and uncertainty remains regarding conditions that will be encountered during construction. Accordingly, excavation may encounter unstable conditions during construction that may require modification to the grading plan in the Landfill Area and the adjoining steep slopes. The final design will consider a contingency for a larger excavation footprint beyond the Landfill Area to achieve stable final slopes. The excavation contingency may include expanding the slope grading footprint approximately 100 feet farther onto State Park's land than shown in the 50% Design excavation plan (see Figure 5). The need for an expanded excavation footprint will be evaluated during construction based on the subsurface conditions encountered during excavation and at the direction of the geotechnical engineer. The final slope will be vegetated, and no buildings or roadways are currently planned.

Geotechnical analyses indicate that a 2H:1V final slope in the Vashon Glacial Drift is appropriate to meet the geotechnical design objective. Subsurface information is absent at the base of the landfill, but excavations will likely need to be at least 35 feet deep to establish the 2H:1V slope in the Vashon Glacial Drift. A series of cutoff drains at least 4 feet deep should be installed along the final slope to collect surface runoff or any seepage from the slope. The final slope should be vegetated with a rooted zone that extends to a minimum of 8 inches deep.

Seismic design is based on a Contingency Level Earthquake, as defined by a 10 percent probability of exceedance, which is equivalent to a 475-year return period. Native soils ranging in consistency from medium to very dense were encountered at the Site during subsurface investigations, indicating that a USGS earthquake soil classification between Site Class C (soft rock or very dense soil) and Site Class D (stiff soil) is appropriate for design. The 475-year peak ground acceleration is 0.33 g (USGS, 2018), where g is the acceleration of gravity. A deep intraplate earthquake is the greatest contributor to the hazard and has a characteristic magnitude of 6.8.

6.5 Stormwater Management

Stormwater management will be in accordance with the CSWGP and a SWPPP to control erosion and prevent discharge of potentially contaminated stormwater to waters of the State. Groundwater that surfaces at the toe of the slope intermingles with surface water in the wetland that perches and flows within the shallow subsurface on the low-permeability till. The CSWGP and SWPPP will manage Site stormwater runoff, including potential impacts to groundwater or seeps in contact with contaminated soils, surface water present within the wetland, and the naturally occurring spring.

The natural spring near the northwest corner of the Landfill Area discharges from the slope and flows in a web of channels into the Wetland Area. During construction, the spring will be temporarily contained and rerouted to discharge at the toe of the slope below the Landfill Area. This will reduce the potential for saturated soil and allow for construction of a permanent armored channel to contain the spring flow on the final graded slope. The temporary rerouting of the spring will distribute the spring water along the toe of the slope outside the construction area and will, therefore, minimally change the surface water conditions in the wetland. These actions are in accordance with the USACE Nationwide and Section 404 Permits. Surface water in the inferred wetlands may still contain surface water that will require management during construction.

It is possible that COC-impacted shallow groundwater will daylight as diffuse seeps from areas at the toe of the slope during construction. Routing the spring around the Landfill Area during and after construction and completing the construction during the dry season will minimize the potential for seepage. The known spring is not in the Landfill Area. The potential for diffuse seepage of impacted groundwater during construction is uncertain, and a groundwater treatment contingency, consisting of passive treatment methods placed at the downgradient end of the Site's wetland, will be available to treat surface water discharges, should they occur. The SWPPP will describe the treatment.

6.6 Restoration

The cleanup action will temporarily disturb vegetation and soil during excavation of the landfill and by grading to achieve stable slopes. The slope will be restored to the pre-landfill ecological condition through implementation of the Restoration Plan (Appendix B). In general, the cleanup action will restore the slope consistent with nearby native conditions during a 10-year performance monitoring period. After the cleanup action is complete and the removal, grading, and staging areas are graded to final elevations with clean soil, the disturbed areas will be planted with native vegetation. A Vegetation and Monitoring Plan, to be developed in coordination with Ecology, will specify a mix of native trees, shrubs, and herbaceous vegetation to be planted and maintained to be consistent with the native plant communities and ecology of the area.

7 Construction

The following sections summarize construction of the cleanup action, including preparations; excavation, waste removal, and backfill; disposal; grading; well installation; and restoration. The selected construction contractor (Contractor) will execute the construction. GSI is the Engineer of Record (Engineer) and responsible for ensuring the cleanup action is built according to the approved design.

7.1 Preparation

Preparation includes identification of Work Areas, utility protection, stormwater management and pollution prevention, vegetation removal, and otherwise preparing the Site for construction, as described below.

7.1.1 Work Areas

Work Areas include the Site, Property, and portions of Nisqually State Park that are needed to construct the cleanup action. Figure 5 shows the Work Areas. Areas 6 and 7 are the primary construction areas, namely the Landfill Area and the Wetland Area (which include the waste removal and IC areas). The eight Work Areas are as follows:

- **Area 1:** The roads leading up to the Property. Actions may include installation of security gates, grading, placement of gravel, limbing of trees, leveling of a berm at the east end of the road adjacent to Highway 7.
- **Area 2:** The area immediately in front of and to the side of the entrance to the Property to allow construction access. Actions may include removal of trees, grading, placement of gravel.
- **Area 3:** The old road grade and new trail tread leading from Property into State Parks' land on the northwest side. Actions may include removal of trees, grading, establishment of a foot trail to allow access for sampling, and placement of gravel.
- **Area 4:** The upper portion of the Property.
- **Area 5:** The Landfill Area cleanup action.
- **Area 6:** The Wetland Area waste removal.
- **Area 7:** The wetland soil IC monitoring area. This area encompasses portions of the Wetland Area (Area 7). No ground disturbance activities are planned in this area outside of Area 7 waste removal extents.

State Parks may elect to abandon the security gates installed in Area 1 and not maintain the gravel pad (Area 2) and road grade trail (Area 3). In addition, trees removed as part of the development of these areas would be removed and staged in a manner that is agreeable to State Parks. The Site Control Plan will define how potential conflicts between the cleanup action and use of State Parks' land and surrounding roadways will be addressed.

7.1.2 Utility Protection, Relocation, and Restoration

The Contractor and Engineer will arrange public and private utility locates within Work Areas to clear them for subsurface work. The Contractor will contact the Washington Utility Notification Center, which will notify public utilities to mark underground installations present in the removal area. The Contractor will also subcontract a private utility locator to mark the locations of private utilities, if any, within the Work Areas. The Contractor must avoid, protect, decommission, or temporarily reroute, as necessary, any utilities before beginning work in a given area. The Engineer will oversee the utility locates and notify the appropriate agencies at least 7 days before the Contractor excavates near utilities and for obtaining any necessary inspections. The Site is remote, and subsurface utilities have not been identified during previous investigations and are not expected. Overhead power lines are present on State Parks' land and in the staging area (Area #2) (Figure 5).

7.1.3 Erosion Control and Stormwater Pollution Prevention

Standard BMPs will be implemented during construction to control erosion, limit offsite sediment transport, and protect waters of the State from contaminated Site stormwater. BMPs will be employed in Work Areas, including the Wetland Area, the Landfill Area, and staging areas. BMPs will cover Site preparations, excavation, grading, capping, and backfilling, and surface restoration. The Engineer will specify and the Contractor will implement BMPs consistent with the SWPPP and Contaminated Media Management Plan (CMMP), which will be attachments to the Construction Plans and Specifications.

The SWPPP and CMMP follow the guidance and requirements of the *Stormwater Management Manual for Western Washington* (Ecology, 2024b) and the CSWGP (Issued November 18, 2020). The SWPPP and CMMP cover details such as stockpile protection, prevention of truck trac-out, and standard BMPs.

Following is a summary of erosion control goals and methods:

- Vegetation clearing and grubbing will only be used as necessary, and existing vegetation and ground cover will be retained to the maximum extent possible to retain buffer zones and help limit erosion.

- Excavation and grading will be implemented with a phased approach to limit the extents of bare soil areas exposed at one time and the duration of exposure. The Contractor will attempt to minimize the length and steepness of temporary slopes as much as possible to limit erosion potential. The Contractor will stabilize disturbed slopes that remain bare for extended periods during construction. The design and specifications will identify performance criteria. The Contractor will propose and the Engineer will approve methods to achieve the objectives.

- Groundwater or potential seeps surfacing from the toe of the landfill and stormwater runoff will be channelized and contained to allow for construction and to channel flow to a discharge point. Shallow groundwater that is perched on the till underlying the landfill and seeps from the slope may contain COCs. Accordingly, the design will specify a contingency passive water treatment, and it will be ready to implement in the Wetland Area as a contingency to treat COCs in surface water in the discharge if sampling detects COCs during construction at concentrations exceeding stormwater monitoring criteria, as established in the SWPPP. The contingency treatment will consist of passive treatment at the directed discharge location or passive surface treatment upgradient of the discharge location using granular activated carbon passive filtration, broadcast activated carbon, or similar Ecology-approved methods consistent with the *Stormwater Management Manual for Western Washington* (Ecology, 2024b).

- The presence of the spring, piezometer data, and field observations indicate that shallow groundwater may be perched on the till under the waste prism. Groundwater seepage must be managed along the face of recently constructed slopes to avoid instability or erosion of the excavated slope. A series of sumps and ditches may be needed to manage seepage and overland flow to allow for construction. The Geotechnical Evaluation Report (Appendix C) and the 50% Design provide additional details.

7.1.4 Clearing and Grubbing

Trees, shrubs, brushes must be cleared from portions of the Work Area. Clearing and grubbing will occur in stages to minimize potential for erosion. The staging of clearing and grubbing will be timed to support the sequence of the excavation (see Section 7.2). The Contractor will select the means and methods of clearing.

Roots, stumps, and other vegetation in contact with the soil will be removed and reduced, as necessary. Vegetation and roots potentially in contact with contaminated soil will be stockpiled and segregated. Trees removed from State Parks' land will be removed and staged for State Parks' use. Trees removed from the Site may be used for onsite or offsite restoration or by State Parks for it uses. Section 7.3 describes material handling and transport.

Large branches, limbs, debris may be chipped and used as mulch or composted consistent with the Restoration Plan (Appendix B). Chipped green waste from native vegetation can be used as erosion control to help stabilize bare soil and support the re-establishment of native vegetation cover, especially if native seeds are present.

7.1.5 Piezometer Decommissioning

Five piezometers (PZ-01 through PZ-05) (Figure 4) provided groundwater information during the RI. These wells will be decommissioned to allow for construction and replaced with new wells to monitor the cleanup action.

A Washington-licensed driller will be contracted to decommission existing piezometers (PZ-01 through PZ-05), in accordance with WAC 173-160 and 173-162. The piezometers will be protected from damage before decommissioning. The driller will document the decommissioning.

7.1.6 Haul Roads and Work Pads

Haul roads and work pads will provide Site access and material staging. The surficial sandy soil may be sensitive to moisture and may be easily remolded. During wet conditions, upland construction traffic should be limited to haul roads and work pads constructed of relatively clean structural fill. The final Construction Plans and Specifications will include details regarding haul roads and work pads.

7.2 Waste Removal and Backfill

The following sections describe excavation, removal of large waste, and backfilling. The final design will specify details, and the Contractor will select methods.

7.2.1 Landfill Area Excavation and Grading

The cleanup action will excavate Landfill Area waste and impacted soil from the steep hillside. The cleanup action will include collecting large trash and debris from the ground surface beyond the primary landfill waste prism. Sheet C4 (Excavation Plan) of the Construction Plans and Specifications shows excavation boundaries (Appendix D).

The Geotechnical Evaluation Report (Appendix C) and Section 6.4 provide the geotechnical basis of the design, including slopes and subgrade. The 50% Design assumes that excavation can be performed on temporary 1.5H:1V slopes, but permanent slopes must be graded at a maximum 2H:1V to meet stabilization requirements per the Geotechnical Evaluation Report, unless the slopes are otherwise stabilized. The Contractor will determine the grading sequence in conformance with the geotechnical requirements.

The excavation will remove the unstable layer of loose sand described in the Geotechnical Report and establish in final cut in Vashon Glacial Drift, which likely consists of medium dense to dense sand or very stiff clay along the proposed grade. Subsurface data are limited or absent near the base of the Landfill Area, requiring field decisions for final grading.

Organic material, soft soil, or poorly compacted fill along the bottom of the planned slopes will be over-excavated to medium stiff or stiffer subgrade soils and replaced with structural fill. A qualified geotechnical engineer will observe conditions the exposed soil at the final slope grades and make a professional judgement of the suitability of the materials to support the excavated slope. If the conditions are deemed unstable, then contingent actions will be implemented. Exposed subgrades will also be observed for apparently low-strength materials such as unconsolidated sands before placing fill.

If the waste and loose sand are thicker than anticipated, additional excavation may be needed to achieve stable slopes during construction. Temporary slopes as steep as 1.5H:1V feet may be excavated in the Vashon Glacial Drift up to a maximum height of 15 feet. After the waste is removed to a subgrade of dense Vashon Glacial Drift, the temporary excavation should be backfilled to a final grade no steeper than 2H:1V, unless stabilized. Due to the potential for weak layers in the unconsolidated waste, vertical cuts exceeding 4 feet are not recommended without shoring. The Vashon Formation may contain boulders, requiring excavation and processing to break the boulders into smaller pieces.

A network of trenches and drains will likely be needed to minimize potential seepage along the face of the new slope. Drains will also be installed in backfill used to regrade sections of the slope. The Geotechnical Evaluation Report (Appendix C) and the 50% Design Construction Plans (Appendix D) provide additional details. The details will be more fully developed as the design progresses.

The anticipated excavation sequence is downward from the top of the slope, in a manner to retain a stable slope and to limit the area of exposed soils, thereby minimizing erosion. The Contractor will recommend methods to remove large waste items and then excavate the slope. A downward excavation sequence is also necessary to gain access to the lower waste prism, as characterization of the lower waste prism will not be possible until excavation and grading has progressed to provide sufficient access. Waste characterization is completed for the upper portion of the landfill (GSI, 2024b).

The 50% Design grading plan shows the expected excavation area and depths to remove the waste and the underlying soil and achieve stable slopes during construction. Observations of actual conditions encountered during construction and the recommendations of the geotechnical engineer could result in a larger excavation area, including additional area of impact on State Parks' land, as compared to that shown in the 50% grading plan. If visual and/or olfactory observations indicate that soil at the limits of the excavation is potentially contaminated or landfill waste is present, the additional materials will be either excavated immediately or additional analysis will be conducted (e.g., field contamination screening or sampling and analysis) to assess whether the material needs to be removed. Clean soil beyond the horizontal and/or vertical limits of the Landfill Area will be excavated, stockpiled, and characterized for disposal. Additional excavation will only be performed as directed by the Engineer or staff and with agreement by Ecology and the performing parties.

7.2.2 Wetland Area Waste Removal

The Wetland Area contains large waste items, including tires, auto bodies, and appliances. Heavy machinery and specialized equipment may be necessary to remove, handle, and sort large waste items. Removal of large waste items will progress starting with removal adjacent to the Landfill Area and working outward into the wetlands. No excavation of soil in the Wetland Area will occur, unless soil contains greater than 50 percent waste particulates. The Contractor will select removal methods.

The Contractor will sort large waste items (e.g., large concrete pieces, car bodies, tires, and other landfill debris) as practical to recycling. Waste will be stockpiled in the areas specified in the SWPPP and CMMP. Section 7.3 describes waste management.

7.2.3 Backfill and Compaction

The Geotechnical Evaluation Report (Appendix C) details the geotechnical basis and requirements of the design to achieve stable slopes. Certain areas of the excavation will be backfilled to balance excavation and filled to the extent possible. Materials used for drain backfill have specific characteristics and should be placed to meet the criteria in the Geotechnical Evaluation Report.

The 50% Design does not consider possible reuse of excavated soil. The 90% Design, to be developed in consultation with the design team, the Contractor, and the stakeholders, will evaluate excavation contingencies, stabilization, and criteria for disposal or reuse of clean excavated soil as compacted structural fill or topsoil. Soil to be used for backfill (either reused or imported) must be certified for use in the cleanup action. Section 7.2.4 provides additional information on materials testing. Section 7.3 describes material management and disposal.

7.2.4 Materials Testing

Import materials, including rock and topsoil imported from offsite, are required to construct the cleanup action. The Contractor will use only clean backfill verified through onsite testing of recycled material or the submittal of a supplier's certificate documenting compliance with the testing methods and results and the materials' characteristics. The Materials Testing Plan and the construction specifications will specify the analytes, sampling methods, and sampling frequency. An Ecology accredited laboratory must conduct the analyses. The Engineer will approve the import material before it is brought to the Site. Structural import materials such as rock and rip rap will be reviewed and approved by the geotechnical engineer before its use.

Certain materials (i.e., wood chips, vegetation debris, and clean fill [rock, outwash sands, and glacial till]) generated during construction may be used to construct the cleanup action. Materials from onsite sources will be tested for soil COCs, as outlined in the Materials Testing Plan, an attachment to the final Construction Plans and Specifications. In general, materials generated from the Property, including soil and rock, will be analyzed for soil COCs.

7.3 Material Management and Disposal

The cleanup action will excavate waste and contaminated soil from the Landfill Area to achieve the CULs. The excavated waste and soil will be disposed of at a permitted offsite facility (e.g., Pierce County's LRI Landfill). The CMMP and the Construction Plans and Specifications will describe the handling of the excavated waste, contaminated soil, and other materials.

During excavation, the Contractor and Engineer will evaluate waste as it is removed to determine appropriate handling methods based on physical considerations such as the waste size, composition, and potential for comingling with other waste types. Large waste items will be removed from the Wetland Area at the toe of the landfill waste prism, but wetland soil will not be excavated unless waste constitutes greater than 50 percent of the total volume, and it can be removed manually. The RI/FS estimated the volume of waste and underlying impacted soil to be 23,300 cubic yards.

The 50% Design has refined the volume estimates as follows:

- Wastes and comingled soils from the former waste prism to be disposed of - 22,000 cubic yards (This volume is comparable to the 23,300 cubic yards stated above.)
- Impacted soils assumed to be within 1-foot of the native soil contact throughout the Landfill Area to be disposed of - 3,000 cubic yards
- Unstable sandy soils that cannot be used as structural fill - 6,000 cubic yards
- Assumed to be “clean” soils to be moved during grading and managed as fill or for offsite use/disposal - 24,800 cubic yards
- Wetland Area wastes to be selectively removed and disposed of - 500 cubic yards

The Contractor will clear and grade areas to stockpile uncharacterized and potentially contaminated soil (i.e., suspected or confirmed soil impacted by landfill debris or contaminants in addition to the volume described by the first two bullets above) and other materials generated by the cleanup action that must be staged or characterized before disposal or reuse. Uncharacterized materials will be temporarily staged and maintained during sampling, analysis, and characterization of the material for offsite disposal.

GSI (2024a) described characterization of the upper half of the Landfill Area. The data indicate that the materials are non-hazardous and suitable for disposal at the LRI Landfill as LRI “special wastes” under a Waste Disposal Authorization (WDA) provided by the Tacoma-Pierce County Health Department (TPCHD, 2024). Wastes in the lower half of the waste prism must be characterized to support the WDA if they are to be disposed of at the LRI Landfill (TPCHD, 2024). The Lower Waste Prism Characterization Plan will be included in the Construction Plans and Specifications and will detail the characterization actions necessary for the lower waste prism.

Uncontaminated materials that must be managed during construction include cleared vegetation, uncontaminated soil and rock, and imported materials to be used for backfilling and restoration. Such materials will be stored in designated areas and reused or disposed of in accordance with the CMMP. Soil presumed to be uncontaminated and vegetation may be tested for most Landfill Area soil COCs before use or re-use during the cleanup action and restoration (Section 7.2.4). Large boulders and rock generated during the cleanup action will not require testing.

Excavated materials to be hauled offsite will be either loaded directly into covered haul trucks or temporarily stored in designated staging areas before loading and transport. Stockpiles of contaminated soil or waste and clean soil for reuse will be placed on plastic, bermed, securely covered, and labeled. Soil will be loaded from the excavations or stockpiles in a manner to limit dust generation, to the extent practical. The Contractor will be responsible for dust control.

Contaminated soil will be transported directly to the selected disposal facility (Resource Conservation and Recovery Act Subtitle D Landfill). The Contractor will implement measures to minimize track-out and cleanup incidental spills of materials from trucks onto public roadways.

7.4 Monitoring Well Installation

The existing piezometers upgradient of the landfill (PZ-01, PZ-02, and PZ-05) and at the base of the landfill in the Wetland Area (PZ-03 and PZ-04) will be decommissioned before construction (Section 7.1.5). After removal and grading are complete, two new monitoring wells will be installed upgradient of the Landfill Area to represent background conditions and four monitoring wells will be installed at the base of the Landfill Area (see Figure 4) as POC wells to monitor the cleanup action.

The July 2024 CAP (Ecology, 2024a) described four monitoring wells: two in the middle of the former landfill and two at the base of the slope. GSI later opined (GSI, 2024c) that installing wells in the till in the center of the Site would be difficult and dangerous, given the hardness of the till, very steep slopes, and unstable shallow soil. Wells in the till may not yield water or provide useful information, given the very low permeability of the till and the very low probability that COCs would leach from the landfill waste and through the till to depth. The modified POC wells will include two in the near-surface saturated zone (approximately 2 feet bgs), and two slightly deeper wells to the top of the till in nearby locations (screened approximately 2 feet to 6 feet bgs). Field conditions and safe access will dictate the well construction and completion depths. Two monitoring wells will also be installed upgradient of the Landfill Area to evaluate natural and area background conditions during compliance monitoring.

A Monitoring Well Installation and Development Work Plan will be part of the Performance Monitoring Plan. The work plan will show the well locations and design.

7.5 Restoration

Vegetation and soil will be disturbed while creating access, removing contaminated soil and debris, and staging materials. Constructing the cleanup action will temporarily disturb approximately 81,975 square feet of uplands, 26,355 square feet of wetland, and 97,972 square feet of wetland buffer. These numbers do not include permanent impacts from the routing of the springs flow path through a rock chute and other rock structures and the installation of monitoring wells. Restoration details will be updated as the design progresses.

The goal of the Restoration Plan (Appendix B) is to revegetate impacted areas with healthy, native plants, in compliance with WAC 173-340-410. The disturbed areas will be restored with native plantings, including a mix of native trees, shrubs, and herbaceous plants to approximate the presumed pre-landfill conditions (like surrounding undisturbed areas). The Restoration Plan describes vegetation types, planting locations, and monitoring. Monitoring (see Section 8) will assess restoration performance during a 10-year monitoring period.

8 Monitoring and Performance Assessment

This section describes monitoring and performance assessment during and after construction, pursuant to WAC 173-340-410. This program will consist of protection, performance, confirmation monitoring, and performance assessment. The Operations, Maintenance, and Monitoring Plan (OMMP) will describe monitoring after construction.

8.1 Protection Monitoring

Protection monitoring and mitigation protect human health and the environment during the construction and maintenance of the remedy. Protection monitoring applies to both the Landfill Area and the Wetland Area. The Health and Safety Plan (HASP) and CMMP (appendices to the Construction Plans and Specifications) will provide details. Documented compliance with the plans will demonstrate performance.

8.2 Performance Monitoring

Performance monitoring identifies whether the cleanup action meets the CULs. Performance monitoring is required for Landfill Area soil, Site groundwater, and Site surface water. A Performance Monitoring Plan (an attachment to the Construction Plans and Specifications) will describe the objectives, scope, COCs, regulatory requirements, screening criteria, and schedule for performance monitoring. Performance monitoring establishes a baseline after waste removal.

For soil, performance monitoring samples will be collected immediately after the landfill removal. Sampling and analysis during the excavation will compare COC concentrations in soil to the appropriate soil CULs. Interim evaluation and a performance monitoring report will document COC concentrations in soil and use statistical tools to demonstrate that the cleanup meets the CULs. By this approach, the average residual COC concentrations in soil will be the performance criterion, allowing that some COC concentrations in performance monitoring samples might be above the CULs (in less than 10 percent of the samples, and no sample may exceed two times the CUL). This approach may allow excavation at the perimeter of the landfill to be managed and constrained so that the excavation does not result in very steep and unstable slopes. The Performance Monitoring Plan will provide the details.

8.3 Confirmation Monitoring

Confirmation monitoring and 5-year reviews confirm the performance of the cleanup action. A Confirmation Monitoring Plan will be part of the OMMP. Confirmation monitoring will consist of the following monitoring events for Wetland Area soil, Site groundwater, Site surface water, and background groundwater:

- Quarterly monitoring for the first year after completing the cleanup action
- Semi-annual (twice per year) monitoring for the second and third years after completing the cleanup action
- Annual monitoring for the fourth and fifth years after completing the cleanup action and annually thereafter until concentrations of COCs in Site media are below CULs

WAC 173-340-420 requires 5-year reviews of the cleanup action’s performance. The 5-year reviews will evaluate chemical concentration trends to confirm that concentrations are trending toward the CULs.

9 Quality Assurance and Quality Control

The following sections describe the quality assurance/quality control procedures to be implemented during the cleanup action. These include construction quality assurance and quality control, monitoring, field documentation, and adaptive management techniques.

9.1 Construction and Analytical Quality Assurance and Quality Control

The Contractor will prepare a Construction Quality and Assurance Plan for review and approval by the Engineer before starting work. The Construction Quality and Assurance Plan will provide procedures for construction quality assurance and construction quality control, as needed, to demonstrate the cleanup actions conformance to the design and contract. Construction quality assurance and construction quality control are procedures, information, and actions to confirm that construction complies with the cleanup action's design and requirements. At a minimum, the Construction Quality and Assurance Plan will:

- Identify and describe the responsibilities of contractors and personnel implementing the cleanup action.
- Establish procedures to verify that the cleanup action is constructed in accordance with the design, contract, and industry standards.
- Describe verification, such as inspections, sampling, testing, and monitoring.
- Establish a process to detect, document, and address changes or conditions that could affect the construction or operational quality of the cleanup action.

The Engineer and Contractor will maintain construction quality control records. These records will include Contractor submittals, daily field reports, photographs, requests for information (RFIs), and change order requests. Excavated waste and impacted native soil below the waste prism on the upper part of the landfill were characterized as part of the WDA (TPCHD, 2024; GSI, 2024a). The lower half of the waste prism and native soil beneath it will be characterized per the Lower Waste Prism Characterization Plan, an attachment to the Construction Plans and Specifications, and these results will amend the WDA.

9.2 Monitoring and Documentation

The Engineer and Contractor will maintain daily records of work done in accordance with the Construction Quality and Assurance Plan. Construction documentation will meet requirements in WAC 173-340-400. Onsite field engineers, as agents for Weyerhaeuser and the Town, will document field conditions and construction work and support the Contractor. Construction quality assurance documentation will include local weather conditions, onsite contractors and personnel, visitors, work performed, equipment used, types and amounts of materials imported or exported from the Site, potential health and safety concerns, any deviations, and miscellaneous notes or outstanding issues. Field reports will also include photo documentation of work and any supporting field forms (e.g., chain-of-custody forms, stormwater inspection forms) completed during inspections and/or sampling.

9.3 Adaptive Management

Landfill waste is the source of COCs in soil, groundwater, and surface water at the Site. Some Wetland Area soil contains iron, zinc, and TPH at concentrations above the soil-to-groundwater and groundwater-to-surface water screening levels, but the data do not indicate that impacted wetland soil is causing exceedances of groundwater or surface water CULs.

As described in the CAP, the cleanup action will not excavate soil from the Wetland Area, and COC concentrations in the wetland soil are expected to decline after the landfill source is removed. Section 4.3.4 of the CAP refers to adaptive management as a method to monitor conditions in the Wetland Area and take additional action, if necessary (Ecology, 2024a).

After the cleanup action has been implemented, adaptive management will be applied in the Wetland Area if the data show that COCs in groundwater, surface water, and Wetland Area soil will not recover below CULs within the 10-year restoration timeframe. The term “adaptive management” generally means site actions developed in response to data. The CAP explains that confirmation monitoring and periodic reviews (see Section 9) will be used to assess recovery of Wetland Area soil and Site groundwater over time. If recovery is not occurring, or if trends after the fifth year indicate that CULs for specific COCs and media may not be met within the 10-year restoration timeframe, media-specific contingency actions may be evaluated to address the identified exceedances. The need for adaptive actions will be determined in collaboration between Ecology, Weyerhaeuser, and the Town based on interpretation of the monitoring data and residual risk.

9.4 Site Closure

Confirmation monitoring conducted in accordance with WAC 173-340-410 will demonstrate whether the cleanup action has achieved the CULs and met other requirements in the consent decree. An annual report or a 5-year review will recommend regulatory closure.

10 Health and Safety

The following sections detail the health and safety requirements and procedures to be followed during the cleanup action.

10.1 Health and Safety Plan

The Engineer will prepare a site-specific HASP, an appendix to the Construction Plans and Specifications, which will address work hazards, in accordance with the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910 and 1926; RCW 49.17; WAC 173-340-410; and WAC 296-843-12005. The HASP will cover potential hazards associated with the tasks necessary to complete the cleanup action. Contractors will prepare their own HASP, that aligns with site-specific requirements in the Engineer's HASP, and keep their own health and safety training records.

10.2 Training Requirements

Onsite workers and subcontractors working on a cleanup site, as defined in the regulations, must have 40-hour hazardous waste operations and emergency response (HAZWOPER) training and first aid, cardiopulmonary resuscitation (CPR), and automated external defibrillator training. Supervisors of field staff must have HAZWOPER supervisor training. The Engineer will maintain a record of the relevant trainings of GSI and contractors supporting the cleanup action.

10.3 Personal Protective Equipment

Anyone entering controlled work zones must wear the U.S. Environmental Protection Agency/OSHA-approved level of protection as specified in the HASP. Levels of protection may vary depending on the task. Protection may be upgraded or downgraded depending on monitoring data and Site conditions, as determined by the Site Safety Officer.

10.4 Incident Reporting

In case of a work-related injury or illness, an incident report form will be filled out detailing the injury and how it could have been prevented. Reports will be submitted to OSHA, as applicable. Near-miss incidents (i.e., incidents with high likelihood of resulting in injury, illness, significant spill, or property damage) will be reported to the Site Safety Officer using a near-miss report form. Copies of these forms will be included in the HASP.

10.5 Other Requirements

The supervisor and employees will inspect the Work Areas and/or Site daily to identify and correct unsafe conditions and avoid accidents. Field personnel and subcontractors should inspect the Work Areas thoroughly before leaving. The environmental covenants and ICs (Wetland Area access and groundwater/surface water use) will minimize potential hazards after construction is complete.

11 Construction Administration

The following sections describe construction administration practices to be followed during the cleanup action.

11.1 Authority and Communication

Weyerhaeuser and the Town are the performing parties for the cleanup action. GSI is the agent of the performing parties and the Engineer for the cleanup action. Ecology is the agency directing the cleanup action. Ecology has approved the cleanup action and has the authority to approve changes that are also approved by Weyerhaeuser and the Town. State Parks owns the land that surrounds the Property, a portion of the Site, and the access road to the Property and Site. Weyerhaeuser, the Town, and State Parks are negotiating access to conduct the work under a Right of Entry Permit with the performing parties.

The Engineer will oversee the construction as an agent for Weyerhaeuser and the Town. The Engineer is responsible for communicating progress on the construction and for managing change, as approved by Ecology and the performing parties. Weekly summaries will communicate the progress of construction from Contractor mobilization to demobilization. Figure 6 is an organization chart of the cleanup action.

11.2 Schedule

Public review of the CAP and the RI/FS is ongoing concurrent with the design. Construction is planned between June and October 2025. If construction is finished in one season, then the Construction Completion Report and post-cleanup monitoring and reporting will occur between October 2025 and approximately May 2026. Figure 7 is the design and construction schedule. If a second construction season is required (not shown on the schedule), construction will start in approximately June 2026, and reporting will extend into 2027.

11.3 Access

The Site is centered in a 6.3-acre rectangular parcel of land owned by Weyerhaeuser (Tax Parcel No. 0416201007). A small part of the Wetland Area soil IC monitoring area extends into State Parks' land. The Site will be accessed from the western end of a utility corridor road off Mashel Prairie Road. Construction traffic will enter the Site from the west along this road and exit the Site heading east on the same road and onto Washington State Route 7. The Site Control Plan, an attachment to the Construction Plans and Specifications, will describe Site access and traffic control during construction.

11.4 Hours of Operation

This EDR assumes that construction hours will be typical Pierce County construction hours of 7 a.m. to 5 p.m., Monday through Friday. The hours of operation for the adjoining Nisqually State Park are 6 a.m. to 6 p.m., Monday through Sunday. Unless otherwise agreed to by State Parks, work will be conducted during the park hours to minimize impacts on Nisqually State Park operations. The actual work schedule may be modified with agreement by State Parks and Pierce County to complete the cleanup action on schedule.

11.5 Site Control and Security

The Site Control Plan, an attachment to the Construction Plans and Specifications, will provide details of site control and security, as outlined below.

Access to the Site and associated Work Areas is by Mashel Prairie Road. The public also uses Mashel Prairie Road to access the Nisqually State Park Trailhead and facilities to the north. The Engineer and Contractor will coordinate, phase, and schedule work to minimize disturbances and maintain access for users of Nisqually State Park during construction. Construction signage along limits of Work Areas and access points will notify the public of construction and potential related hazards. The Engineer and Contractor will direct construction so that the work does not block roadways and to allow park-users access to use areas in Nisqually State Park.

The Contractor will install traffic control measures (e.g., signage, flaggers, barricades) within and near the Work Areas as directed by the Engineer and in accordance with Pierce County Code. Standard construction entrance stabilization and/or sediment control measures may be required at the west and east ends of the utility corridor road connecting to public roadways to prevent vehicle soil track out. If necessary, street sweeping and cleaning of Mashel Prairie Road and State Route 7 may be performed to prevent adverse impacts to stormwater quality due to the work.

The Contractor will provide and install temporary security measures, including, but not limited to, lockable gates, security fencing, lights, and informational signage, as necessary, to establish and maintain control to Nisqually State Park and Site during the work. The Contractor will secure work areas to prevent access by unauthorized personnel. Gates at the west and east ends of the utility road leading to the Property will be locked at the end of each workday to prevent unauthorized vehicle access to State Parks' land or the Property through these areas. The Contractor will manage access during work hours to ensure that only relevant related personnel access the Work Areas. The Contractor will be responsible for coordination with other contractors conducting cleanup work.

11.6 Noise Levels

The Contractor will limit construction to designated work hours (Section 11.4), unless otherwise approved. Due to the Site's rural setting, construction noise is not expected to affect residents, and noise level monitoring is not proposed. The Contractor and Engineer will ensure use of appropriate hearing protection.

11.7 Requests for Information and Change Management

RFIs are a formal process whereby the Contractor requests information to clarify the scope, details, or approach specified in the design, including proposed alternative construction methods, substitution of materials, unanticipated field conditions, and identification of work outside the scope. The Contractor will submit written RFIs, and the Engineer will resolve the requests in consultation with Weyerhaeuser and Town, as necessary. The Engineer will log requests submitted by the Contractor and either approve the request or communicate the requests and proposed changes to the performing parties and Ecology for discussion and approval. The contract documents will identify the RFI process (see Section 12.3.2).

12 Deliverables

The following sections detail the administrative, design, and construction deliverables to be submitted to Ecology during design and implementation of the remedy.

12.1 Administrative Deliverables

Administrative deliverables include documents that describe management of the cleanup action and administrative agreements, such as covenants.

12.1.1 Progress Reports

Progress reports are due monthly on the 10th of each month per the draft execution schedule of the Consent Decree (State of Washington, n.d.). Quarterly progress reporting will begin after the effective date of the Consent Decree when it is entered into Pierce County Superior Court and will continue until construction is complete.

12.1.2 Institutional Control and Environmental Covenants

ICs are a component of the cleanup action to protect human health. The OMMP will identify and evaluate the need for ICs based on monitoring data. If required, ICs will be put into effect through environmental covenants. The environmental covenants will do the following:

- Restrict human consumption of Site groundwater.
- Establish and maintain onsite features, such as signs, to prevent human access to the spring/Site surface water flow path (hexavalent chromium) and the Wetland Area (TPH-GRO).

Draft environmental covenants are due to Ecology within 30 days of Ecology's approval of the final as-built drawings, submitted with the Construction Completion Report. Final environmental covenants are due to Ecology within 30 days of receipt of Ecology's comments on the draft environmental covenants.

12.2 Design Deliverables

Design deliverables include all documents related to the design of the cleanup action, as summarized below.

12.2.1 Engineering Design Report

This document is the draft EDR, prepared in accordance with WAC 173-340-400(4)(a). The EDR is due to Ecology 90 days from the effective date of the Consent Decree, after it is entered into Pierce County Superior Court. The final EDR is due 60 days after receiving comments from Ecology on the draft EDR. The EDR contains background information on the Site and the selected cleanup action and provides the basis for design, schedule, and overview of deliverables.

12.2.2 Construction Plans and Specifications

The Construction Plans and Specifications details the design of the cleanup action, in accordance with WAC 173-340-400(4)(b). Appendix D is the 50% Design Construction Plans. The following sheets are included in the 50% Design:

- Cover Sheet – Sheet CS

- General Plan Set Information – Sheets G1 – G2
- Existing Conditions Survey Information – Sheets G3 – G5
- Overview Existing Site Plan – Sheet C1
- Clearing and Grubbing Plan – Sheet C2
- Temporary Erosion and Sediment Control Plan – Sheet C3
- Excavation and Grading Plans (Topography, Removal Depths, Slopes) – Sheets C4 through C6
- Excavation and Grading Sections – Sheets C7 – C9
- Site Restoration and Stabilization Plan – Sheet C10
- Details – Various – Sheets DXX

Specifications will be consistent with the Construction Specifications Institute Master Format 2018 or newer and will be prepared for Ecology review at the 50%, 90%, and 100% Design levels.

The Construction Plans and Specifications will include the following attachments:

- **Geotechnical Evaluation Report.** This report summarizes the geotechnical evaluation to support design and discusses impacts and implications of the geotechnical conditions on the design. The geotechnical report will be an updated version of Appendix C to this EDR.
- **Restoration Plan.** This plan outlines the restoration of the Work Areas after the cleanup action. Restoration discussed in the Restoration Plan will be developed in coordination with USACE, pursuant to permit requirements.
- **Lower Waste Prism Characterization Plan.** This plan describes characterization of the Lower Waste Prism. The Lower Waste Characterization Plan will meet requirements of the Tacoma-Pierce County Health Department and the disposal location. Additionally, the Lower Waste Prism Characterization Plan supports the WDA provided by Tacoma-Pierce County Health Department.
- **Performance Monitoring Plan.** This plan details the scope and schedule for performance monitoring of Landfill Area soils, Site groundwater, and Site surface water. Performance monitoring requirements and objectives are consistent with WAC 173-340-410(7) and intended to verify that the cleanup action meets design requirements.
    - **Monitoring Well Installation and Development Work Plan:** A Well Installation and Development Work Plan will outline requirements and construction of Site monitoring wells. Monitoring wells will be installed at groundwater points of compliance. The well installation work plan is an attachment to the Performance Monitoring Plan.
- **Stormwater Pollution Prevention Plan and Erosion Control Plan.** This plan satisfies Ecology's CSWGP and substantive requirements of the Pierce County Fill and Grade Permit.
- **Contaminated Media Management Plan.** The CMMP describes the procedures to characterize, handle, and dispose of waste media during the work. Waste is presumed to be non-hazardous based on results

of the RI, and Tacoma-Pierce County Health Department provided the WDA for the cleanup action accordingly.

- **Health and Safety Plan.** The site-specific HASP identifies and addresses hazards associated with the cleanup work in accordance with OSHA, 29 CFR 1910 and 1926; RCW 49.17; WAC 173-340-410; and WAC 296-843-12005. The HASP covers potential field hazards associated with the tasks necessary to complete the cleanup action.

- **Archaeological Monitoring Plan and Inadvertent Discovery Plan**. The current Site IDP (Ecology, 2020) will be updated to account for implementation of the cleanup action consistent with WAC 173-340-815. The Archaeological Monitoring Plan is based on the findings of the cultural resource survey conducted during the PDI in consultation with Ecology. The Archaeological Monitoring Plan identifies zones where cultural resources may be encountered and the level of archeological monitoring required.

- **Operations, Maintenance, and Monitoring Plan.** The OMMP will describe Site operations after completion of construction. The OMMP provides contact information for responsible individuals and several attachments (the Compliance Monitoring Plan, IDP, Archaeological Monitoring Plan, and an updated CMMP) in accordance with WAC 173-340. The final OMMP will update the initial CMMP to include information pertinent to Site management after construction is complete. The OMMP will meet the requirements of WAC 173-340-400(4)(c).

- **Confirmation Monitoring Plan.** The Compliance Monitoring Plan is an attachment to the OMMP that details how the cleanup action will be evaluated to ensure it continues to be effective after completion. The Compliance Monitoring Plan will detail the locations, methods, and analytical requirements for collection and analysis of confirmation monitoring samples.

- **Materials Testing Plan.** The Materials Testing Plan is an attachment to the Construction Plans and Specifications. This plan lists materials that may be used or re-used during the cleanup action, including wood, vegetation, and clean soil. The plan specifies the certification process for import materials and the chemical and physical testing that will be performed on materials generated from the Property to ensure they are suitable for use.

- **Site Control Plan.** The Site Control Plan will include information about managing recreational access, traffic, and ongoing park development, among other potential risks. The Site Control Plan will also establish buffer zones to protect archaeological resources per the Cultural Resources Report and State Parks' archaeologist's recommendations.

12.3 Construction Deliverables

The following are construction deliverables.

12.3.1 Contractor Submittals

The Construction Plans and Specifications will develop the submittals list. The following are examples:

- Contractor Safety Plan

- Materials specifications for imported backfill, roadway materials, and restoration planting sources

- Disposal and recycling records

- Monitoring well decommissioning and construction records
- Before and after photographs of construction
- Construction completion survey
- Archaeological monitoring report

12.3.2 Change Management and Change Record

Change management protocols document RFIs (Section 11.7), unexpected field conditions, or adjustments to the scope of work. The change record documents approved construction modifications that differ from the design. The Engineer will communicate schedule changes to Weyerhaeuser, the Town, and Ecology.

12.3.3 Construction Completion Report

The draft Construction Completion Report will be developed consistent with WAC 173-340-400(6)(b) and will include as-built drawings and the OMMP. The draft report will be submitted to Ecology within 120 days of completing construction, and the final Construction Completion Report will be submitted to Ecology within 60 days of receiving Ecology's comments on the draft report.

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Tables

Table 1. Cleanup Levels for Soil, Groundwater, and Surface Water

Contaminant		Landfill Area Soil		Wetland Area Soil		Groundwater		Surface Water	
		CUL (mg/kg)	Basis	CUL (mg/kg)	Basis	CUL (µg/L)	Basis	CUL (µg/L)	Basis
Metals	Arsenic	7	MTCA Method B Direct Contact, Cancer; and Statewide 90th Percentile Natural Background	—	Not a COC	—	Not a COC	—	Not a COC
Metals	Cadmium	4	Soil Ecological Indicator - Plants	—	Not a COC	—	Not a COC	—	Not a COC
Metals	Chromium	42	Soil Ecological Indicator - Plants and Soil Biota, and Statewide 90th Percentile Natural Background	—	Not a COC	—	Not a COC	—	Not a COC
Metals	Copper	50	Soil Ecological Indicator - Soil Biota	—	Not a COC	—	Not a COC	—	Not a COC
Metals	Hexavalent Chromium[1]	—	—	—	—	0.046	MTCA Method B Cancer	0.13	MTCA Method B Cancer
Metals	Lead	50	Soil Ecological Indicator, Plants	—	Not a COC	—	Not a COC	—	Not a COC
Metals	Nickel	38	Soil Ecological Indicator - Plants, and Statewide 90th Percentile Natural Background	—	Not a COC	—	Not a COC	—	Not a COC
Metals	Zinc[2]	86	MTCA Method B Protective of Groundwater to Surface Water, Saturated; Soil Ecological Indicator - Plants, and Statewide 90th Percentile Natural Background	5,480	TEE pCUL	100	WAC Criteria for Aquatic Life - Freshwater Chronic	100	WAC Criteria for Aquatic Life - Freshwater Chronic
SVOCs	Pentachlorophenol (PCP)	2.5	MTCA Method B Direct Contact, Cancer	—	Not a COC	—	Not a COC	—	Not a COC
SVOCs	Total cPAHs	0.19	MTCA Method B Direct Contact, Cancer	—	Not a COC	—	Not a COC	—	Not a COC
TPH	Gasoline Range Organics (TPH-GRO)	30	MTCA Method A Unrestricted Land Use	30	MTCA Method A Unrestricted Land Use	—	Not a COC	—	Not a COC
TPH	Diesel/Oil Range Organics (TPH-DRO/ORO)	200	Soil Ecological Indicator - Soil Biota	200	Soil Ecological Indicator - Soil Biota	—	Not a COC	—	Not a COC

Notes

[1] The Landfill Area surface water points of compliance are specific to hexavalent chromium and their associated institutional controls.

[2] Zinc will only be evaluated in Wetland Area soil if surface water and groundwater zinc concentrations are not recovering.

— = not available or not applicable
µg/L = micrograms per liter
COC = contaminant of concern
cPAH = carcinogenic polycyclic aromatic hydrocarbon
CUL = cleanup level
DRO/ORO = diesel and oil range organics
GRO = gasoline range organics
mg/kg = milligrams per kilogram
MTCA = Model Toxics Control Act
pCUL = proposed cleanup levels
SVOC = semivolatile organic compound
TEE = Terrestrial Ecological Evaluation
TPH = total petroleum hydrocarbon
WAC = Washington Administrative Code

Table 2. Applicable Regulatory Requirements

	Requirement	Citation	Comments
Federal	*Federal Water Pollution Control Act (Clean Water Act)*	33 USC 1251 et seq.	Regulates the discharge of contaminants into waters of the United States, including wetlands.
	NPDES Program	40 CFR 122	Limits the discharge of contaminants into surface waters of the United States.
	Water Quality Standards	40 CFR 131	Provides guidance for states to establish criteria for discharge of contaminants into state waters.
	Clean Water Act Section 404	33 USC 1344	Regulates the discharge of dredged and fill material into waters of the United States, including wetlands.
	Safe Drinking Water Act	42 USC 300f et seq.	Defines MCLs for drinking water.
	National Primary and Secondary Drinking Water Regulations	40 CFR 141, 143	Establishes contaminant levels in drinking water (primary MCLs are enforceable, secondary MCLs are recommended).
	National Historic Preservation Act Section 106	16 USC 470 et seq.	Federal legislation for the preservation of historic and archaeological sites.
	NEPA	42 USC 4321 et seq.	Requires all branches of government to give consideration to the environment prior to undertaking any federal action that affects the environment.
	Wetland Protection Policy/The NEPA Rule	EPA Executive Order 11990	Requires federal agencies to take action to avoid adversely impacted wetlands wherever possible.
	Clean Water Act Section 404	33 USC 1344	Regulates permitting requirements for construction projects in wetlands that result in changes in the area's bottom elevation.
	Resource Conservation and Recovery Act	42 USC 6901 et seq.	Framework for proper management of hazardous and non-hazardous solid waste.
	Identification and Listing of Hazardous Waste; Standards Applicable to Generators of Hazardous Waste; Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Land Disposal Restrictions	40 CFR 261, 262, 264, 268	Solid waste designations and disposal facilities standards.
	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Solid waste transportation requirements.
	Transportation: Hazardous Materials Regulations	49 CFR Subchapter C	Solid waste transportation requirements.
	General Information, Regulations, and Definitions; Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans; Shippers - General Requirements for Shipments and Packaging	49 CFR 171, 172, 173, 177	General Information, Regulations, and Definitions; Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans; Shippers
	Federal Endangered Species Act	16 USC 1531 et seq.	List of threatened and endangered species and requirements for preparing and implementing plans for their recovery.
	Interagency Cooperation - Endangered Species Act of 1973, as Amended	50 CFR 402	Interagency cooperation to avoid take of listed species and for issuing permits for otherwise prohibited activities; provides for cooperation with states.
	Federal Water Pollution Control Act (Clean Water Act)	33 USC 1251 et seq.	Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.
	NPDES	40 CFR 122	Permit program that addresses water pollution by regulating point source pollution discharging to waters of the United States.
	Water Quality Standards	40 CFR 131	Provisions of state, territorial, authorized tribal or federal law approved by EPA that describe the desired condition of a water body and the means by which that condition will be protected or achieved.
	Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	40 CFR 230	Restores and maintains the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material.
	Federal Clean Air Act	42 USC 7401 et seq.	Defines EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer.
	National Primary and Secondary Ambient Air Quality Standards; Standards of Performance for New Stationary Sources; National Emission Standards for Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants for Source Categories	40 CFR 50, 60, 61, 63	Air pollutant standards.

Table 2. Applicable Regulatory Requirements

	Requirement	Citation	Comments
State	*Washington Hazardous Waste Cleanup - MTCA*	RCW 70A.305, WAC 173-340	Outlines methodology for establishing and implementing cleanup levels for surface water, groundwater, soil, and sediments.
	Washington State Water Pollution Control Act	RCW 90.48	Aims to reduce discharge of pollutants to surface waters of the state.
	Water Quality Standards for Surface Waters of the State of Washington	WAC 173-201A	Establishes water quality standards for contaminants of concern in surface waters of the state.
	Water Quality Standards for Groundwaters of the State of Washington	WAC 173-200	Establishes water quality standards for contaminants of concern in groundwaters of the state.
	Washington State Department of Health - Group A Public Water Supplies	WAC 246-290	Defines basic regulatory requirements and protects the health of consumers using public drinking water supplies.
	Maximum contaminant levels (MCLs) and Secondary MCLs (SMCLs)	WAC 246-290-310	Defines contaminant levels in drinking water (primary MCLs are enforceable, secondary MCLs are recommended).
	Washington NPDES Permit Program	WAC 173-220	Limits the discharge of contaminants into surface waters of the United States.
	Washington Sediment Management Standards	WAC 173-204	Aims to reduce and ultimately eliminate adverse effects on biological resources and significant threats to human health from surface sediment contamination.
	Washington MTCA	RCW 70.105D, RCW 70A.305, WAC 173-340	MTCA funds and directs the investigation, cleanup, and prevention of sites that are contaminated by hazardous substances.
	Washington Department of Ecology 401 Water Quality Certification	RCW 90.48	For federally regulated wetlands, a Section 401 Water Quality certification under the federal Clean Water Act may be required for the Project for filling of or discharge to wetlands.
	Washington Solid Waste Handling Standards	WAC 173-350	County governments and local health departments develop solid waste regulations and management plans, while the State's Solid Waste Management program supports local governments with technical assistance and guidance.
	Washington Criteria for Municipal Solid Waste Landfills	WAC 173-351	Establishes minimum statewide standards for all municipal solid waste landfills.
	Washington Hazardous Waste Management	RCW 70.105, RCW 70A.300	Establishes statewide framework for the planning, regulation, control, and management of hazardous waste which will prevent land, air, and water pollution and conserve the natural, economic, and energy resources of the state.
	Land Disposal Restrictions	WAC 173-303-140	Encourages the best management practices for dangerous wastes.
	Treatment, Storage, or Disposal of Dangerous Waste	WAC 173-303-141	Encourages the best management practices for dangerous wastes.
	State Patrol - Transportation of Hazardous Materials	WAC 446-50	Regulates the safe transportation of hazardous materials, hazardous waste, and radioactive waste materials upon the public highways.
	Washington State Environmental Policy Act (SEPA)	RCW 43.21C, Chapter 197-11 WAC	Requires evaluation of environmental impacts, alternatives, and mitigation measures (i.e. Environmental Impact Statement as outlined in RCW 43.21C.031).
	Watershed Restoration Project Regulations	RCW 89.08.450-510	Requires permitting for projects involving watershed restoration.
	State Water Pollution Control Act, NPDES Regulations	RCW 90.48, Chapter 173-220 WAC	Criteria for discharge of pollutants and other wastes into state surface waters.
	Washington Department of Fish and Wildlife Hydraulic Project Approval	RCW 77.55	Applies to projects near state waters that will use, divert, obstruct, or change the natural flow or bed.
	State Water Code and Water Rights	RCW 90.03, 90.04	Promotes the use of the public waters in a fashion which provides for obtaining maximum net benefits arising from both diversionary uses of the state's public waters and the retention of waters within streams and lakes in sufficient quantity and quality to protect instream and natural values and rights.
	Protection of Withdrawal Facilities Associated with Groundwater Rights; Water Rights; Protection of Upper Aquifer Zones	WAC 173-150, 152, 154	Establishes and sets forth the policies, framework, and procedures of the Washington State Department of Ecology in regard to the protection of the availability of groundwater as it pertains to the water withdrawal facilities of holders of groundwater rights.
	Solid Waste Standards - Reduction and Recycling	RCW 70.95.215	Provides framework for separation, recycling, and reduction of waste delivered to a solid waste facility.
	Deputies of Department - State Solid Waste Management Plan - Assistance - Coordination - Tire Recycling	RCW 70.95.260	Requirements for tire recycling.
	Landfilling Standards	WAC 173-304-460	Landfill performance standards including prevention of groundwater contaminations and requirements for allowable landfill gas concentrations.
	Washington State Forest Practices Rules	Title 222 WAC	Requirements for timber harvesting, pre-commercial thinning, road construction, fertilization, forest chemical application and other forest practices applications under the Forest Practices Act (chapter 76.09 RCW) and Stewardship of Non-industrial Forests and Woodlands (chapter 76.13 RCW).
	Forest Practices Act	RCW 76.09	The Forest Practices Act rules are designed to protect public resources such as water quality and fish habitat while maintaining a viable timber industry.
	Washington State Parks and Recreation Commission Real Property Agreement	--	The Real Property Agreement serves to provide access rights to Washington State Parks and Recreation Commission owned lands.
	Minimum Standards for Construction and Maintenance of Wells	WAC 173-160	Any monitoring wells installed, modified, or removed during the remedial action will comply with these standards.
	Regulation and Licensing of Well Contractors and Operators	WAC 173-162	Drilling subcontractors will be licensed in accordance with these regulations.
	Washington State Executive Order 05-05	GEO 05-05	Requires archeological and cultural resource review by Department of Archaeology and Historic Preservation for capital construction projects not undergoing Federal Section 106 review.

Table 2. Applicable Regulatory Requirements

Requirement		Citation	Comments
Local	*Pierce County Code: Wetlands*	Title 18E.30	County code designed to avoid impacts to wetlands due to development.
	Pierce County Code: Regulated Fish and Wildlife Species and Habitat Conservation Areas	Title 18E.40	Identifies regulated fish and wildlife species, habitat, and mitigation measures.
	Pierce County Code: Grading	Title 17A.30	Outlines slope grading, excavation, and fill requirements.
	Excavation Standards; Fill Standards; Soil Engineering -- Stability	Section 010, 020, 030	Grading and filling completed at the site will be regulated through the County standards.
	Pierce County Code: Forest Practices	Title 18H	Establishes the minimum standards and requirements associated with local government review and jurisdiction over Forest Practices in accordance with Chapter 76.09 RCW.
	Class IV - General Forest Practices Permit	Section 10, 040	This Title is directly related to specific subsections in Chapter 76.09 RCW and its rules.
	Pierce County Code: Development Regulations – Critical Areas	Title 18E	Protects critical areas of Pierce County from the impacts of development.
	Land Use Permit with Wetland and Fish and Wildlife Reviews	Section 10, 070	Required when there are critical areas on the property.
	Pierce County Code: Shoreline Management	Title 18S	Provides a comprehensive review of development on shorelines to ensure compliance with the Shoreline Management Act and Pierce County Code 18S.
	Shoreline Substantial Development Permit (SD)	Section 10, 065	Required for shoreline development.

Notes

CFR = Code of Federal Regulations

EPA = U.S. Environmental Protection Agency

MCL = Maximum Contaminant Level

MTCA = Model Toxics Control Act

NEPA = National Environmental Policy Act

NPDES = National Pollutant Discharge Elimination System

RCW = Revised Code of Washington

SMCL = Secondary Maximum Contaminant Level

USC = United States Code

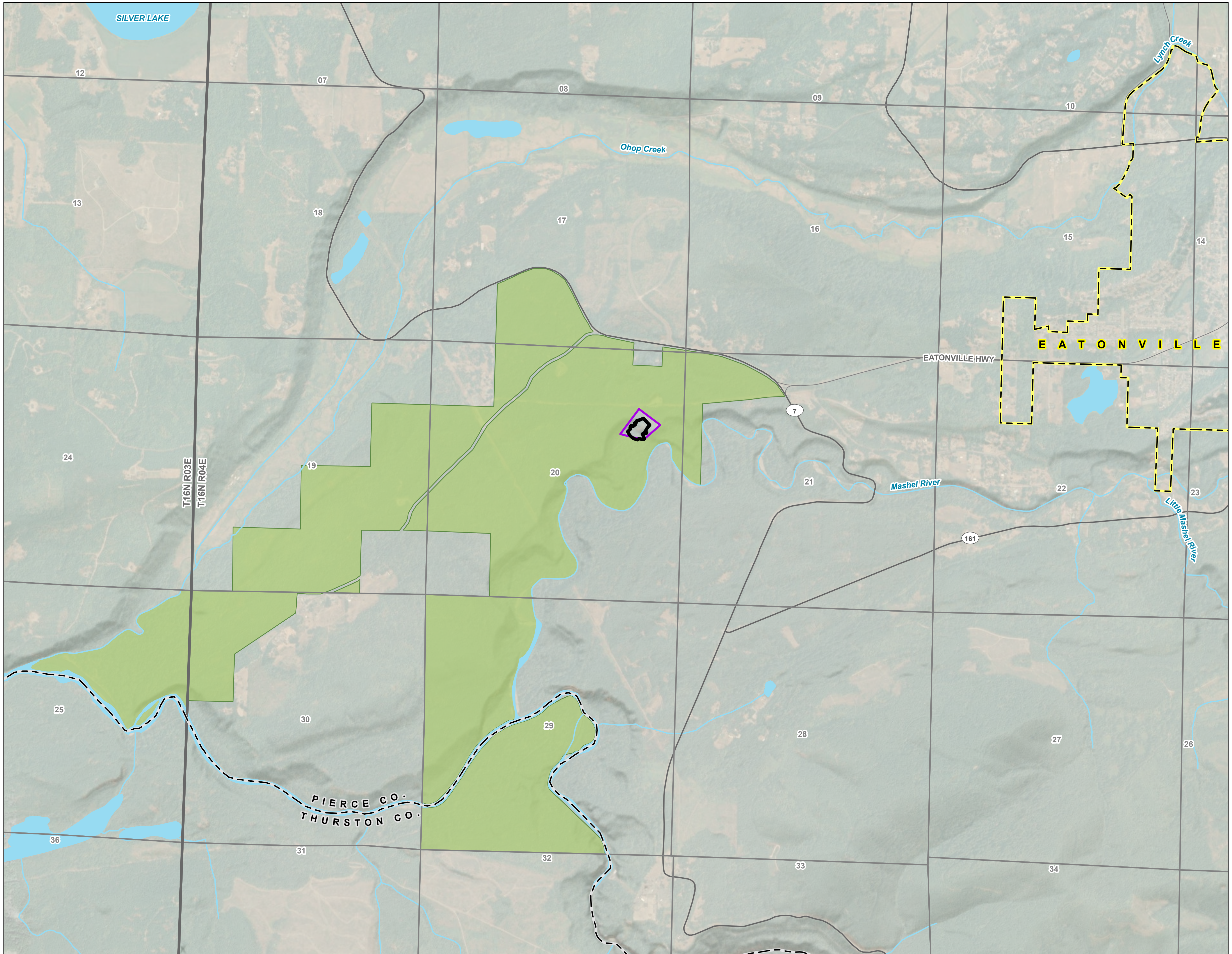
WAC = Washington Administrative Code

Figures

FIGURE 1

Vicinity Map

Engineering Design Report
Eatonville Landfill
Eatonville, WA



LEGEND

- Site
- Weyerhaeuser Property (Tax Parcel No. 0416201007)
- Nisqually State Park
- City Boundary
- County Boundary
- Major Road
- Watercourse
- Waterbody

NOTE

Site features are approximate.

N

0 1,000 2,000 3,000
FEET

Date: February 13, 2025
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.

GSI Water Solutions, Inc.

Document Path: Y:\0171_Weyerhaeuser\Source_Figures\078_Former_Eatonville_Landfill\EDR\Figure1_Site_Vicinity.aprx, Figure1_Site_Vicinity, npalmer

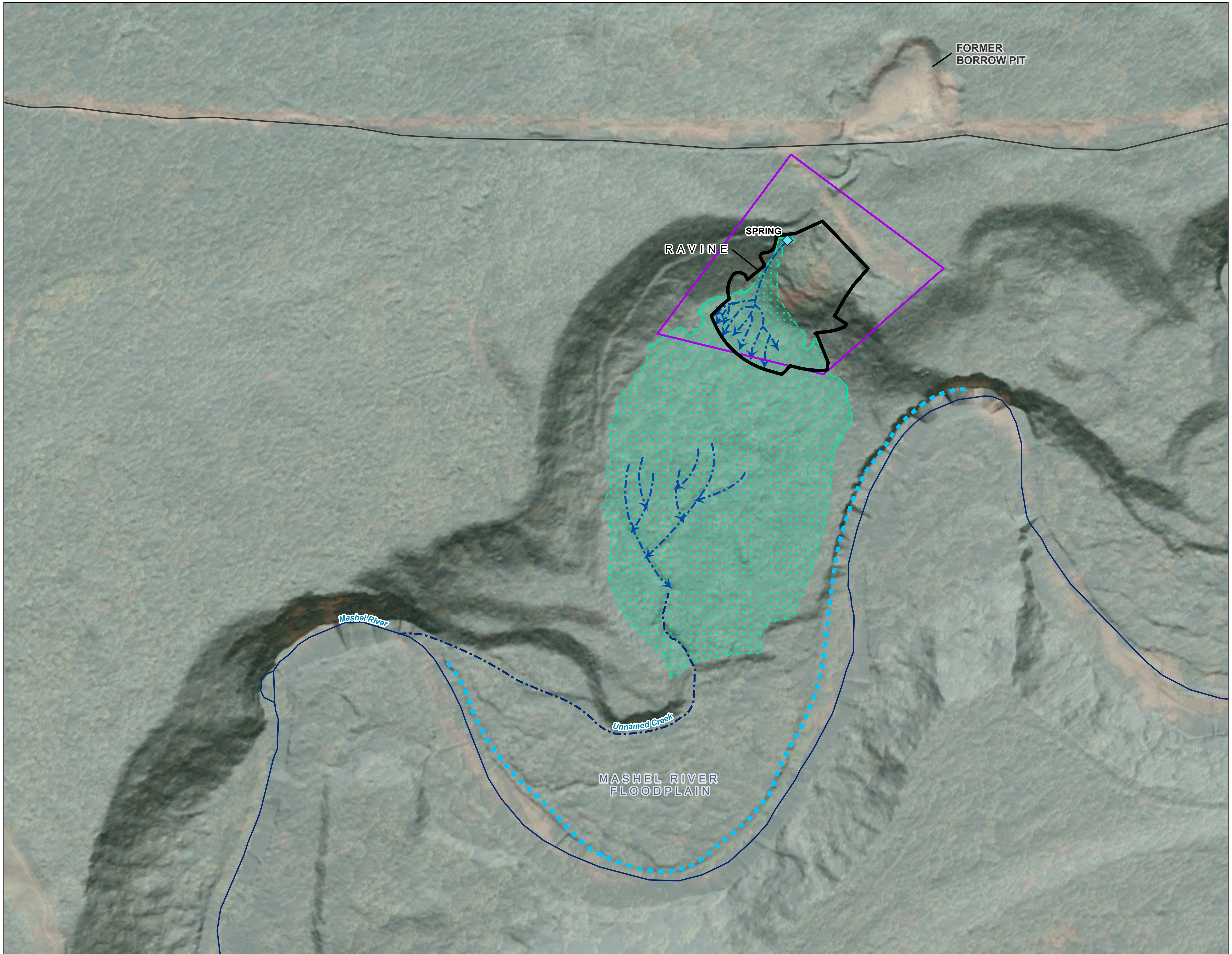


FIGURE 2

Site Map

Engineering Design Report
Eatonville Landfill
Eatonville, WA

LEGEND

- Spring
- Estimated Ordinary High Water Line
- Wetland
- Inferred Wetland
- Weyerhaeuser Property (Tax Parcel No. 0416201007)
- Site

All Other Features

- State Park Road Limited Access
- Flow Path
- Mashel River

NOTE

Site features are approximate.

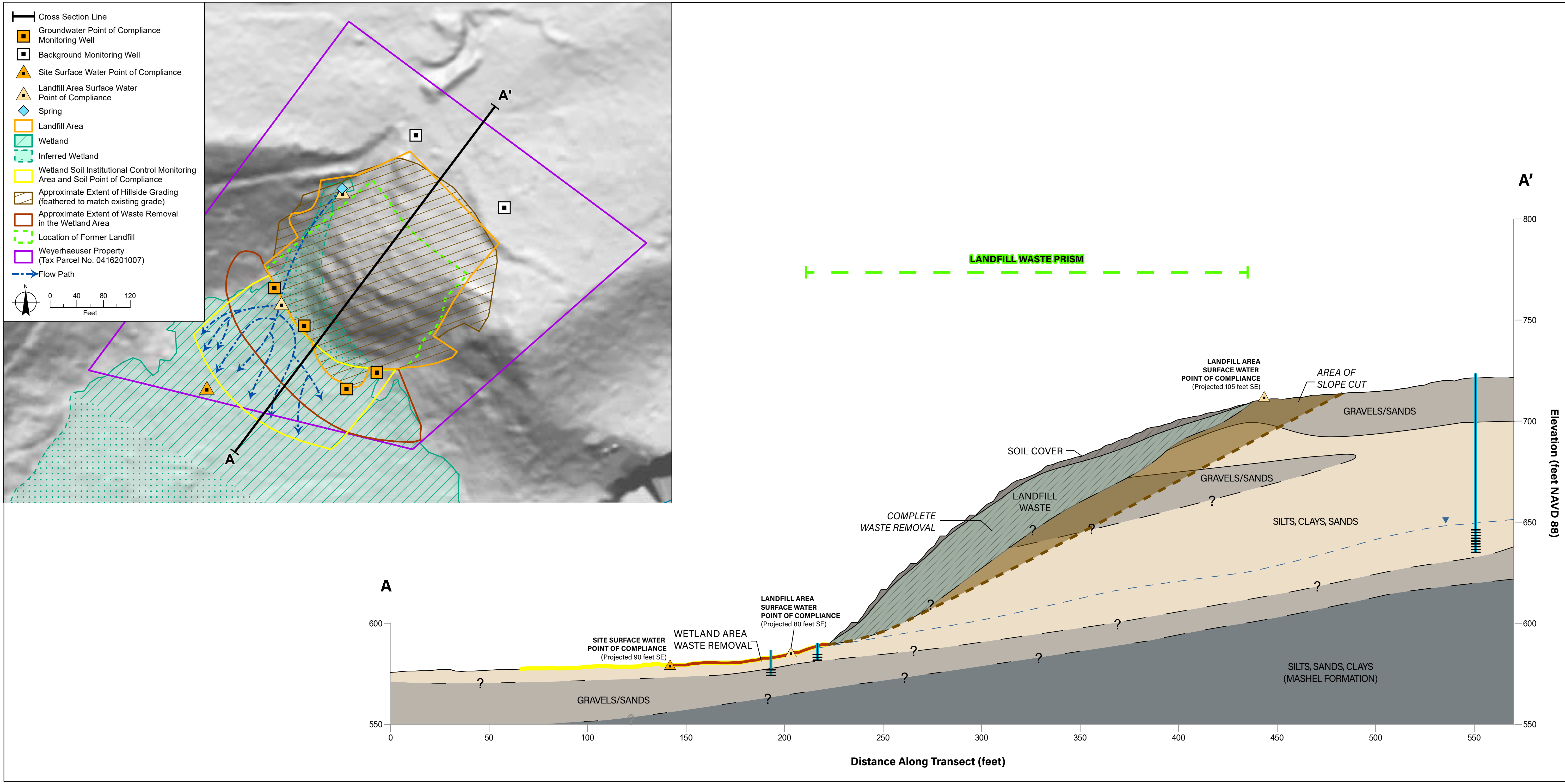
N

0 140 280 420
FEET

Date: February 13, 2025
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.

GSI Water Solutions, Inc.

Document Path: Y:\0171_Weyerhaeuser\Source_Figures\078_Former_Eatonville_Landfill\EDR\Figure2_Site_Map.aprx, Figure2_Site_Map, npalmer



LEGEND

Water Table

Groundwater Point of Compliance Monitoring Well

Screen

Soil Cover

Landfill Waste Prism

Vashon Drift

Coarse Gravels and Sands; Silty

Silts, Clays, Silty Sands

Mashel Formation

Silts, Sands, Clays

Lanfill Area Soil Point of Compliance

Wetland Soil Institutional Control Monitoring Area and Point of Compliance

Approximate Extent of Waste Removal in the Wetland Area

Complete Waste Removal

Area of Slope Cut

NOTES

NAVD 88: North American Vertical Datum of 1988

TD: total depth

If loose gravel or sand is observed at the new leave surface, this material will be either removed and filled with suitable base-course (potentially material excavated from Site) or slopes will be no greater than 2.5H:1V.

FIGURE 3

Cleanup Action Overview and Points of Compliance

Engineering Design Report
Eatonville Landfill
Eatonville, WA

GSI Water Solutions, Inc.

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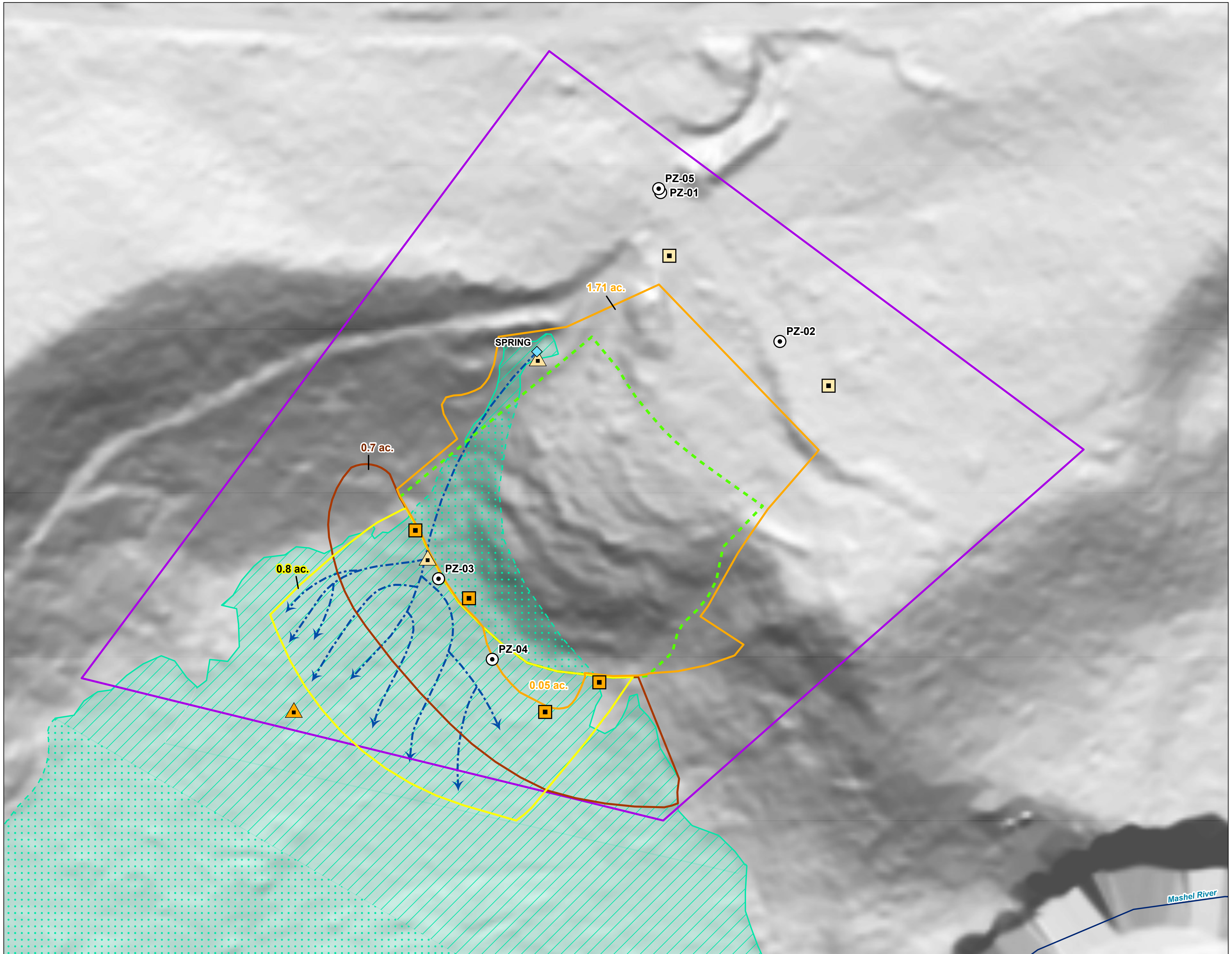


FIGURE 4

Remediation Areas

Engineering Design Report
Eatonville Landfill
Eatonville, WA

LEGEND

- Groundwater Point of Compliance Monitoring Well
- Background Monitoring Well
- Site Surface Water Point of Compliance
- Landfill Area Surface Water Point of Compliance
- Groundwater Piezometer
- Wetland Soil Institutional Control Monitoring Area and Soil Point of Compliance
- Approximate Extent of Waste Removal in the Wetland Area

All Other Features

- Spring
- Landfill Area
- Estimated Extent of the Waste Prism
- Wetland
- Inferred Wetland
- Weyerhaeuser Property (Tax Parcel No. 0416201007)
- Flow Path
- Mashel River

NOTE

Site features are approximate.

N

0 40 80 120
FEET

Date: February 13, 2025
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.

GSI Water Solutions, Inc.

NOTES

#1 - Road improvements, including the addition of base rock, grading, and tree limbing. This work may be needed before and after the remedial action. Additionally, secure access gates would need to be established at both ends of this road. At the east end, a berm would need to be leveled.

#2 - Site access improvements. This area is likely in need of improvements to facilitate site access and provide opportunities for turning haul trucks around. Improvements would include adding base rock, grading, and removing select trees (approximately 10). A security gate will be placed at the entrance to the Weyerhaeuser property.

#3 - Trail improvements along the old road grade and to the base of the landfill to provide safe access to the Wetland Area.

#4 - The upper portions of the Weyerhaeuser property above the waste prism will be used for staging and the development of infrastructure necessary to implement the remedial action. These improvements will include grading, the addition of base rock, removal of trees, and establishment of roads and stockpiling areas.

#5 - Landfill area remedial action.

#6 - Wetland Area waste removal.

#7 - Wetland soil institutional control monitoring area. No ground disturbance planned outside of the Wetland Area waste removal extents.

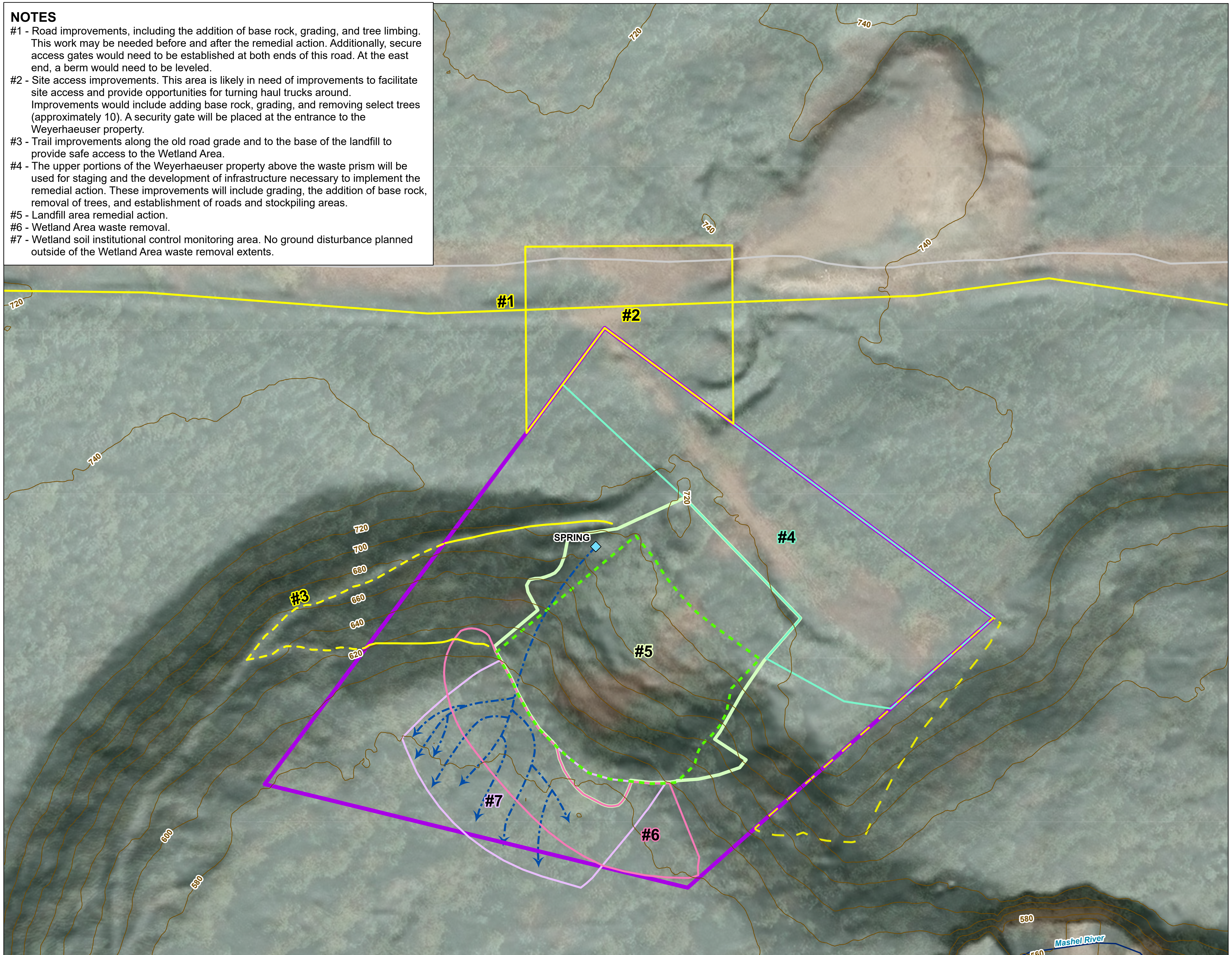


FIGURE 5

Cleanup Action and Work Areas

Engineering Design Report
Eatonville Landfill
Eatonville, WA

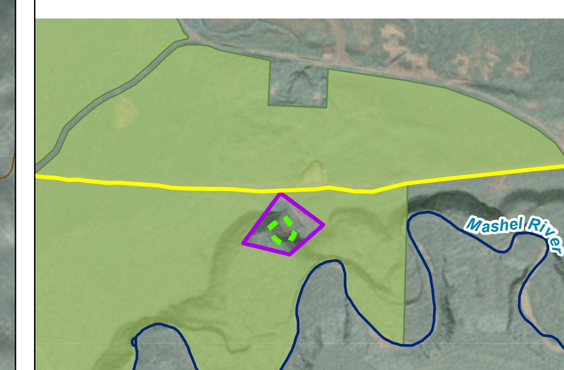
LEGEND

Cleanup Action Use Area

- #1 and #2
- #4
- #5
- #6
- #7
- **Potential Cleanup Action Use Area**

All Other Features

- Spring
- Weyerhaeuser Property (Tax Parcel No. 0416201007)
- Estimated Extent of the Waste Prism
- Power Line
- Elevation Contour (20-foot interval NAVD 88)
- Mashel River
- Flow Path



NOTE

Site features are approximate.

N

0 55 110 165
FEET

Date: February 13, 2025
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.

GSI Water Solutions, Inc.

Document Path: Y:\0171_Weyerhaeuser\Source_Figures\078_Former_Eatonville_Landfill\EDR\Figure5_Cleanup_Action.aprx, Figure5_Cleanup_Action, npalmer

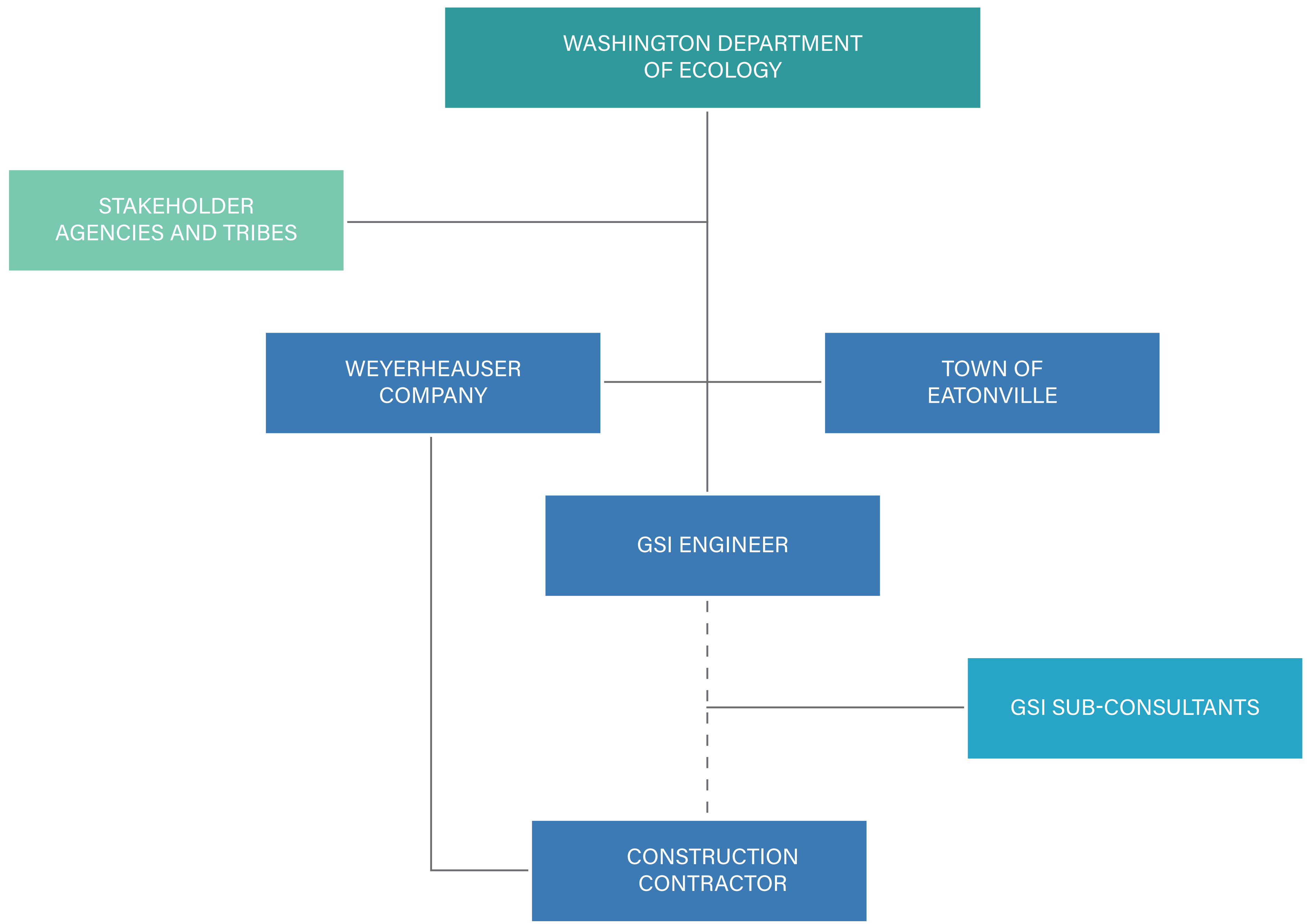


FIGURE 6

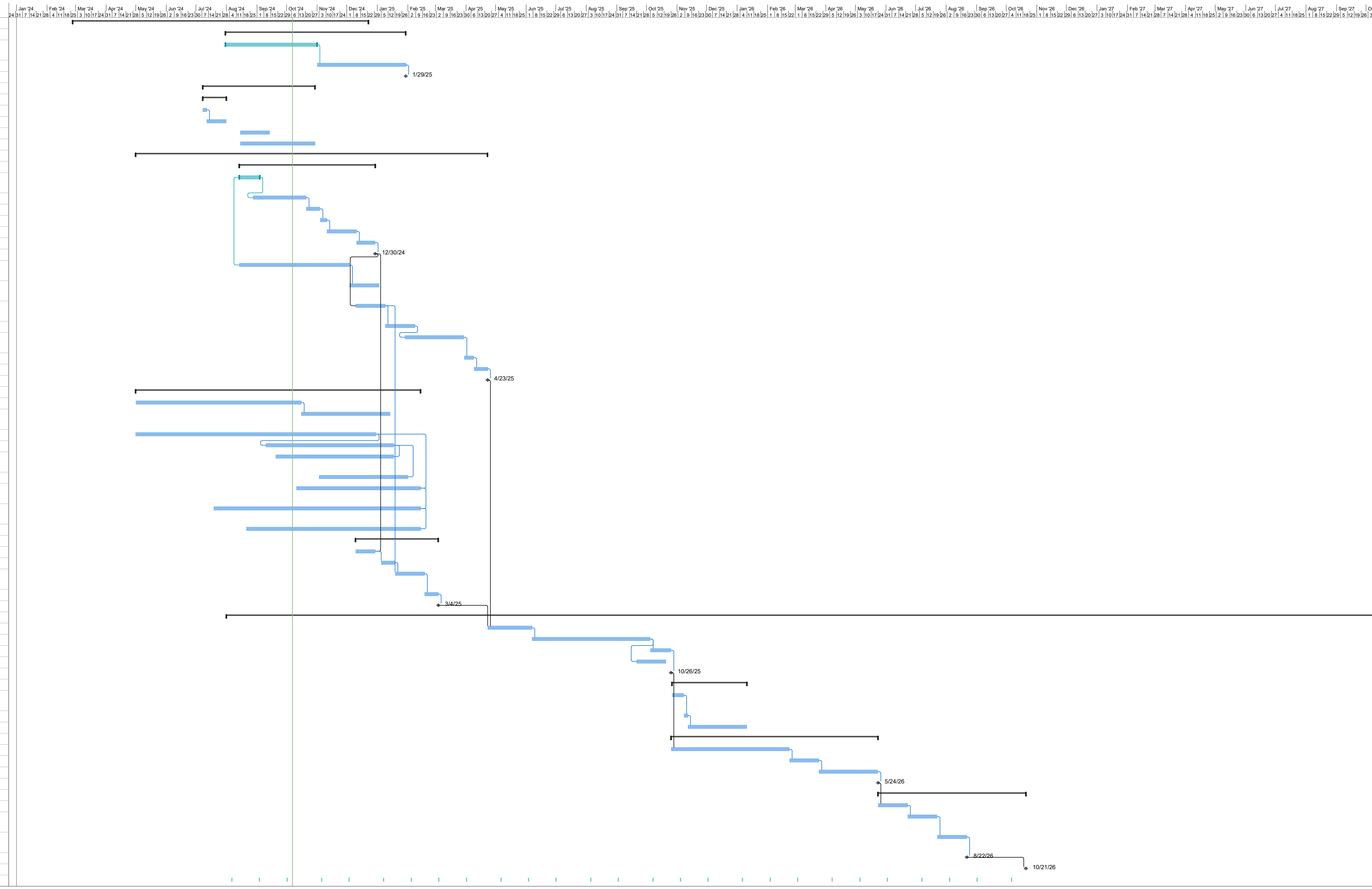
Organizational Chart

Engineering Design Report
Eatonville Landfill
Eatonville, WA

GSI Water Solutions, Inc.

Y:\0171_Weyerhaeuser\Source_Figures\078_Former_Eatonville_Landfill\EDR

ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	Work Plans, Scoping, Funding	214 days	Tue 2/27/24	Mon 12/23/24		
17	Consent Degree	131 days	Wed 7/31/24	Wed 1/29/25		
18	CD Public comment package Issued (package includes RI/FS, dCAP, SEPA, and CD)	67 days	Wed 7/31/24	Thu 10/31/24		
19	CD Public comment package review	90 edays	Thu 10/31/24	Wed 1/29/25	18	
20	Effective date of consent decree (estimate)	0 days	Wed 1/29/25	Wed 1/29/25	19	
21	Pre-Design Investigations	82 days	Mon 7/8/24	Wed 10/30/24		
22	Survey	18 days	Mon 7/8/24	Wed 7/31/24		
23	Survey field work	4 days	Mon 7/8/24	Thu 7/11/24		
24	Survey reporting and deliverable	14 days	Fri 7/12/24	Wed 7/31/24	23	
25	Geotechnical investigation & report	30 edays	Thu 8/15/24	Sat 9/14/24		
26	Cultural resources survey	76 edays	Thu 8/15/24	Wed 10/30/24		
27	Design and Deliverables	255 days?	Wed 5/1/24	Wed 4/23/25		
28	Basis of Design 30% EDR	98 days	Wed 8/14/24	Mon 12/30/24		
29	EDR outine and parties and Ecology review	21 edays	Wed 8/14/24	Wed 9/4/24		
30	Prepare draft EDR	54 edays	Wed 8/28/24	Mon 10/21/24	29FS-5 days	
31	Client review EDR	14 edays	Mon 10/21/24	Mon 11/4/24	30	
32	Incorporate client review EDR	7 edays	Mon 11/4/24	Mon 11/11/24	31	
33	Ecology and tribes Review of Draft EDR	30 edays	Mon 11/11/24	Wed 12/11/24	32	
34	Respond to Ecology comments on EDR	19 edays	Wed 12/11/24	Mon 12/30/24	33	
35	Final EDR	0 days	Mon 12/30/24	Mon 12/30/24	34	
36	Prepare design supporting documents (see list in notes and project tracking list)	80 days	Wed 8/14/24	Tue 12/3/24	29SS	
37	Ecology review of design supporing documents	30 edays	Tue 12/3/24	Thu 1/2/25	36	
38	50% plans and specifications and supporting documents preparation	30 edays	Tue 12/10/24	Thu 1/9/25	35FS-14 days	
39	50% plans and specifications review	30 edays	Thu 1/9/25	Sat 2/8/25	38	
40	90% plans and specifications and supporting documents preparation	60 edays	Wed 1/29/25	Sun 3/30/25	39FS-10 edays	
41	90% plans and specifications review	10 edays	Sun 3/30/25	Wed 4/9/25	40	
42	100% plans and specifications preparation	14 edays	Wed 4/9/25	Wed 4/23/25	41	
43	100% Plans and Specifications IFC	0 days	Wed 4/23/25	Wed 4/23/25	42	
44	Permitting	207 days?	Wed 5/1/24	Thu 2/13/25		
45	JARPA review (USACE dependent)	120 days?	Wed 5/1/24	Tue 10/15/24		
46	JARPA supporting documentation (BA, mitigation design)	90 edays	Tue 10/15/24	Mon 1/13/25	45	
47	SEPA	174 days	Wed 5/1/24	Mon 12/30/24		
48	SW Permit SWPPP	130 edays	Tue 9/10/24	Sat 1/18/25	47FS-80 days	
49	Stormwater construction general permit NOI and public notice	120 edays	Fri 9/20/24	Sat 1/18/25	48FF	
50	Parks Real Property Agreement	90 edays	Sat 11/2/24	Fri 1/31/25	48FF+10 days	
51	HPA permitting (substantive requirements)	90 days	Fri 10/11/24	Thu 2/13/25	47FF+45 edays	
52	Pierce County fill and grade permit (substantive requirements)	150 days?	Fri 7/19/24	Thu 2/13/25	51FF	
53	Cultural resources review	127 days?	Wed 8/21/24	Thu 2/13/25	52FF	
54	Contractor Procurement	60 days	Tue 12/10/24	Tue 3/4/25		
55	Contractor prequalification	20 edays	Tue 12/10/24	Mon 12/30/24	35FF	
56	Prepare bid documents	14 edays	Sun 1/5/25	Sun 1/19/25	55FS-5 days	
57	Issue bid request and bid period (includes contractor input on design)	30 edays	Sun 1/19/25	Tue 2/18/25	56,38	
58	Review bids	14 edays	Tue 2/18/25	Tue 3/4/25	57	
59	Contract Construction Contractor	0 days	Tue 3/4/25	Tue 3/4/25	58	
60	Construct Cleanup Action	831 days	Thu 8/1/24	Thu 10/7/27		
61	Mobilization and staging	45 edays	Wed 4/23/25	Sat 6/7/25	59,43	
62	Construction	120 edays	Sat 6/7/25	Sun 10/5/25	61	
63	Construction demobilization	21 edays	Sun 10/5/25	Sun 10/26/25	62	
64	Restoration	30 edays	Sun 9/21/25	Tue 10/21/25	62FS-14 edays	
65	Construction Complete	0 days	Sun 10/26/25	Sun 10/26/25	63	
66	Compliance Monitoring Reports	55 days	Mon 10/27/25	Sat 1/10/26		
67	Prepared for baseline post-construction monitoring	10 days	Mon 10/27/25	Fri 11/7/25	65	
68	Baseline post-construction monitoring event	4 edays	Fri 11/7/25	Tue 11/11/25	67	
69	Baseline post-construction monitoring report	60 edays	Tue 11/11/25	Sat 1/10/26	68	
70	Construction Completion Reporting	150 days	Sun 10/26/25	Sun 5/24/26		
71	Draft CCR, as-builts, and OMMP	120 edays	Sun 10/26/25	Mon 2/23/26	65	
72	Ecology review	30 edays	Mon 2/23/26	Wed 3/25/26	71	
73	Address Ecology comments on CCR	60 edays	Wed 3/25/26	Sun 5/24/26	72	
74	Final CCR, as-builts, and OMMP	0 days	Sun 5/24/26	Sun 5/24/26	73	
75	Environmental Covenant(s)	107 days	Sun 5/24/26	Wed 10/21/26		
76	Draft Environmental Covenant(s)	30 edays	Sun 5/24/26	Tue 6/23/26	74	
77	Ecology review of Environmental Covenants	30 edays	Tue 6/23/26	Thu 7/23/26	76	
78	Respond to Ecology commens on environmental covenants	30 edays	Thu 7/23/26	Sat 8/22/26	77	
79	Final environmental covenants	0 edays	Sat 8/22/26	Sat 8/22/26	78	
80	Record environmental covenants	0 days	Wed 10/21/26	Wed 10/21/26	79FS+60 edays	
81	Eatonville Landfill Monthly Meeting	831 days	Thu 8/1/24	Thu 10/7/27		



- Task
- Split
- Milestone
- Summary
- Project Summary
- Inactive Task
- Inactive Milestone
- Inactive Summary
- Manual Task
- Duration-only
- Manual Summary Rollup
- Manual Summary
- Start-only
- Finish-only
- External Tasks
- External Milestone
- Deadline
- Progress
- Manual Progress

FIGURE 7
Schedule

Engineering Design Report
Eatonville Landfill
Eatonville, WA

GSI Water Solutions, Inc.

APPENDICES

APPENDIX A

Pre-Design Investigation Results

APPENDIX A1
Survey Results

FORESIGHT SURVEYING, Inc.

Professional Land Surveyors

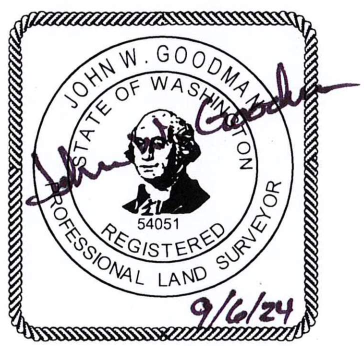
1583 N. National Ave. Ph. 360 748-4000
Chehalis, WA 98532

September 06, 2024

SURVEYOR'S CERTIFICATE

I, John W. Goodman, do hereby certify that I am a Registered Land Surveyor, holding Washington license number 54051, and that on dates July 8-11, 2024, under my direct supervision, a survey was conducted at the former Eatonville landfill site.

I further certify that the results of this survey are correctly represented in this report.



John W. Goodman
License No. 54051

SCOPE AND GENERAL COMMENTS

The fieldwork consisted of surveying former Eatonville landfill, WA for Weyerhaeuser, topographic survey of the road approaches both on the East and West main access to the public roadways (area 1), provide topographic data of the connecting access to the landfill site (area 2), the full length of the road and staging area (area 3), over the landfill hillside (area 4), locate visible landfill debris sprawling from the toe of slope and in the wetland area (area 5), locate the spring on the northerly side of area 4, establish monuments/points for both horizontal and vertical control for future use. Area details were supplied in the RFP and attached to the signed contract.

INSTRUMENTATION

The instruments for this survey include:

(1) Trimble S5 Robotic 3” Total Station
(2) Trimble R12 RTK GPS
(3) Tribrachs with -30mm offset prisms

FIELD PROCEDURES

HORIZONTAL MEASUREMENT

Field survey were accomplished utilizing standard closed traverse and radial survey methods along with standard global positioning system (GPS) network RTK GPS Methods. Horizontal measurements were performed/established measuring at ground distances while holding the control that was previously measured and established by Foresight Surveying Inc, under the supervision of Keneth L. Frazier holding Smartnet GPS network positions as a basis of bearing. During this survey it was found that the checks indicated that the control fit well amongst itself, and exceeds 1:5000 horizontal accuracy and was held for consistency of previous work preformed. The Coordinates were verified in relationship to Washington State Plane NAD 83/2011, South Zone, Grid published coordinates from the held network results, on monument designations BM27007-53 (ID #5951) and M 66 (ID #5927).

Ultimately the local site control was held for basis of bearing as indicated during previous surveys.

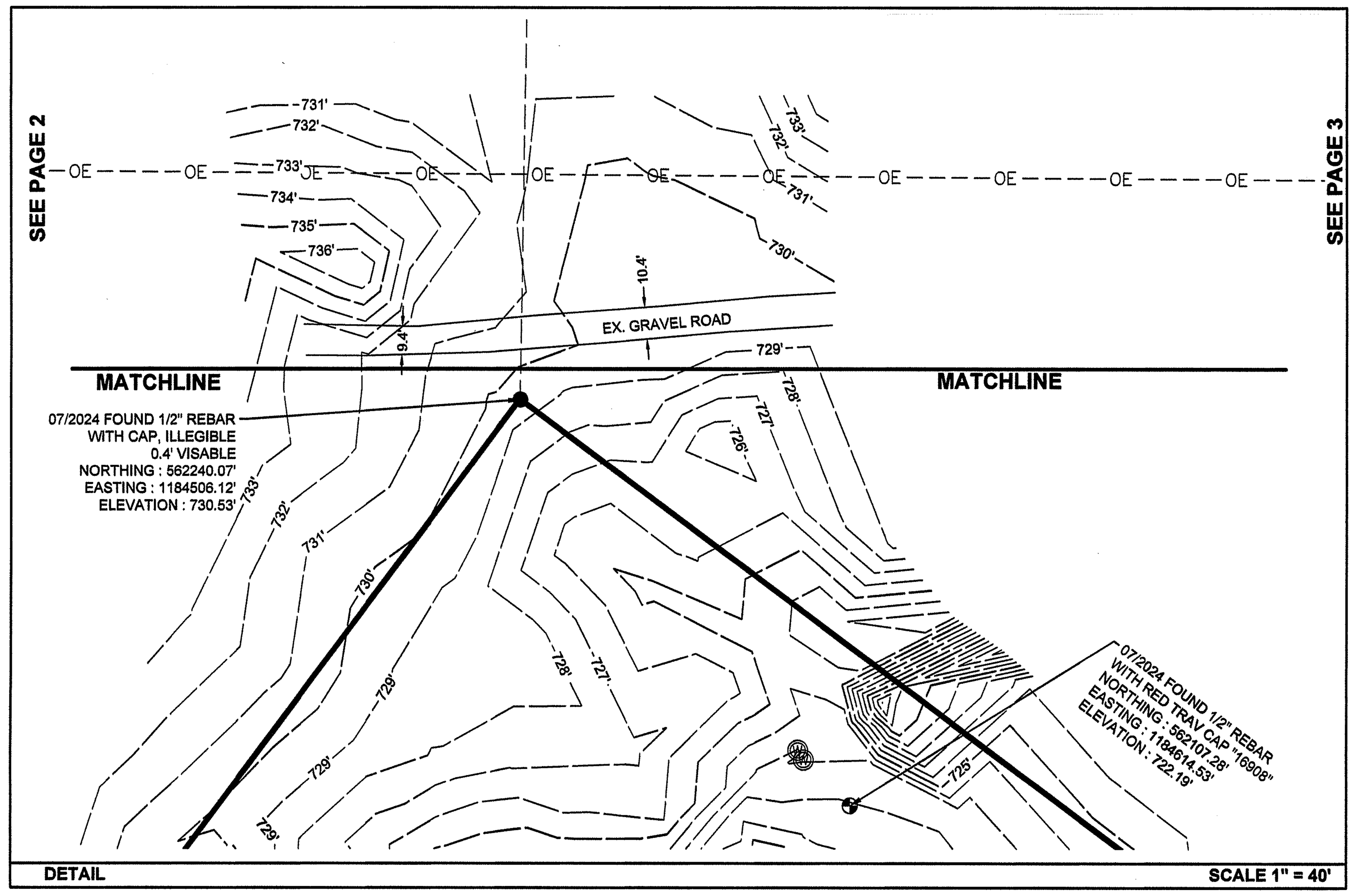
VERTICAL MEASUREMENT

Network GPS was used to measure and compare relative control on site at the locations indicated on the signed map, in relationship to published WSDOT control NAVD 88 Vertical Datum, at monument designations BM27007-53 (ID #5951) and M 66 (ID #5927).

STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

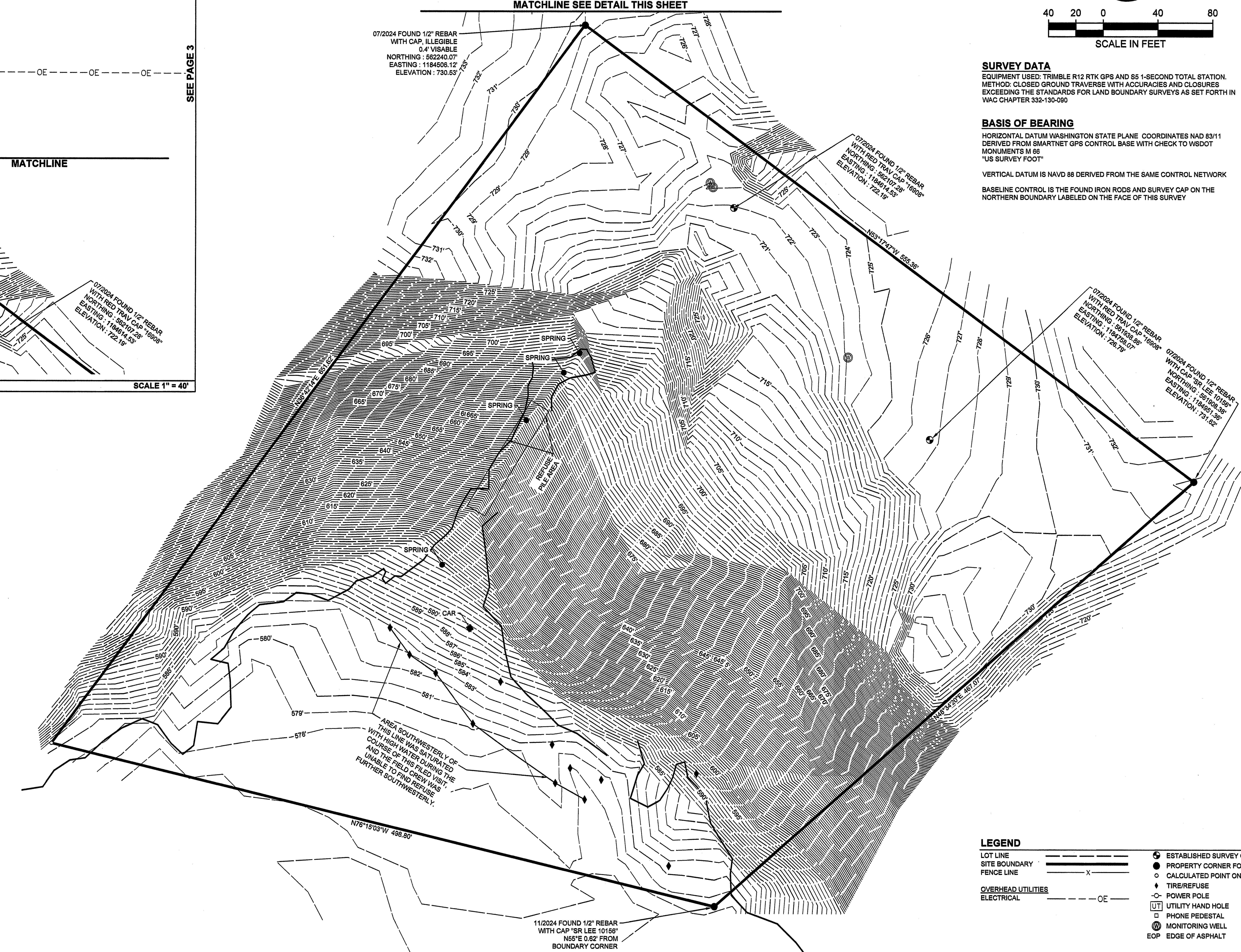
PORTION OF THE NE 1/4 NE 1/4 & SE 1/4 NE, 1/4 SEC 20, T 16 N, R 4 E; W.M.

PIERCE COUNTY, WASHINGTON



DETAIL

SCALE 1" = 40'



N

40 20 0 40 80

SCALE IN FEET

SURVEY DATA

EQUIPMENT USED: TRIMBLE R12 RTK GPS AND S5 1-SECOND TOTAL STATION.
METHOD: CLOSED GROUND TRAVERSE WITH ACCURACIES AND CLOSURES EXCEEDING THE STANDARDS FOR LAND BOUNDARY SURVEYS AS SET FORTH IN WAC CHAPTER 332-130-090

BASIS OF BEARING

HORIZONTAL DATUM WASHINGTON STATE PLANE COORDINATES NAD 83/11 DERIVED FROM SMARTNET GPS CONTROL BASE WITH CHECK TO WSDOT MONUMENTS M 66
"US SURVEY FOOT"

VERTICAL DATUM IS NAVD 88 DERIVED FROM THE SAME CONTROL NETWORK

BASELINE CONTROL IS THE FOUND IRON RODS AND SURVEY CAP ON THE NORTHERN BOUNDARY LABELED ON THE FACE OF THIS SURVEY

SURVEYOR'S NOTES

1. FORESIGHT TIED THE TOP AND THE TOE OF THE STEEP SLOPE AREA IN AREA 4.
2. FORESIGHT FOUND THAT AN ERROR IN THE LEGAL DESCRIPTION COMPARED TO THE MONUMENTS IN THE FIELD SET BY SR. LEE, LS 10156. FOR THE PURPOSE OF THIS SURVEY THE PREVIOUS BOUNDARY IS SHOWN HEREON, UNTIL A DECISION IS MADE FROM THE STAKEHOLDERS. THE LEGAL DESCRIPTION MAY NEED TO BE UPDATED TO THE AGREED AREA WHERE THE MARKERS ARE LOCATED, OR THE MARKERS SHOULD BE SET AT THE CORRECT LEGALLY DESCRIBED LOCATIONS. EITHER WAY A RECORD OF SURVEY WILL BE NECESSARY TO DOCUMENT THE TRUE LOCATION OF THE BOUNDARY.

LEGEND

LOT LINE
SITE BOUNDARY
FENCE LINE ——X——

OVERHEAD UTILITIES
ELECTRICAL ——OE——

ESTABLISHED SURVEY CONTROL
PROPERTY CORNER FOUND
CALCULATED POINT ONLY
TIRE/REFUSE
POWER POLE
UT UTILITY HAND HOLE
PHONE PEDESTAL
MONITORING WELL
EOP EDGE OF ASPHALT

12/31/24 | 4:07 PM | J. GOODMAN
N:\16-4E-20\5455 GSI BASE.DWG

No.	DATE	DSN	CHK	APP	REVISION

DESIGNED BY:	B. RAINS
DRAWN BY:	M. NOWELS
CHECKED BY:	J. GOODMAN
APPROVED BY:	J. GOODMAN

JOHN W. GOODMAN STATE OF WASHINGTON 54051 REGISTERED PROFESSIONAL LAND SURVEYOR 12/31/24

FORESIGHT SURVEYING, INC.
PROFESSIONAL LAND SURVEYORS
1583 N NATIONAL AVE
CHEHALIS, WA 98532 OFFICE: (360) 748-4000

SUBMITTED BY: GSI WATER SOLUTIONS

DATE:

REVIEWED BY:

DATE:

LINE IS 1" AT FULL SCALE

SCALE:	1" = 40'
FILENAME:	5455 GSI BASE
CONTRACT No.:	5455
DATE:	12/30/2024

STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

APN: 0416201007

DRAWING No.:	5455 GSI BASE
LOCATION ID:	5455 GSI BASE
SHEET No.:	REV:
1 OF 3	

STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

PORTION OF THE NE 1/4 NE 1/4 & SE 1/4 NE 1/4, SEC 20, T 16 N, R 4 E; W.M.

PIERCE COUNTY, WASHINGTON

No.	DATE	DSN	CHK	APP	REVISION

DESIGNED BY: B. RAINS
DRAWN BY: M. NOWELS
CHECKED BY: J. GOODMAN
APPROVED BY: J. GOODMAN

JOHN W. GOODMAN — STATE OF WASHINGTON — 54051 — REGISTERED PROFESSIONAL LAND SURVEYOR — 12/31/24

FORESIGHT SURVEYING, INC.
PROFESSIONAL LAND SURVEYORS
1583 N NATIONAL AVE
CHEHALIS, WA 98532 OFFICE: (360) 748-4000

SUBMITTED BY: GSI WATER SOLUTIONS
DATE:
REVIEWED BY:
DATE:

LINE IS 1" AT FULL SCALE

SCALE: 1" = 20'
FILENAME: 5455 GSI BASE
CONTRACT No.: 5455
DATE: 12/30/2024

STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

APN: 0416201007

DRAWING No.: 5455 GSI BASE
LOCATION ID: 5455 GSI BASE
SHEET No.: 2 OF 3
REV:

12/31/24 | 4:09 PM | J. GOODMAN
N:\16-4E-20\5455 GSI BASE.DWG

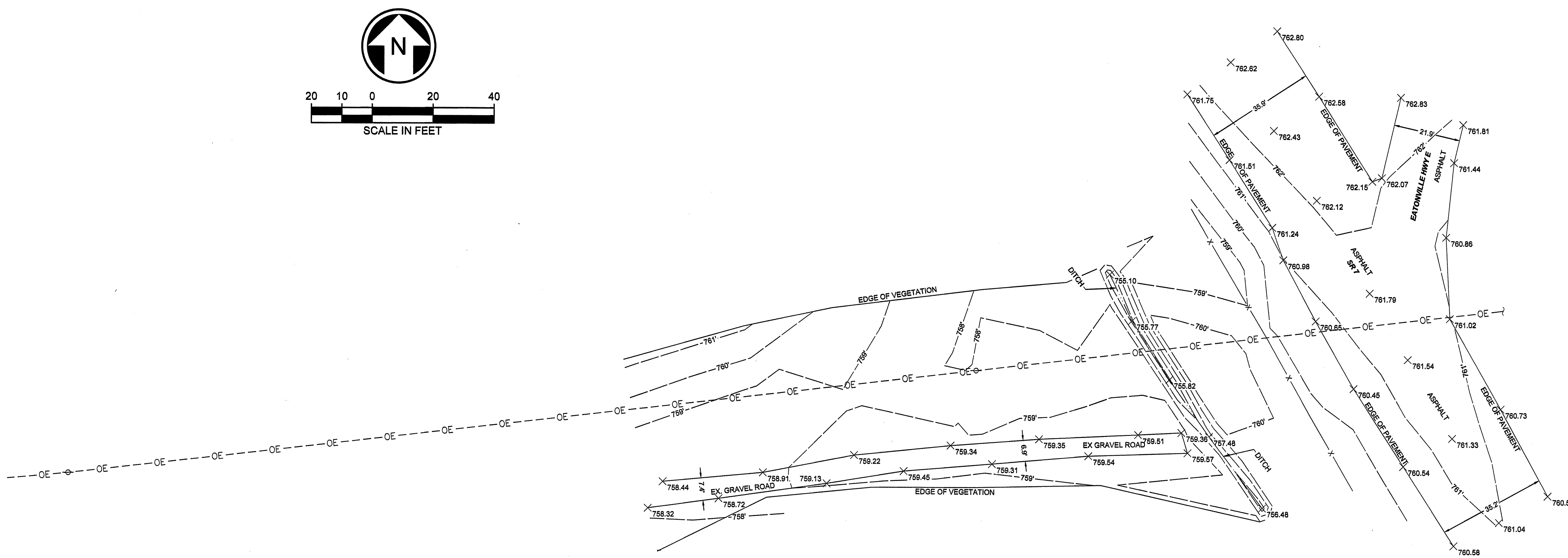
STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

PORTION OF THE NE 1/4 NE 1/4 & SE 1/4 NE 1/4, SEC 20, T 16 N, R 4 E; W.M.

PIERCE COUNTY, WASHINGTON

#1119 MAG NAIL W/ FLASHER
AT THE N EDGE
EATONVILLE HWY E AND E EDGE SR7
NORTHING: 562763.92'
EASTING : 1187406.91'
ELEVATION : 764.51'

#1120 MAG NAIL W/ FLASHER
AT THE S AND E EDGE
EATONVILLE HWY E AT WYE INTN
NORTHING: 562715.11'
EASTING : 1187677.66'
ELEVATION : 764.80'



#1121 MAG NAIL W/ FLASHER
AT E EDGE SR7
NORTHING: 562384.86'
EASTING : 1187647.54'
ELEVATION : 758.50'

No.	DATE	DSN	CHK	APP	REVISION

DESIGNED BY: B. RAINS
DRAWN BY: M. NOWELS
CHECKED BY: J. GOODMAN
APPROVED BY: J. GOODMAN

JOHN W. GOODMAN
STATE OF WASHINGTON
24051
REGISTERED PROFESSIONAL LAND SURVEYOR
12/31/24

FORESIGHT SURVEYING, INC.
PROFESSIONAL LAND SURVEYORS
1583 N NATIONAL AVE
CHEHALIS, WA 98532 OFFICE: (360) 748-4000

SUBMITTED BY: GSI WATER SOLUTIONS
DATE:
REVIEWED BY:
DATE:

LINE IS 1" AT FULL SCALE

SCALE: 1" = 20'
FILENAME: 5455 GSI BASE
CONTRACT No.: 5455
DATE: 12/30/2024

STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY
APN: 0416201007

DRAWING No.: 5455 GSI BASE
LOCATION ID: 5455 GSI BASE
SHEET No.: 3 OF 3
REV:

12/31/24 | 4:17 PM | J. GOODMAN
N:\16-4E-20\5455 GSI BASE.DWG

APPENDIX A2
Spring Flow Gauging Results

Table A2-1. Spring Flow Rate Gauging Results

Date	Test Method	Test Number	Volume (gallons)	Time (seconds)	Test Flow Coefficient	Measured Flow (gpm)	Measured Flow (cfs)	Test Average (gpm)	Test Average (cfs)	Notes
7/8/2024	Bucket Test	1	5	11.00	1.2	32.73	0.0729	33.5	0.075	Approximately 15 - 20% of total spring flow unable to be captured in bucket test based on field observations. Test flow coefficient of 1.2 used to account for estimated flow losses during bucket tests.
		2		10.63		33.87	0.0754			
		3		10.64		33.83	0.0754			
		4		10.57		34.06	0.0759			
		5		10.89		33.06	0.0736			
8/20/2024	Bucket Test	1	5	15.04	1.05	20.94	0.0467	21.1	0.047	Approximately 5% of total spring flow unable to be captured in bucket test based on field observations. Bentonite used to help route spring flow to 6-inch poly tube which helped improve overall flow capture. Test flow coefficient of 1.05 used to account for estimated flow losses during bucket tests.
		2		14.60		21.58	0.0481			
		3		15.11		20.85	0.0464			
		4		15.04		20.94	0.0467			
		5		15.000		21.00	0.0468			
8/21/2024	Bucket Test	1	5	15.47	1.1	21.33	0.0475	21.5	0.048	Approximately 5 - 10% of total spring flow unable to be captured in bucket test based on field observations. Unable to capture flow with bentonite dam as effectively as previous day. Test flow coefficient of 1.1 used to account for estimated flow losses during bucket tests.
		2		16.03		20.59	0.0459			
		3		15.14		21.80	0.0486			
		4		15.36		21.48	0.0479			
		5		14.93		22.10	0.0492			
9/30/2024	Bucket Test	1	5	21.86	1.1	15.10	0.0336	14.9	0.033	Approximately 5% of total spring flow unable to be captured in bucket test based on field observations. Bentonite used to help route spring flow to 6-inch poly tube which helped improve overall flow capture. Test flow coefficient of 1.05 used to account for estimated flow losses during bucket tests.
		2		22.43		14.71	0.0328			
		3		22.00		15.00	0.0334			
		4		22.35		14.77	0.0329			
		5		22.18		14.88	0.0331			

Notes
cfs = cubic feet per second
gpm = gallons per minute

APPENDIX A3
Geotechnical Investigation Results

GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

September 6, 2024

GSI Water Solutions, Inc.
650 NE Holladay Street, Suite 900
Portland, OR 97232

Attention: Benjamin Johnson, Principal Hydrogeologist

Subject: Pre-Design Field Investigation Memorandum
Former Eatonville Landfill Remedial Design
Eatonville, Washington

Greenfield Geotechnical is pleased to provide this memorandum describing the results of our Pre-Design Field Investigation. The purpose of this investigation is to determine the consistency and texture of the near-surface native soils outside of the waste prism, which may inform the design of temporary and final slopes for the remediation of the site. The investigation was initiated and coordinated by GSI Water Solutions, Inc. (GSI), which is currently developing a remedial design for the former landfill near Eatonville, Washington. The Site Plan, Figure 1, includes a vicinity map insert showing the site location.

The former landfill was developed on a steep, approximately 141-tall slope within the boundary of the current Nisqually State Park. The top of the slope is established at approximately elevation 726 ft and is graded gently down to approximately elevation 704 ft, where the slope steepens to approximately 2.4 horizontal to 1 vertical (2.4H:1V). Waste is exposed at the ground surface on the slope below elevation 704 ft. At an approximate elevation of 670 ft, the slope becomes very steep and is sloped at approximately 1.25H:1V. Sections of the slope up to 6 ft tall are nearly vertical below elevation 670 ft. The base of the landfill is formed at approximately elevation 585 ft where the waste intersects a wetland with standing water. The Typical Landfill Section, Figure 2, shows a conceptual profile of the slope and landfill.

GEOLOGY

The ground surface at the top of the landfill was likely extensively modified during the operation of the landfill. Evidence of roadways, grading, and material stockpiles are present at the top of the landfill. The landfill itself is located within a deposit of Vashon glacial drift, which tends to consist of a descending sequence[1] of:

1. Loose to medium dense silty sand and sandy silt (recessional outwash);
2. Very dense, well-graded mixtures of clay, silt, sand, gravel, cobbles, and boulders (Vashon Till);

---

[1] Mullineaux, D.R., Waldron, H.H. and Rubin, M., 1965. *Stratigraphy and chronology of late interglacial and early Vashon glacial time in the Seattle area, Washington* (No. 1194-O). US Geological Survey.

3. Loose to medium dense, well-graded medium sand (Esperance Sand); and then
4. Very stiff to hard, dark gray clayey silt and clay (Lawton Clay).

Beneath the Vashon glacial drift, the Mashel Formation consists of unconsolidated clay, sand, and lignite deposits. Peat and organic silt are also present in areas of standing water at lower elevations in the vicinity of the Mashel River.

The Vashon glacial drift in and around the site was likely incised by the Mashel River, creating very steep, marginally stable slopes. A possible landslide head scarp was observed at the top of the slope to the east of the landfill, indicating that the existing slopes may be unstable. Colluvium likely mantles much of the ground surface on and below the very steep slopes.

SUBSURFACE SOILS

Previous subsurface investigations were conducted at the site by Greenfield Geotechnical and GSI. The results of these investigations are summarized in the document titled:

> Remedial Investigation/Feasibility Study. Former Eatonville Landfill. GSI Water Solutions. February 2024.

Greenfield Geotechnical and GSI also explored the subsurface conditions around the margins of the landfill on August 20–21, 2024 with 19 hand augers and 1 grab sample. The Site Plan, Figure 1, shows the approximate locations of the geotechnical investigations. Appendices A and B provide summary logs of the field explorations and laboratory testing results for the August 2024 investigations: hand augers HA-11 through 21, HP-1 through 6, and grab sample G-1. Logs of the previous investigations are provided in the Remedial Investigation/Feasibility Study report, including logs from hollow stem auger borings B-1 through B-3, piezometer monitoring wells PZ-01 through PZ-05, and probes SB-10, 11, 14, and 16 through 19. Geophysical survey results from six seismic refraction surveys are also provided in the Remedial Investigation/Feasibility Study report. The following sections summarize the subsurface conditions encountered at the site.

Surficial Organic Soil. Organic soil consisting of sand and gravel with roots, wood debris, humus, waste, and other detritus was encountered at the ground surface at higher elevations and on the slope outside of the landfill area. The thickness of the surficial organic soil ranges from less than 1 inch thick near the top of the landfill up to 12 inches thick on the steep slopes in the forested areas adjacent to and below the landfill at lower elevations.

At the bottom of the landfill, organic peat soils were encountered in piezometers PZ-03 and 04. The piezometer logs indicate the organic peat is saturated and up to 3.2 ft thick.

Sandy Gravel (Fill). Landfill cover and roadway fill were encountered at the ground surface in borings B-1 and 2; piezometers PZ-01 and 05; probes SB-10, 11, 14, and 16 through 19; and in hand augers HA-11, 16, 17, and HP-1 through 6. The fill typically consists of very dense, fine to coarse, sub-rounded to rounded sandy gravel with some cobbles and boulders and a trace to some organic debris and waste. The Standard Penetration Resistance (SPT) N-values range from 2 to 16 blows/ft. Laboratory tests indicate that the fine-grained content of the sandy gravel typically ranges from 8 to 11%. The sandy gravel fill is approximately 0.5 to 10 ft thick over the landfill waste and is approximately 2 to 25 ft over the native soils.

Waste. Waste from the former landfill was encountered below the sandy gravel fill in borings B-1; probes SB-17, 18, 19; and in hand auger HP-3. Waste was also present at the ground surface below elevation 704 ft and in hand augers HA-14 and 20. The waste ranges in consistency from silt with sand to fine to coarse gravel intermixed with paper, plastic, glass, concrete, and construction debris. Organic debris including paper and plastic composes up to 23% of the landfill contents by dry weight. Larger debris including appliances and car bodies were observed at the ground surface below the steep slope at lower elevations. The waste is very loose with N-values ranging from 1 to 2 blows/ft. The geophysical survey indicates that the waste may be up to 27 ft thick.

Sandy Gravel (Recessional outwash). Native sandy gravel was encountered in borings B-2 and 3; piezometers PZ-01, 02, and 05; and hand auger HA-12. The sandy gravel is fine to coarse, rounded to sub-angular, and contains some cobbles and boulders and a trace to some silt. The relative density of the sandy gravel ranges from medium dense to very dense with SPT N-values ranging from 18 to over 50 blows/ft. The elevation, texture, and density of the sandy gravel indicate it is likely a member of the Vashon recessional outwash. The sandy gravel extends to depths of up to 35 ft.

Sand (Colluvium). Loose fine to medium sand with some silt and silty sand were encountered below the landfill in boring B-1; probes SB-16, 17, and 19; and hand augers HA-13, 14W, 15, 18, 19, and 21. The sand is loose with SPT N-values ranging from 6 to 7 blows/ft and is likely colluvium from mass wasting processes of the upslope deposits. The sand and silty sand colluvium may be up to 10 ft thick based on samples collected from boring SB-17.

Sandy Silt (Vashon Till). Consolidated mixtures of sandy silt with some clay, gravel, cobbles, and boulders were encountered below the recessional outwash in piezometers PZ-01, 02, 05 and below the landfill in boring B-1 and probes SB-10, 11, 14, 18. The sandy silt is very stiff to hard with N-values ranging from 20 to 33 blows/ft and is medium to high plasticity with a plasticity index of 23%.

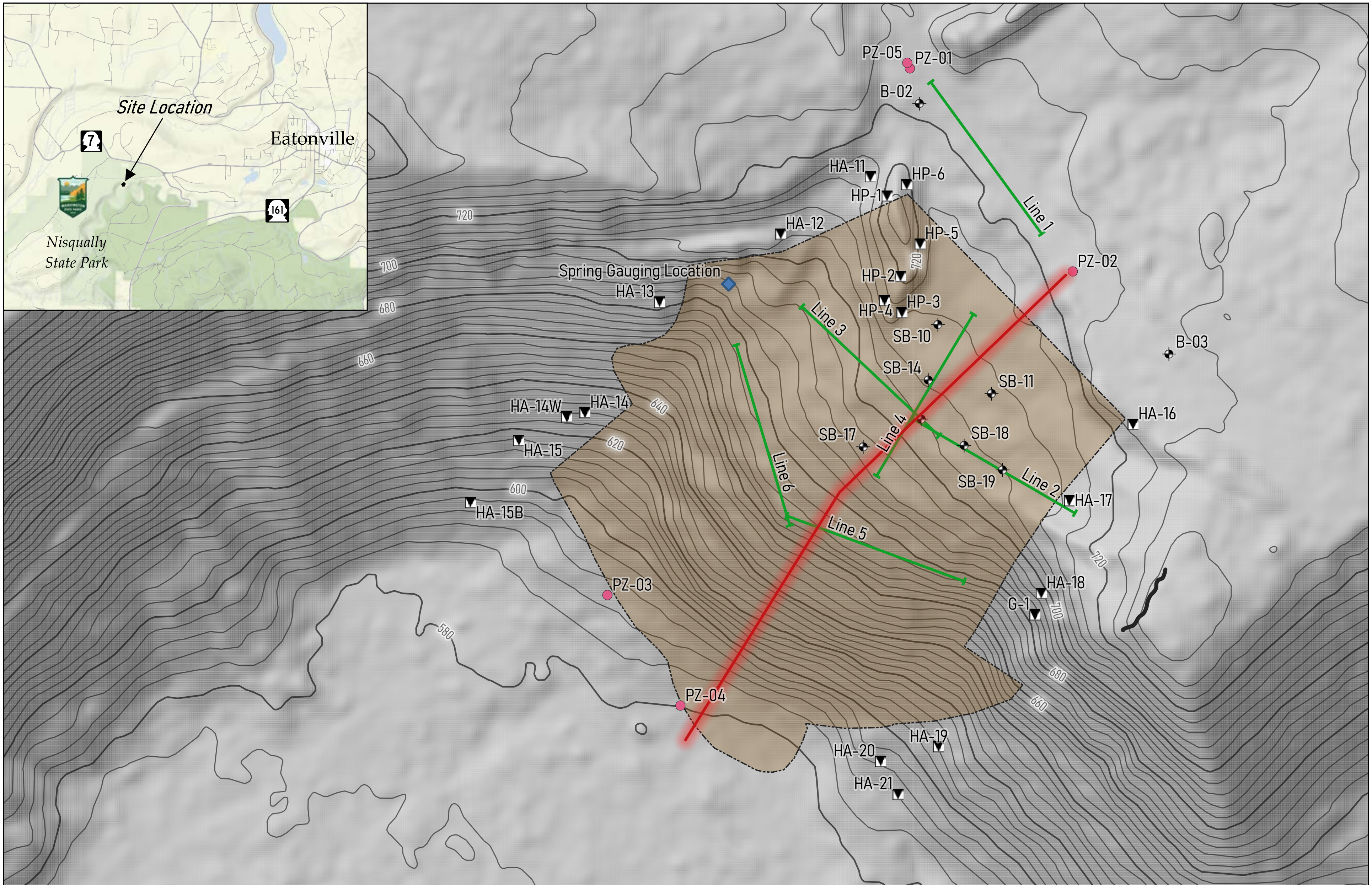
Sand (Esperance Sand). Fine to coarse sand and gravelly sand with some trace to some silt were encountered below the Vashon Till or Colluvium in piezometers PZ-01 and 02 and probe SB-17. The Esperance Sand is distinguished from the colluvium by its higher relative density. SPT N-values ranging from 29 to 33 blows/ft indicate the Esperance Sand is dense.

GROUNDWATER

GSI investigated groundwater conditions with 5 piezometers and 1 spring gauging station. Logs of the piezometers are provided in the Remedial Investigation/Feasibility Study report. Table 1 lists the maximum observed piezometric elevations from two measurements during the fall of 2021 and winter of 2022. The elevation of the spring is approximately 688 ft.

Table 1: Piezometric elevation

Piezometer	Ground surface elevation (ft)	Piezometric elevation (ft)
PZ-01	723	647
PZ-02	726	650
PZ-03	590	589
PZ-04	580	580
PZ-05	723	700



LEGEND

- Estimated Extent of Landfill
- Potential Headscarp
- Cross Section A

Subsurface Investigations

- 2024 Hand Augers & Grab Samples
- Sept. 2021 Explorations
- Spring Gauging Location
- Piezos

25 0 25 50 75 100 125 ft

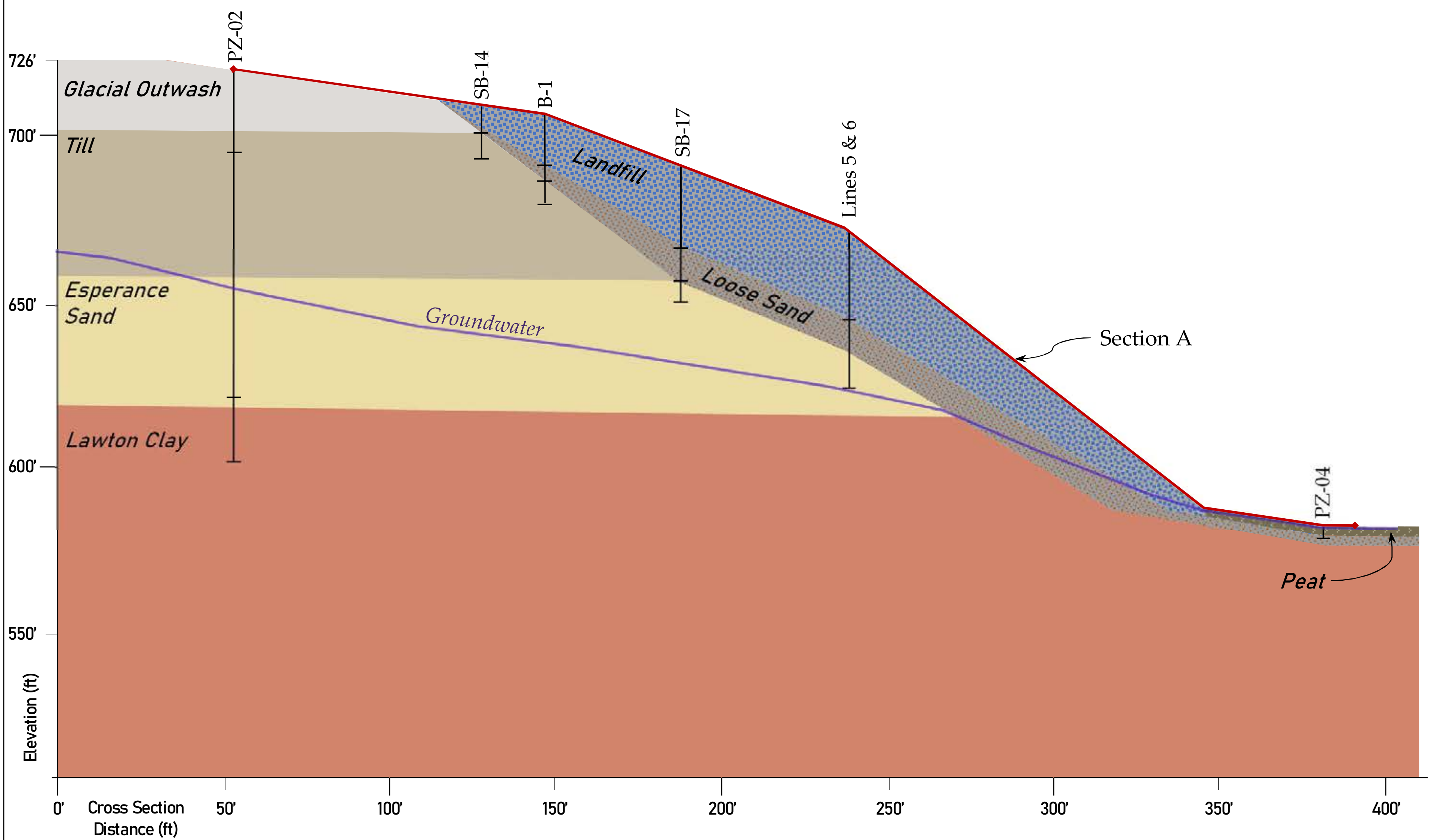
GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

FORMER EATONVILLE LANDFILL PROJECT

Site Plan/Subsurface Investigations

Figure 1

Contour Interval of 4'



Prepared for GSI Water Solutions

GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

FORMER EATONVILLE LANDFILL PROJECT
Draft

SECTION A: TYPICAL SLOPE GEOMETRY

Figure 2

PRE-DESIGN FIELD INVESTIGATION MEMORANDUM
FORMER EATONVILLE LANDFILL REMEDIAL DESIGN
EATONVILLE, WASHINGTON

APPENDIX A:
HAND AUGER LOGS

GREENFIELD
GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

EXPLORATION HA-11

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL at 0.8 ft	GRAB S-1	100				

Bottom of exploration at 0.8 feet.

EXPLORATION HA-12

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT	GSI Water Solutions, Inc.	**PROJECT NAME**	Eatonville Landfill
PROJECT NUMBER		**PROJECT LOCATION**	Eatonville, Washington
DATE STARTED	8/20/24 **COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES**	,
DRILLING METHOD	Solid Stem Auger	**GROUND WATER LEVELS:**	
LOGGED BY	M. Greenfield **CHECKED BY**	AT TIME OF DRILLING	---
NOTES	Hand auger	AFTER DRILLING	---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SANDY GRAVEL (GW), some cobbles and boulders; fine to coarse, subrounded to rounded, tan-brown (Till), 3-in.-thick layer of organic debris at ground surface REFUSAL at 0.7 ft	GRAB S-1	100				

Bottom of exploration at 0.7 feet.

EXPLORATION HA-13

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 3-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.1 ft	GRAB S-1	100				

Bottom of exploration at 1.1 feet.

GEOTECH_SHALLOW - GINT STD US LAB.GDT - 9/3/24 16:26 - C:\USERS\SMART\GREENFIELD DROPBOX\ACTIVE PROJECTS\EATONVILLE LANDFILL\FIELD INVESTIGATION\PRE-DESIGN HAND AUGERS\EATONVILLE_HA.GPJ

EXPLORATION HA-14

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		WASTE; organic debris, cobbles and boulders (LANDFILL CONTENTS) REFUSAL at 0.5 ft						

Bottom of exploration at 0.5 feet.

EXPLORATION HA-14W

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT	GSI Water Solutions, Inc.	**PROJECT NAME**	Eatonville Landfill
PROJECT NUMBER		**PROJECT LOCATION**	Eatonville, Washington
DATE STARTED	8/20/24 **COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES**	,
DRILLING METHOD	Solid Stem Auger	**GROUND WATER LEVELS:**	
LOGGED BY	M. Greenfield **CHECKED BY**	**AT TIME OF DRILLING**	---
NOTES	Hand auger	**AFTER DRILLING**	---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 6-in.-thick layer of organic debris at ground surface						
1.0								
2.0		REFUSAL on cobbles at 2.0 ft	GRAB S-1	100				● ☐

Bottom of exploration at 2.0 feet.

Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HA-15

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 12-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.7 ft	GRAB S-1	100				

Bottom of exploration at 1.7 feet.

EXPLORATION HA-15B

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 8-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.5 ft	GRAB S-1	100				

Bottom of exploration at 1.5 feet.

EXPLORATION HA-16

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, brown, scattered roots and wood debris (FILL), 2-in.-thick layer of metal and organic debris at ground surface						
1.0		REFUSAL at 1.0 ft	GRAB S-1	100				

Bottom of exploration at 1.0 feet.

EXPLORATION HA-17

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.		**PROJECT NAME** Eatonville Landfill	
PROJECT NUMBER		**PROJECT LOCATION** Eatonville, Washington	
DATE STARTED 8/20/24	**COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES** ,	
DRILLING METHOD Solid Stem Auger		**GROUND WATER LEVELS:**	
LOGGED BY M. Greenfield	**CHECKED BY**	**AT TIME OF DRILLING** ---	
NOTES Hand auger		**AFTER DRILLING** ---	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, brown, scattered roots and wood debris (FILL), 2-in.-thick layer of metal and organic debris at ground surface REFUSAL at 0.5 ft						

Bottom of exploration at 0.5 feet.

EXPLORATION HA-18

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.		**PROJECT NAME** Eatonville Landfill	
PROJECT NUMBER		**PROJECT LOCATION** Eatonville, Washington	
DATE STARTED 8/20/24	**COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES** ,	
DRILLING METHOD Solid Stem Auger		**GROUND WATER LEVELS:**	
LOGGED BY M. Greenfield	**CHECKED BY**	**AT TIME OF DRILLING** ---	
NOTES Hand auger		**AFTER DRILLING** ---	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 2-in.-thick layer of organic debris at ground surface						
1.0								
2.0		REFUSAL at 2.0 ft	GRAB S-1	100				

Bottom of exploration at 2.0 feet.

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.		**PROJECT NAME** Eatonville Landfill	
PROJECT NUMBER		**PROJECT LOCATION** Eatonville, Washington	
DATE STARTED 8/21/24	**COMPLETED** 8/21/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES** ,	
DRILLING METHOD Solid Stem Auger		**GROUND WATER LEVELS:**	
LOGGED BY M. Greenfield	**CHECKED BY**	**AT TIME OF DRILLING** ---	
NOTES Hand auger		**AFTER DRILLING** ---	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some silt and gravel; fine to coarse, brown (Colluvium), 2-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.5 ft	GRAB S-1	100				● ☐

Bottom of exploration at 1.5 feet.

EXPLORATION HA-20

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/21/24 **COMPLETED** 8/21/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		WASTE; silt with some clay, trace sand, wet (LANDFILL CONTENTS)						
1.0		REFUSAL at 1.0 ft	GRAB S-1	100				

Bottom of exploration at 1.0 feet.

Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HA-21

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/21/24 **COMPLETED** 8/21/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some silt and gravel; fine to coarse, brown (Colluvium), 2-in.-thick layer of organic debris at ground surface						
1.0								
2.0		REFUSAL at 2.2 ft	GRAB S-1	100				

Bottom of exploration at 2.2 feet.

EXPLORATION HP-1

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0								
1.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL on gravel at 1.2 ft	GRAB S-1	100				

Bottom of exploration at 1.2 feet.

CLIENT	GSI Water Solutions, Inc.	**PROJECT NAME**	Eatonville Landfill
PROJECT NUMBER		**PROJECT LOCATION**	Eatonville, Washington
DATE STARTED	8/20/24	**COMPLETED**	8/20/24
GROUND ELEVATION		**HOLE SIZE**	4 inches
DRILLING CONTRACTOR		**GPS COORDINATES**	,
DRILLING METHOD	Solid Stem Auger	**GROUND WATER LEVELS:**	
LOGGED BY	M. Greenfield	**CHECKED BY**	
AT TIME OF DRILLING	---	**AFTER DRILLING**	---
NOTES	Hand auger		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL on gravel at 0.8 ft	GRAB S-1	100				

Bottom of exploration at 0.8 feet.

EXPLORATION HP-3

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of glass and organic debris at ground surface						
1.0		WASTE; possible wallboard, white fiber, fine- to coarse-gravel-size fragments (LANDFILL CONTENTS)	GRAB S-1	100				
2.0		REFUSAL at 2.4 ft						

Bottom of exploration at 2.4 feet.

Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HP-4

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.0 ft	GRAB S-1	100				

Bottom of exploration at 1.0 feet.

GEOTECH_SHALLOW - GINT STD US LAB.GDT - 9/3/24 16:26 - C:\USERS\SMART\GREENFIELD DROPBOX\ACTIVE PROJECTS\EATONVILLE LANDFILL\FIELD INVESTIGATION\PRE-DESIGN HAND AUGERS\EATONVILLE_HA.GPJ

EXPLORATION HP-5

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots, wood, and plastic debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL at 0.5 ft						

Bottom of exploration at 0.5 feet.

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EXPLORATION HP-6

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of metal and organic debris at ground surface	GRAB S-1	100				
1.0		REFUSAL at 1.0 ft						

Bottom of exploration at 1.0 feet.

PRE-DESIGN FIELD INVESTIGATION MEMORANDUM
FORMER EATONVILLE LANDFILL REMEDIAL DESIGN
EATONVILLE, WASHINGTON

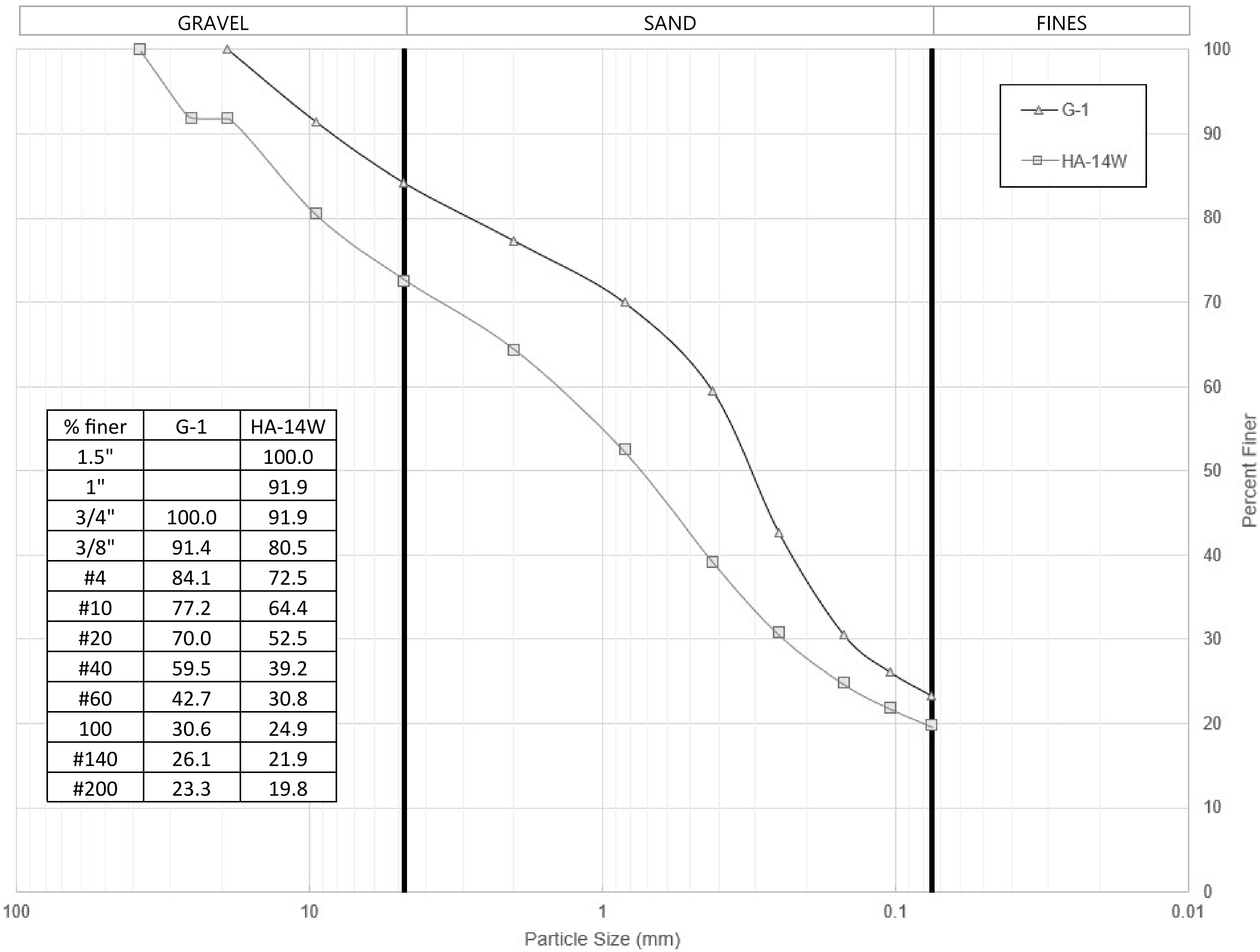
APPENDIX B:
LABORATORY TEST RESULTS

GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

Natural Moisture Content
and Percent Finer than No. 200 Sieve

Boring	Sample	depth (ft)	Container #	Tare (g)	Wet + Tare (g)	Dry + Tare (g)	Washed + Tare (g)	Moisture Content (%)	Fines Content (%)
G-1	G-1	0.0	98	131.03	488.56	477.9	397.94	3.1	23.1
HA-14W	S-1	1.5	96	129.07	700.73	645.27	546.65	10.7	19.1
HA-15B	S-1	1.0	D1	40.85	212.13	189.36	164.43	15.3	16.8
HA-19	S-1	1.0	B4	42.43	245.38	218.3	149.85	15.4	38.9

Particle Size Gradation Curve



% finer	G-1	HA-14W
1.5"		100.0
1"		91.9
3/4"	100.0	91.9
3/8"	91.4	80.5
#4	84.1	72.5
#10	77.2	64.4
#20	70.0	52.5
#40	59.5	39.2
#60	42.7	30.8
100	30.6	24.9
#140	26.1	21.9
#200	23.3	19.8

GREENFIELD GEOTECHNICAL
Eatonville Landfill
Pre-Design Field Investigation
September 2024

APPENDIX B

Restoration Plan

CONFLUENCE ENVIRONMENTAL COMPANY

Eatonville Landfill
RESTORATION PLAN

Prepared for:

GSI Water Solutions, Inc.
February 2025

146 N Canal Street, Suite 111 • Seattle, WA 98103 • www.confenv.com

Eatonville Landfill
RESTORATION PLAN

Prepared for:

GSI Water Solutions, Inc.
650 NE Holladay St., Suite 900
Portland, Oregon 97232

Prepared by:

Confluence Environmental Company
Kerrie McArthur, PWS, CERP, FP-C

February 2025

This report should be cited as:

Confluence (Confluence Environmental Company). 2025. Eatonville landfill: Restoration plan. Prepared for GSI Water Solutions, Inc., Portland, Oregon, by Confluence, Seattle, Washington.

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TABLES

FIGURES

1.0 INTRODUCTION

A combined Remedial Investigation (RI)/Feasibility Study (FS) was developed for the Eatonville Landfill[1] (Site), located in unincorporated Pierce County, Washington. The Site largely falls within a 6.3-acre parcel of land owned by Weyerhaeuser Company (Tax Parcel No. 0416201007; Property) extends slightly into the adjoining Nisqually State Park managed by Washington State Parks and Recreation Commission (Figure 1) (Groundwater Solutions, Inc [GSI] 2023). The RI/FS was prepared in accordance with the requirements of the 2021 Agreed Order No. DE 20072. The Washington Department of Ecology (Ecology) identifies the Site using Facility Site ID No. 85933 and Cleanup Site ID No. 15271.

The Site is composed of a former municipal waste landfill (referred to as the "Landfill Area") and the area beyond the toe of the landfill (referred to as the "Wetland Area") where wastes and select contaminants have migrated over time.

The FS recommended Alternative 1A (Landfill Area: Full Waste and Impacted Soil Removal to the Maximum Practicable Extents) and Alternative 2B (Wetland Area: Containment, Natural Attenuation, and Institutional Controls) as the preferred cleanup action alternatives, and Ecology's Cleanup Action Plan (CAP) selected the recommended alternatives (Ecology 2024a). The cleanup action will remove wastes that are a source of contaminants to soil and groundwater, improve the functions of the wetland by removing debris and contaminants, and eliminate permanent impacts to the existing thriving wetland ecosystem.

Confluence Environmental Company (Confluence) prepared this plan to describe the proposed restoration of areas with temporary impacts associated with the cleanup action. The design of the cleanup action is at 30% completion, and this restoration plan will be updated to align with the final design. The concepts of the restoration proposed in this plan are not expected to change (e.g., plant species and planting methods), but the areas and quantities will be updated for the final design.

[1] Also referred to as the "Former" Eatonville Landfill in previous reports.

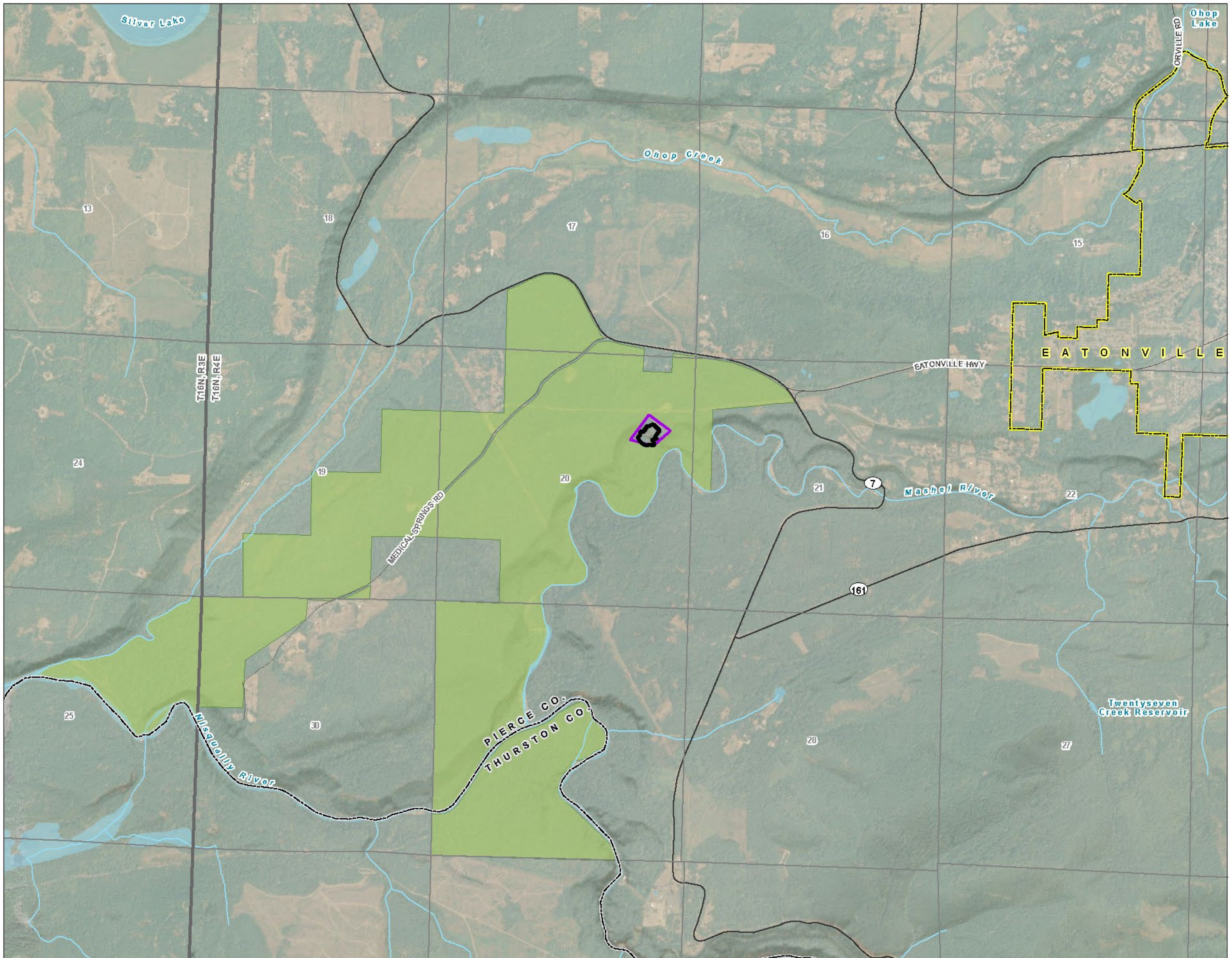

FIGURE 1

Vicinity Map

Detailed Restoration Plan
Former Eatonville Landfill
Eatonville, WA

LEGEND

- Site
- Property (Tax Parcel No. 0416201007)
- Nisqually State Park
- City Boundary
- County Boundary
- Major Road
- Watercourse
- Waterbody

W A S H I N G T O N
SITE LOCATION

NOTE
Site features are approximate.

Date: October 8, 2024
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.

N
0 1,000 2,000 3,000
Feet

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2.0 EXISTING CONDITIONS

The Site was leased by the Town of Eatonville, which used it as a municipal landfill between 1950 and 1980. The landfill is a source of contamination to underlying soil and groundwater.

The Site is located on top of a bluff north of the Mashel River and is surrounded and underlain by unconsolidated glacial deposits that are part of the Vashon Formation. The bluff is an erosional feature of the historical Mashel River channel, and ongoing erosion and mass wasting have resulted in natural slopes as steep as 1.5H:1V near the Site. Landfill deposits on top of the erosional slope are as steep as 1H:1V, with evidence of ongoing slope instability and debris runout near the toe of the slope. The steep bluff gives way to a flat region of land that eventually transitions to the Mashel River floodplain and riverbanks.

The landfill was covered during its operation using fill materials from a borrow pit located directly across the access road from the landfill on Nisqually State Park property. The original cover material has gradually settled and/or eroded over time, leaving refuse exposed. Accessing the middle and lower portions of the Site is difficult because of the presence of dense brush and the steep, loose, and unimproved grade. There are currently no developed access roads or trails on the Landfill Area. However, a historical access road is present at the top of the landfill, which provides access from maintained State Park roads to near the upper edge of the landfill.

A majority of the Site is forested upland conditions. Dominant tree species consist of Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western red-cedar (*Thuja plicata)*, big-leaf maple *(Acer macrophyllum*), and red alder (*Alnus rubra*). Woody vegetation in the understory consists of beaked hazelnut (*Corylus cornuta*), vine maple (*Acer circinatum*), salal (*Gaultheria shallon*), mountain huckleberry (*Vaccinium parvifolium*), Oregon grape (*Mahonia nervosa*), Himalayan blackberry (*Rubus armeniacus*), trailing blackberry (*Rubus ursinus*), and cut-leaf blackberry (*Rubus laciniatus*). Dominant herbaceous species include sword fern (*Polystichum munitum*), herb-robert (*Geranium robertianum*), bracken fern (*Pteridium aquilinum*,), and piggy-back plant (*Tolmiea menziesii*) (Confluence 2024, Pacific Habitat Services, Inc. [PHS] 2022).

A spring daylights near the top of the bluff but outside the landfill prism. Water from the spring flows down the slope under the landfill waste and surfaces near the toe of the landfill (Figure 2).

One wetland was delineated on the Site and extends generally south toward the Mashel River (Figure 2) (Confluence 2024, PHS 2022). Only the portion of the wetland from the toe of the landfill to the edge of the Site was delineated (PHS 2022). On-site, the landfill prism obscures the native ground beneath, making delineating hydric soils or determining the presence of wetland hydrology impossible. Therefore, the wetland boundary in this area was “inferred” based on soil type and surface hydrology observed in the waste prism (PHS 2022). The wetland boundary to the south was also inferred, based on off-site reconnaissance, topography, and aerial imagery interpretation.

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FIGURE 2

Site Map

Detailed Restoration Plan
Former Eatonville Landfill
Eatonville, WA

LEGEND

- Spring
- Estimated Ordinary High Water Line
- Wetland
- Inferred Wetland
- Property (Tax Parcel No. 0416201007)
- Site

All Other Features

- State Park Road Limited Access
- Flow Path
- Mashel River

NOTE

Site features are approximate.

Date: October 8, 2024
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.

N

0 140 280 420
Feet

The total area of the wetland, including the delineated and inferred areas, is approximately 13 acres. This area may be subject to revision if wetland soil is not found to be present in the area of inferred wetland during the implementation of the cleanup action. The wetland is rated as Category I based on special characteristics as it has been identified as a wetland of high conservation value (Confluence 2024).

On site, the wetland vegetation consists primarily of red alder (*Alnus rubra*), salmonberry (*Rubus spectabilis*), slough sedge (*Carex obnupta*), and creeping buttercup (*Ranunculus repens*). Over time, limited waste (e.g., tires and large metal debris) has migrated beyond the landfill waste prism into the delineated wetland below it. According to the 2014 Wetland Rating System (Hruby and Yahnke 2023), the wetland was rated as a Category I wetland, with a water quality score of 8, hydrology score of 5, and habitat score of 9. Under Pierce County Code 18E.30.060, Category I wetlands have a standard buffer width of 150 feet. Therefore, for the purposes of this restoration plan, upland area within 150 feet of the inferred or delineated wetland boundary is identified as wetland buffer.

3.0 PROJECT DESCRIPTION

The proposed cleanup action is removal of the landfill waste and impacted soil from the steep hillside to protect human and ecological health, and potentially create opportunities for beneficial uses as habitat as part of Nisqually State Park.

The RI/FS (GSI 2023) identified the nature and extent of contamination and recommended remedial alternatives. The contaminants of concern at the Site vary by media and Site area (Landfill Area, Wetland Area, and Site wide) and include metals, volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons, gasoline range organics, and polychlorinated biphenyls. Waste or contaminants from the landfill impact 0.95 acre of wetland, including 0.3 acre of the inferred wetland area and 0.65 acre in delineated wetland area.

The CAP (Ecology 2024a) describes the selected cleanup action. The goal of the cleanup is to achieve unrestricted use throughout the Landfill Area and Wetland Area by removing the wastes and impacted soil. Wastes that have migrated into the delineated wetland will also be removed. Excavation is not proposed in the wetland, but the cleanup will attain objectives in the Wetland Area by natural attenuation of residual contamination after removing the source. Clean topsoil would then be brought into the wetland and wetland buffer to restore the area to pre-disturbance grades. Section 4.0 describes the impacts to upland, wetland buffer, and wetland.

4.0 RESTORATION SEQUENCING AND IMPACT ANALYSIS

The cleanup action for the Site will remove contaminant sources to protect human and ecological health. Execution of the cleanup action will strip vegetation and topsoil from the

Landfill Area and temporarily and minimally impact the Wetland Area. The cleanup action will restore native vegetation in the Landfill Area and enhance the vegetation and ecological function of the Wetland Area. The cleanup action includes monitoring to demonstrate the remedy performance and an institutional control to restrict use of surface water and groundwater for human consumption. The cleanup action will improve the wetland by removing chemical and waste impacts, removing known populations of invasive species (Japanese knotweed, Himalayan blackberry, etc.), restoring grades closer to historical conditions, and revegetating the area with native species.

The cleanup action will result in temporary impacts to uplands, wetland, and wetland buffer and permanent impacts in small areas for monitoring wells and rock channels to direct and distribute the spring flow. Figure 3 shows the locations of impacts.

Disturbance of vegetation and soils for staging, access routes, removal of debris, and removal of contaminated soils, is required for the project to be successful. Under the cleanup action, the following would be temporarily impacted during the cleanup:

- Approximately 26,355 square feet of wetland
- Approximately 97,972 square feet of wetland buffer
- Approximately 81,975 square feet of uplands

Restoration for these impacts is described in Section 5.0.

Permanent impacts would result from the footprint of the monitoring wells, needed to evaluate the performance of the cleanup action and from the permanent routing of the springs flow path through a rock chute and rock structure. Under the cleanup action, the following would be permanently impacted during the cleanup:

- Approximately 12 square feet of wetland (0.00015% of the entire wetland) impact associated with the footprint of monitoring wells.

- No more than 13,867 square feet of wetland (0.02% of the entire wetland) impact associated with the routing of the springs flow path through an rock chute and rock structure.

- Approximately 8 square feet of wetland buffer impact associated with the footprint of monitoring wells.

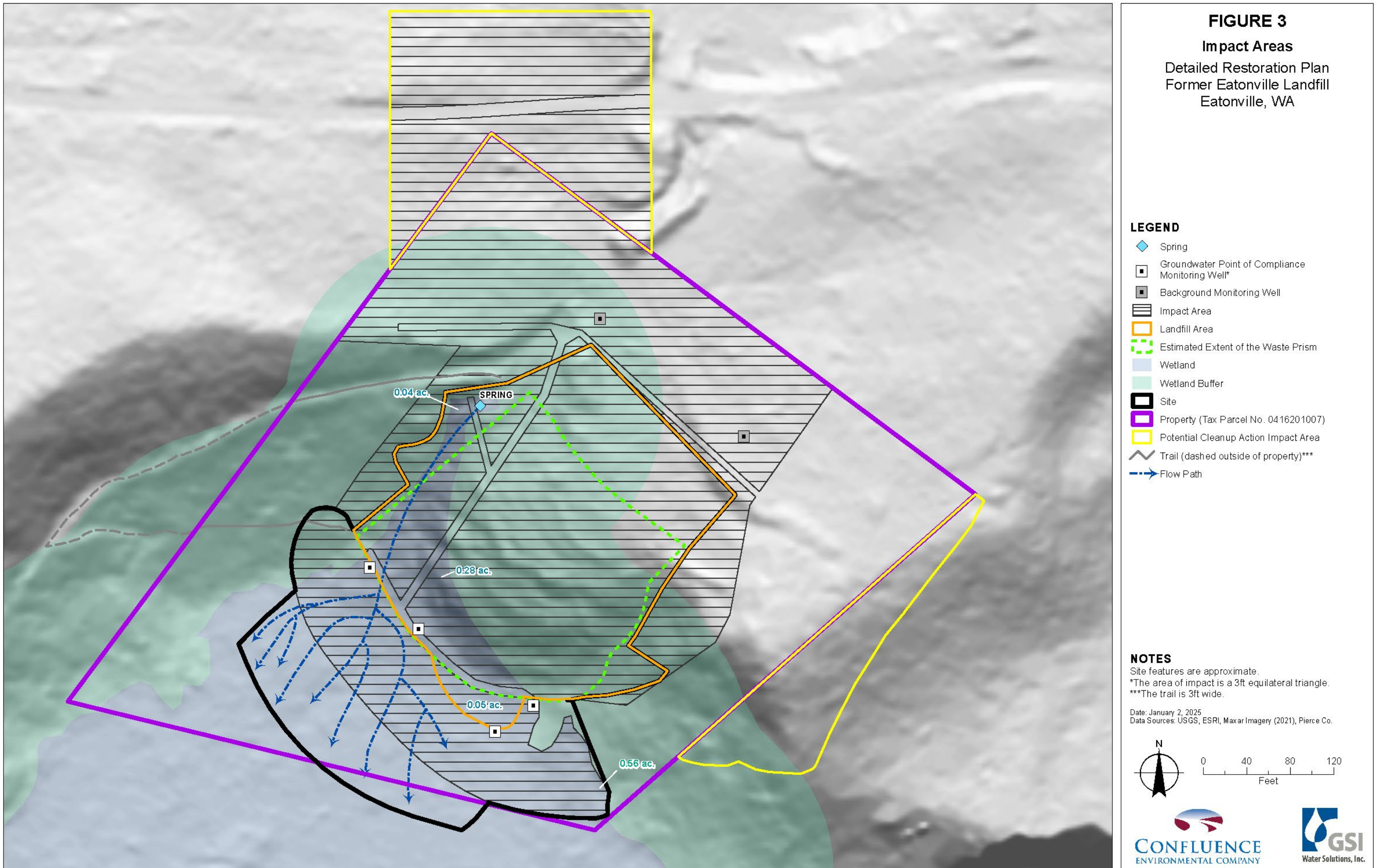
- Approximately 6,202 square feet of wetland buffer impact associated with the routing of the springs flow path through an rock chute and a rock structure.

- Approximately 4 square feet of uplands impact associated with the footprint of monitoring wells.

- Approximately 705 square feet of uplands impact associated with the routing of the springs flow path through an rock chute and a rock structure.

Once debris is removed from the inferred wetland in the Landfill Area, the wetland boundary will be delineated and actual impacts, if any, will be calculated. However, based on the inferred wetland boundary no more than 13,867 square feet of permanent impacts to the wetland would occur as a result of the cleanup action and grading.

Removing waste, contaminated soils, and invasive species (such as Japanese knotweed and Himalayan blackberry), restoring grades closer to historical conditions, and revegetating the area with native species will improve wetland functions and mitigate the permanent impacts.


0.04 ac.
SPRING
0.28 ac.
0.05 ac.
0.56 ac.
FIGURE 3
Impact Areas
Detailed Restoration Plan
Former Eatonville Landfill
Eatonville, WA
LEGEND
Spring
Groundwater Point of Compliance Monitoring Well*
Background Monitoring Well
Impact Area
Landfill Area
Estimated Extent of the Waste Prism
Wetland
Wetland Buffer
Site
Property (Tax Parcel No. 0416201007)
Potential Cleanup Action Impact Area
Trail (dashed outside of property)***
Flow Path
NOTES
Site features are approximate.
*The area of impact is a 3ft equilateral triangle.
***The trail is 3ft wide.
Date: January 2, 2025
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.
N
0
40
80
120
Feet
CONFLUENCE ENVIRONMENTAL COMPANY
GSI Water Solutions, Inc.

5.0 PROPOSED RESTORATION

Temporarily impacted areas will be restored with native vegetation plantings at a 1:1 ratio. Table 1 is the proposed woody species planting schedule. The planting quantities in the wetland area may change based on vegetative conditions after cleanup. It is anticipated that much of the existing native vegetation will remain and therefore not need to be replaced. Therefore, plant quantities in the table depict a worst case (i.e., complete vegetation removal) condition. Table 2 is the proposed native seed mix planting schedule. Figure 4 shows the locations of the planting areas. Prior to planting, a 3-way topsoil free of weeds and chemicals of concern below CULs. Topsoil will be placed 6 to 12 inches thick over the temporarily impacted areas and secured on steep slopes with hydroseed, jute matting, or equivalent.

Table 1. Native woody planting schedule

Common Name	Scientific Name	Container Size	Spacing (feet on center)	Quantity*
Wetland Native Wood Revegetation Area (26,355 square feet)				
Western red-cedar	*Thuja plicata*	1 gallon	15	39
Red alder	*Alnus rubra*	1 gallon	15	39
Black cottonwood	*Populus trichocarpa*	1 gallon	15	39
Peafruit rose	*Rosa pisocarpa*	1 gallon	7	105
Red-osier dogwood†	*Cornus sericea*	1 gallon	7	105
Black twinberry	*Lonicera involucrata*	1 gallon	7	105
Slough sedge†	*Carex obnupta*	1 gallon	7	106
Total				**538**
Wetland Buffer Native Wood Revegetation Area (97,972 square feet)				
Western red-cedar	*Thuja plicata*	1 gallon	15	73
Douglas-fir	*Pseudotsuga menziesii*	1 gallon	15	73
Western hemlock	*Tsuga heterophylla*	1 gallon	15	73
Grand fir	*Abies grandis*	1 gallon	15	73
Big leaf maple	*Acer macrophyllum*	1 gallon	15	40
Red alder	*Alnus rubra*	1 gallon	15	40
Black cottonwood	*Populus trichocarpa*	1 gallon	15	40
Cascara	*Frangula purshiana*	1 gallon	15	25
Salal	*Gaultheria shallon*	1 gallon	7	214
Peafruit rose	*Rosa pisocarpa*	1 gallon	7	150
Red-flowering currant	*Ribes sanguineum*	1 gallon	7	150
Vine maple	*Acer circinatum*	1 gallon	7	214
Common snowberry	*Symphoricarpos albus*	1 gallon	7	214
Ocean-spray	*Holodiscus discolor*	1 gallon	7	150
Oregon grape	*Mahonia nervosa*	1 gallon	7	215
Sword fern	*Polystichum munitum*	1 gallon	7	261

Common Name	Scientific Name	Container Size	Spacing (feet on center)	Quantity*
Total				**2005**
Upland Native Wood Revegetation Area (62,018 square feet)				
Western red-cedar	*Thuja plicata*	1 gallon	15	40
Douglas-fir	*Pseudotsuga menziesii*	1 gallon	15	40
Western hemlock	*Tsuga heterophylla*	1 gallon	15	36
Grand fir	*Abies grandis*	1 gallon	15	35
Big leaf maple	*Acer macrophyllum*	1 gallon	15	35
Red alder	*Alnus rubra*	1 gallon	15	35
Black cottonwood	*Populus trichocarpa*	1 gallon	15	35
Cascara	*Frangula purshiana*	1 gallon	15	20
Salal	*Gaultheria shallon*	1 gallon	7	150
Peafruit rose	*Rosa pisocarpa*	1 gallon	7	100
Red-flowering currant	*Ribes sanguineum*	1 gallon	7	100
Vine maple	*Acer circinatum*	1 gallon	7	130
Common snowberry	*Symphoricarpos albus*	1 gallon	7	150
Ocean-spray	*Holodiscus discolor*	1 gallon	7	100
Oregon grape	*Mahonia nervosa*	1 gallon	7	130
Sword fern	*Polystichum munitum*	1 gallon	7	130
Total				**1,266**

* Quantities are based on planting area and plants installed based on square pattern.

† Species to be planted closer to the rock dispersion structure.

Table 2. Native seed mix planting schedule

Common Name	Scientific Name	% Weight	% Purity	% Germination	Quantity (Pounds/acre)*
Upland Native Seed Revegetation Area (19,957 square feet)					
Oregon bentgrass	*Agrostis oregonensis*	20	92	85	
Roemer's fescue	*Festuca idahoensis*	70	98	90	
Braodleaf lupine	*Lupinus latifolius*	10	98	90	
Total					**55 pounds (based on 120 pounds/acre)**

* Quantities are based on hydroseeding application with at least 1,500 pounds/acre of mulch with 3% tackifier (Ecology 2024b).

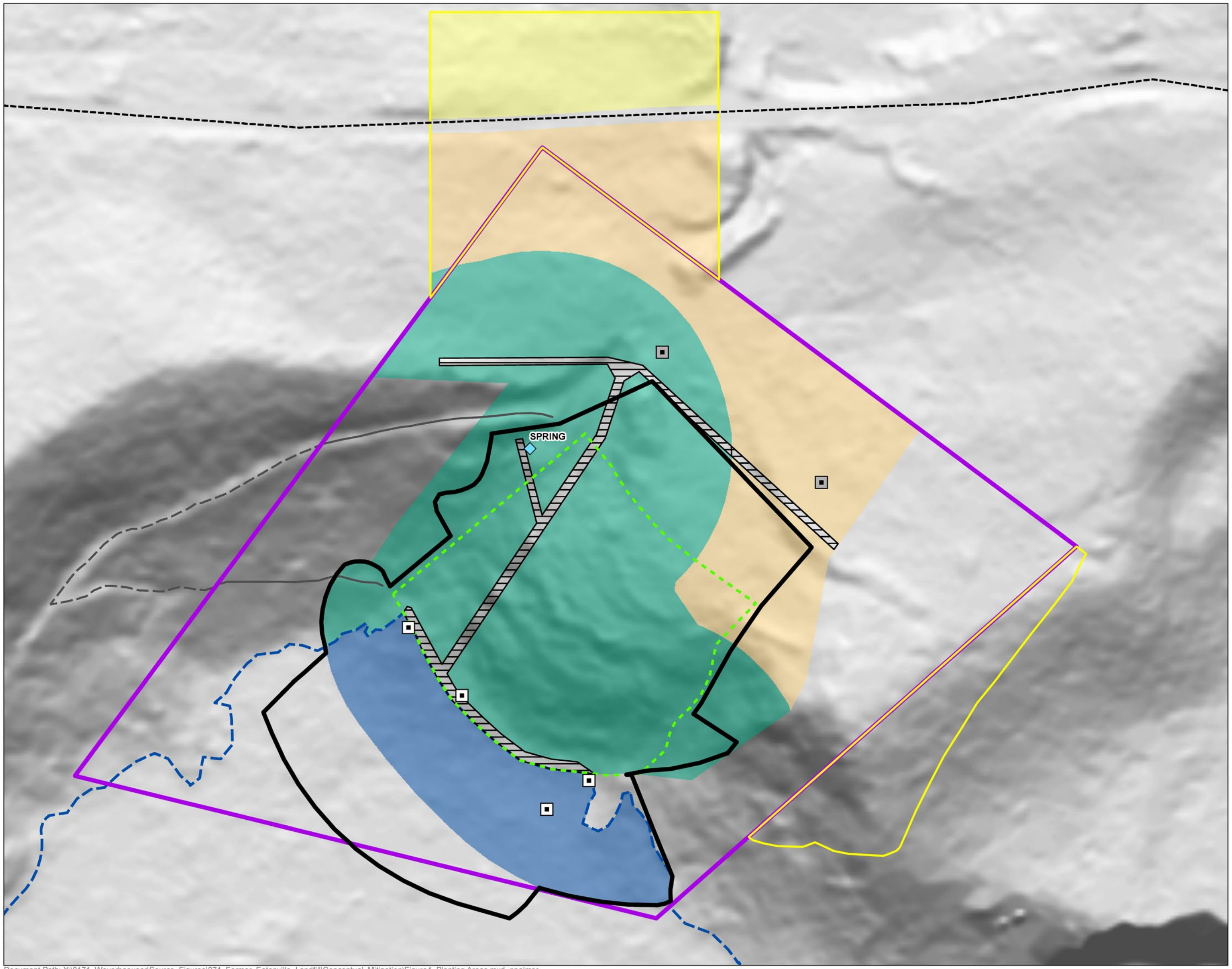


FIGURE 4

Planting Areas

Detailed Restoration Plan
Former Eatonville Landfill
Eatonville, WA

LEGEND

- Spring
- Groundwater Point of Compliance Monitoring Well*
- Background Monitoring Well

Restoration Type

- Upland, Native Seed Area
- Upland, Native Wood Area
- Wetland Buffer, Native Seed Area
- Wetland Buffer, Native Wood Area
- Wetland, Native Wood Area

All Other Features

- Site
- Property (Tax Parcel No. 0416201007)
- Wetland
- Estimated Extent of the Waste Prism
- Potential Cleanup Action Impact Area
- Rock Chute
- No Impact, Roadway
- Trail (dashed outside of property)***

NOTES

Site features are approximate.
The hydroseed only planting area is all areas of impact outside the wetland and wetland buffer footprints.
*The area of impact is a 3ft equilateral triangle.
***The trail is 3ft wide.

Date: January 2, 2025
Data Sources: USGS, ESRI, Maxar Imagery (2021), Pierce Co.

N

0 40 80 120
Feet

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6.0 RESTORATION GOALS, OBJECTIVES, PERFORMANCE STANDARDS

The goal of the restoration plan is to revegetate wetland, wetland buffer, and upland areas disturbed during the cleanup action. The objectives of the restoration plan are as follows:

- 26,356 square feet of wetland will be dominated by healthy, native plants.
- 97,972 square feet of wetland buffer will be dominated by healthy, native plants.
- 81,975 square feet of upland will be dominated by healthy, native plants.

The restoration areas will be monitored for 10 years to assess performance. Table 3 lists the performance standards.

7.0 MONITORING PLAN

The monitoring plan complies with guidance from Pierce County Code 18E and from Ecology, the U.S. Army Corps of Engineers, and U.S. Environmental Protection Agency Region 10 (2021). The restoration areas will be monitored for 10 years to ensure they are trending toward meeting the goals and objectives described in Section 5.0.

7.1 Monitoring Frequency

The restoration areas will be monitored and results reported at the following frequency:

- At completion of construction of restoration (As-built Survey)
- Yearly monitoring (Years 1-10)

An additional survey and extended plant survival monitoring may also be required if replanting is necessary after Year 3.

7.1.1 As-Built Survey

Once construction and planting are complete, an as-built survey will demonstrate that the restoration is implemented per the design and document any modifications during construction.

7.1.2 Yearly Monitoring

The yearly monitoring will include a quantitative study of the restoration areas, as described in Section 7.2. Table 3 lists the performance standards. Yearly monitoring will occur in the fall before deciduous leaves have dropped.

Table 3. Performance standards and success criteria

Performance Standard	Success Criteria										
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Plant Survival (%)	NC	100	80	70	—	—	—	—	—	—	—
Native Species Cover (%)	NC	—	—	40	50	70	—	75	—	80	>80
Invasive Species Cover* (%)	NC	≤10	≤10	≤10	≤10	≤10	—	≤10	—	≤10	≤10

* Source Pierce County 2024 (or latest version), including Himalayan blackberry, reed canarygrass, Scotch broom, Japanese knotweed.
NC No criterion; monitoring data will be used as baseline information
— No monitoring for the year

7.1.3 Replanting Survey and Extended Plant Survival Monitoring

Plant Survival monitoring is not planned after Year 3 (Table 3) because growth of installed plants and natural recruits will obscure individual plants. If an ecologist determines that any portion of the restoration areas needs to be replanted, a survey will document the locations of the newly installed plants. The survey will become the new baseline for subsequent Plant Survival monitoring.

7.2 Monitoring Methods

The following sections discuss the monitoring methods.

7.2.1 Transects and Photo Points

Random transects will be established within the restoration areas for yearly monitoring. The actual locations of the transects will be determined in the field each year. Coordinates for the locations of the end points of each transect will be recorded using a global positioning system (GPS) and reported in the monitoring report.

Photo points established at each end of each transect will document the restoration areas over time. At each of the photo points, a fixed-lens digital camera will be used to take photographs, either a panoramic photo or 1 at every 90 degrees of the compass.

7.2.2 Plant Survival

Plant survival within the restoration areas will be determined by comparing the number and species of plants recorded on the as-built drawings to site conditions at the time of monitoring. The percent survival will be calculated by dividing the number of plants (by species) identified as alive during the monitoring event by the number of plants (by species) identified on the as-built plan. Naturally recruited native plants will be included in the plant census.

7.2.3 Native and Invasive Species Percent Cover

The line-intercept method will be used to determine the percent cover of native and invasive vegetation along each of the transects (U.S. Department of Agriculture and U.S. Department of the Interior 1999). After laying a tape measure along a transect, the lengths of tape directly under the branches and foliage of a tree or shrub will be recorded along with the species. The percent cover of each species will then be calculated by dividing the sum of lengths intercepted for that species by the total length of the transect.

Native species are those identified as native by the National Plants Database (NRCS 2024). Invasive species include those regulated by Pierce County for removal (Pierce County 2024 or (or latest version), and Himalayan blackberry (*Rubus armeniacus*), reed canarygrass (*Phalaris arundinacea*), Scotch broom (*Cytisus scoparius*), Japanese knotweed (*Fallopia japonica*).

7.3 Reports

An ecologist will prepare a report to document each monitoring event. One copy of each report will be provided to the Ecology project manager. The sections below document what will be included in each type of monitoring report.

7.3.1 As-Built

The As-built report will document the actual construction of the restoration areas and will include the following:

- Drawing showing final grading
- Actual planting density (container size, average offset)
- Description of any changes from the original design

7.3.2 Yearly Monitoring

Yearly monitoring reports will include the following:

- Date of survey
- A narrative description of methods and contingency measures taken
- Data tables
- Summary of results
- Discussion of results in relation to success criteria
- Recommendations for maintenance and contingency measures, as needed.
- Color photos from each of the photo points

8.0 MAINTENANCE PLAN

The following sections detail the different components of the restoration maintenance plan.

8.1 Watering

Watering may be necessary depending on the date of planting and the amount of rainfall that year. Monitoring of rainfall will be used to determine the need for watering.

Watering will occur so that the plants will receive at least 1.5 inches of water (or equivalent of rainfall) twice per month during the first year following planting. Watering may be necessary for several years after plant installation to assist survival and establishment of plantings. Watering may be accomplished using a temporary irrigation system or water truck.

8.2 Weeding

The new plantings will be weeded, if necessary, to ensure establishment and prevent stress to the plants from competition for resources. Weeding will occur twice a month during the early growing season (typically between March and July) and late growing season (typically September through October). During the remainder of the year, weeding will occur monthly. All invasive species will be weeded. This schedule of weeding will occur until the plants have established themselves and out-compete the invasive species.

Weed whacking will be allowed around plantings with protective tubing. Control of highly invasive species such as Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), and reed canarygrass (*Phalaris arundinacea*) is especially important, and emphasis will be given to their removal to prevent invasion into the planted areas.

8.3 Mowing

Mowing will not occur in the restoration areas.

8.4 Mulching

The shrub plantings may be mulched, if necessary, to help retain water. Mulch around plantings will be no thicker than 4 inches. Thick layers of mulch (more than 6 inches) may also be used to control reed canarygrass in areas between plantings. Mulch will be placed when plants are installed, and additional mulch may be placed as needed throughout the monitoring period. Trees removed from unimpacted areas (i.e., outside of the landfill and wetland areas) as part of the cleanup actions implementation may be considered for use as mulch during the cleanup action.

8.5 Dead Plant Removal

Dead plant material will be removed only after scheduled monitoring. This will allow for the accurate assessment of planting success needed for the monitoring program. Replacement planting will be detailed in a section of the report from the monitoring program. This will include species recommendations to maintain the desired diversity in the plant communities of the restoration areas.

9.0 CONTINGENCY MEASURES

The following sections detail the different contingency measures that could be put into place as part of the restoration plan.

9.1 Temporarily Impacted Areas

The planting schedule is based on the current understanding of the cleanup action. However, due to the level of field engineering required for this project, temporarily impacted areas could increase or decrease in size. If temporarily impacted areas change in size, the plant quantities will be adjusted accordingly.

9.2 Percent Survival

Plant survival could be negatively affected by improper installation, diseased or infested plants, inadequate watering, or extreme weather. If more than 25 percent of new plantings die in a single year, the cause of the high losses will be investigated and corrected before dead plants are replaced. Dead plant material will only be removed after that year's scheduled monitoring. If less than 70 percent of the total plants installed have survived during the Year 3 monitoring, additional plants will be installed to bring the planting schedule back into original specifications.

9.3 Native Species Percent Cover

Native plant growth, as determined by percent cover, could be negatively affected by improper installation, diseased or infested plants, inadequate watering, or extreme weather. If the native species cover success criterion is not met, the cause will be investigated and corrected. Correction measures may include increased watering, soil amendments, fertilizing, or revision of planting palate and additional plantings.

9.4 Invasive Species Percent Cover

Dominance by invasive species could result from disturbance of the soil, a high mortality rate of the native planted vegetation, or colonization by windborne seeds. To reduce colonization by invasive species, a site maintenance plan is described in Section 8.0. If more than 10 percent of the restored area is covered by invasive species, the cause of infestation will be investigated, and corrective actions will be taken before weeds are removed. Contingency measures could include increasing the frequency of weeding until native vegetation can grow and dominate the area or increasing the density of native vegetation with additional plantings.

10.0 REFERENCES

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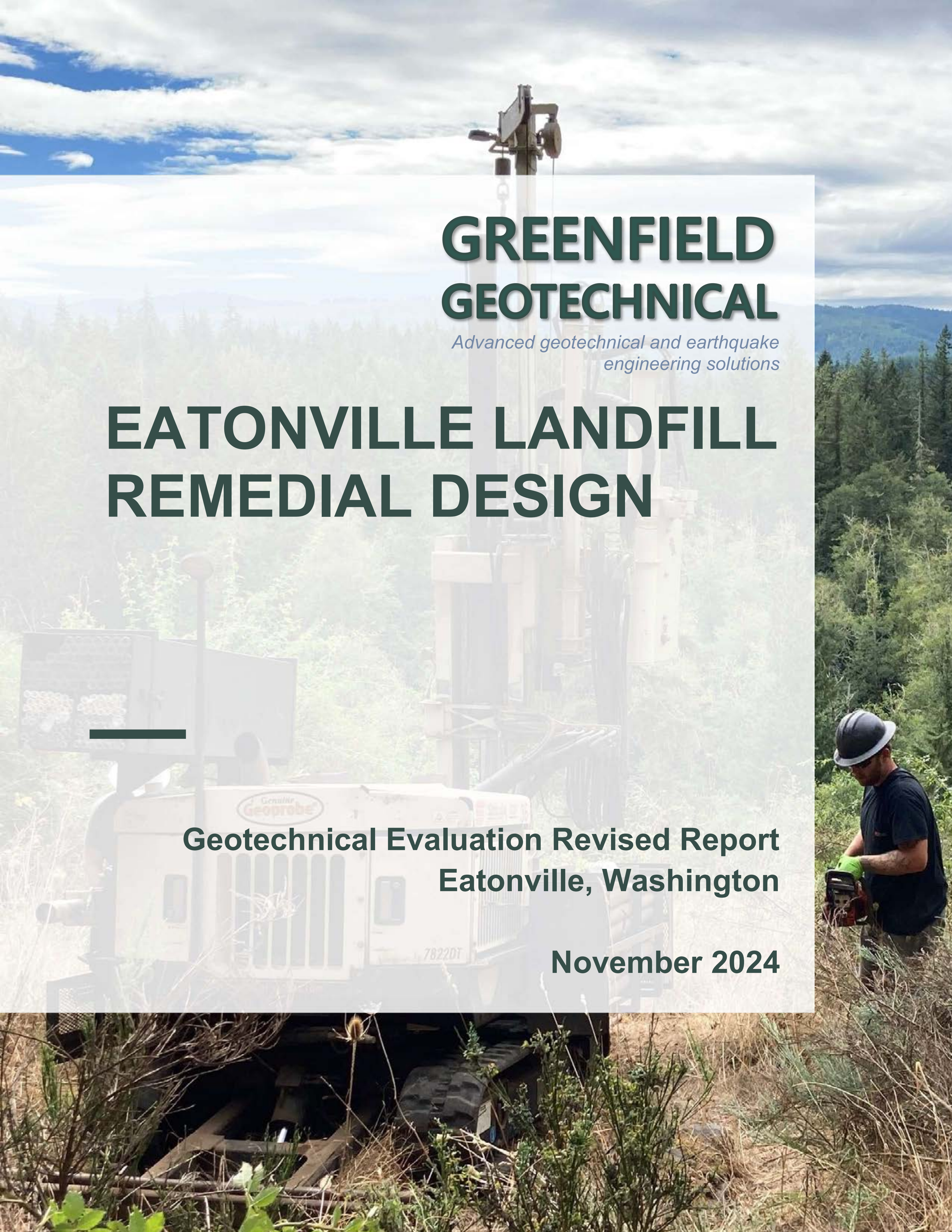
APPENDIX C

Geotechnical Evaluation Report



GREENFIELD GEOTECHNICAL

Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN

Geotechnical Evaluation Revised Report
Eatonville, Washington

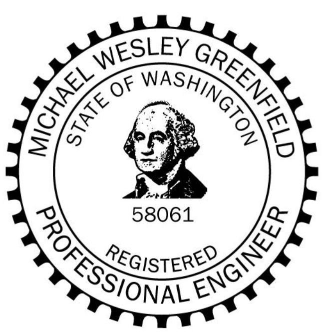
November 2024

GEOTECHNICAL EVALUATION REVISED REPORT

Limitations

This report has been prepared for the exclusive use of the engineer and owner in the project described herein. The scope is limited to the specific project and location. The description of the project represents our understanding of the significant aspects relevant to the evaluation, design, and construction of the remedial design options. If any changes in the design or location of the proposed design elements are planned, Greenfield Geotechnical should be permitted to review the changes and modify or reaffirm the conclusions and recommendations of this report in writing.

The conclusions submitted in this report are based on the data obtained from the explorations shown in the Site Plan (Figure 1) and from the sources discussed in this report. Specific information was obtained at specific locations and times during the subsurface investigations. Variations in soil conditions may exist between borings locations and this report does not reflect all variations that may exist. The nature and extent of variation may not become evident until construction begins. If subsurface conditions encountered during construction are different from those described in this report, Greenfield Geotechnical should be notified at once so that the geotechnical engineer can review the newly discovered conditions and reconsider this report's recommendations wherever necessary. If we do not have the opportunity to confirm the interpretations, assumptions, and analyses described in this report, we cannot be responsible for the consequences of conditions that vary from the assumptions explicitly stated in this report.



Renews Feb 2026

Mike Greenfield, Ph.D., P.E.
Principal Engineer

Greenfield Geotechnical LLC

EATONVILLE LANDFILL REMEDIAL DESIGN
GEOTECHNICAL EVALUATION REVISED REPORT
EATONVILLE, WASHINGTON

Table of Contents

1.0 INTRODUCTION

Greenfield Geotechnical is pleased to provide this report describing our conclusions and recommendations for the remediation of the Eatonville Landfill near Eatonville, Washington. The Site Plan, Figure 1, includes a vicinity map insert showing the approximate site location. GSI Water Solutions, Inc. (GSI) is currently developing a remedial design for the landfill. Alta Science and Engineering (Alta) is assisting GSI by developing grading plans and designs. The purpose of this evaluation is to assist GSI and its subcontractors by developing geotechnical conclusions and recommendations for site remediation.

2.0 PROJECT DESCRIPTION

The landfill was developed on a steep, approximately 141-foot-tall slope within the boundary of the current Nisqually State Park. The top of the slope is established at approximately elevation 726 ft and is graded gently down to approximately elevation 704 ft, where the slope steepens to approximately 2.4 horizontal to 1 vertical (2.4H:1V). Waste is exposed at the ground surface on the slope below elevation 704 ft. At an approximate elevation of 670 ft, the slope becomes very steep and is approximately 1.25H:1V. Portions of the slope up to 6 ft tall are nearly vertical below elevation 670 ft. The base of the landfill is formed at approximately elevation 585 ft where the waste intersects a wetland with standing water. The Typical Landfill Sections A and B, Figures 2 and 3, show typical profiles of the landfill and adjacent slope.

We understand that the existing waste and impacted soils will be removed as part of the remediation. GSI has indicated the design objective for the landfill is to develop a geotechnically stable slope for recreational access. The final slope will be vegetated, and no permanent structures or roadways are currently planned.

3.0 GEOLOGIC AND SEISMIC SETTING

3.1 GEOLOGY

The site lies at the edge of Puget Sound Lowland, an elongate structural and topographic basin that extends from the Cascade Range to the east and the Olympic Mountains to the west. In the last 2.4 million years, Puget Sound Lowland has been impacted by repeated cycles of glacial scouring, deposition, tectonic activity, volcanic mudflows, as well as landslides and stream erosion. The repeated cycles of glaciation and tectonic activity have resulted in a landscape dominated by fluted upland plateaus of till and sand interspersed with cross-cutting valleys, deep north-south troughs, and numerous lakes and depressions. The Vashon Stade, which ended about 13,650 years ago, was the latest advance of glaciers into the Puget Sound Lowland. During that period, glacial drift filled troughs and surrounded bedrock promontories in front of the advancing glacier. These deposits were subsequently overridden and consolidated by the glaciers. As the glaciers receded, recessional deposits consisting of sand and mud were then deposited along streams and in ice-dammed lakes. In general, the advance outwash and till deposits are highly consolidated due to the weight of the overriding glacier, whereas the recessional deposits are often unconsolidated since they were deposited in the wake of the receding glacier.

The ground surface at the top of the landfill was likely extensively modified during the operation of the landfill. Evidence of roadways, grading, and material stockpiles are present at the top of the landfill. The landfill itself is located within a deposit of Vashon Glacial Drift, which tends to consist of a descending sequence[1,2,3] of:

1. Loose to medium dense silty sand and sandy silt (Recessional Outwash);
2. Very dense, well-graded mixtures of clay, silt, sand, gravel, cobbles, and boulders (Vashon Till);
3. Loose to medium dense, well-graded medium sand (Advance Outwash); and then
4. Very stiff to hard, dark gray clayey silt and clay (Lawton Clay).

Beneath the Vashon Glacial Drift, the Mashel Formation consists of unconsolidated clay, sand, and lignite deposits. Peat and organic silt are also present in areas of standing water at lower elevations in the vicinity of the Mashel River.

The Mashel River is located approximately 400 ft southeast of the landfill toe, and the river has incised the Vashon glacial drift, creating very steep, marginally stable slopes. A possible landslide head scarp was observed at the top of the slope to the east of the landfill, indicating that the existing slopes may be unstable. Colluvium likely mantles much of the ground surface on and below the very steep slopes.

3.2 SEISMIC SETTING

Deep intraplate earthquakes are common below the Puget Lowlands as the Juan de Fuca plate subducts into the earth's mantle. Historic intraplate earthquakes include the 2001 M6.8 Nisqually earthquake, the 1965 M6.7 Puget Sound earthquake, and the 1949 M6.7 Olympia earthquake. A similar earthquake proximal to the site could produce severe, long-duration ground shaking.

4.0 SUBSURFACE INVESTIGATIONS

4.1 PREVIOUS INVESTIGATIONS

Previous subsurface investigations were conducted at the site by Greenfield Geotechnical and GSI. The results of these investigations are summarized in the documents titled:

> Remedial Investigation/Feasibility Study. Former Eatonville Landfill. GSI Water Solutions. February 2024.
>
> Pre-Design Field Investigation Memorandum. Former Eatonville Landfill. Eatonville, Washington. Greenfield Geotechnical. September 2024.

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[1] Mullineaux, D.R., Waldron, H.H. and Rubin, M., 1965. *Stratigraphy and chronology of late interglacial and early Vashon glacial time in the Seattle area, Washington* (No. 1194-O). US Geological Survey.

[2] Savage, W.Z., Morrissey, M.M. and Baum, R.L., 2000. Geotechnical properties for landslide-prone Seattle; area glacial deposits (No. 2000-228). US Department of the Interior, US Geological Survey.

[3] Harp, E.L., Michael, J.A. and Laprade, W.T., 2008. Shallow landslide hazard map of Seattle, Washington.

The Site Plan, Figure 1, shows the approximate locations of the geotechnical investigations. Appendix A provides summary logs and laboratory test results from the 2024 Pre-Design Field Investigation: hand augers HA-11 through 21, HP-1 through 6, and grab sample G-1. Appendix B provides selected summary logs and laboratory test results of the 2024 Remedial Investigation/Feasibility Study: logs from hollow stem auger borings B-01 through B-03, piezometer monitoring wells PZ-01 through PZ-05, and probes SB-10, 11, 14, and 16 through 19. Geophysical survey results from six seismic refraction surveys are also provided in the Remedial Investigation/Feasibility Study report. The following sections summarize the subsurface conditions encountered at the site.

4.2 SURFICIAL ORGANIC SOIL

Organic soil consisting of sand and gravel with roots, wood debris, waste, and other detritus was encountered at the ground surface at higher elevations and on the slope outside of the landfill area. The thickness of the surficial organic soil ranges from less than 1 inch thick near the top of the landfill up to 12 inches thick on the steep slopes in the forested areas adjacent to and below the landfill.

At the bottom of the landfill, organic peat soils were encountered in piezometers PZ-03 and 04. The piezometer logs indicate the organic peat is saturated and up to 3.2 ft thick.

4.3 SANDY GRAVEL (FILL)

Landfill cover and roadway fill were encountered at the ground surface in borings B-01 and 02; piezometers PZ-01 and 05; probes SB-10, 11, 14, and 16 through 19; and in hand augers HA-11, 16, 17, and HP-1 through 6. The fill is typically very dense, fine to coarse, sub-rounded to rounded sandy gravel with some cobbles and boulders and a trace to some organic debris and waste. The Standard Penetration Resistance (SPT) N-values range from 2 to 16 blows/ft. Laboratory tests indicate that the fine-grained content of the sandy gravel fill typically ranges from 8 to 11%. The sandy gravel fill is approximately 0.5 to 10 ft thick over the landfill waste and is approximately 2 to 25 ft thick over the native soils.

4.4 WASTE

Waste from the landfill was encountered below the sandy gravel fill in borings B-01; probes SB-17, 18, 19; and in hand auger HP-3. Waste was also observed at the ground surface below approximately elevation 704 ft and in hand augers HA-14 and 20. The waste ranges in consistency from silt with sand to fine to coarse gravel intermixed with paper, plastic, glass, concrete, and construction debris. Organic debris including paper and plastic composes up to 23% of the landfill contents by dry weight. Larger debris including appliances and car bodies were observed at the ground surface below the steepest section of the slope at lower elevations. The waste is very loose with N-values ranging from 1 to 2 blows/ft. The geophysical survey indicates that the waste may be up to 27 ft thick.

4.5 SANDY GRAVEL (RECESSIONAL OUTWASH)

Native sandy gravel was encountered in borings B-02 and 03; piezometers PZ-01, 02, and 05; and hand auger HA-12. The sandy gravel is fine to coarse, rounded to sub-angular, and contains some cobbles and boulders and a trace to some silt. The relative density of the sandy gravel ranges from medium dense to very dense with SPT N-values ranging from 18 to over 50 blows/ft. The sandy gravel recessional outwash extends to depths of up to 35 ft.

4.6 SAND (COLLUVIUM)

Loose fine to medium sand with some silt and silty sand was encountered below the landfill in boring B-01 and probes SB-16, 17, and 19. Sand colluvium was also encountered in hand augers HA-13, 14W, 15, 18, 19, and 21. The sand is loose with SPT N-values ranging from 6 to 7 blows/ft and is likely colluvium from mass wasting processes of the upslope deposits. The sand and silty sand colluvium may be up to 10 ft thick based on samples collected from probe SB-17.

4.7 SANDY SILT (VASHON TILL)

Consolidated mixtures of sandy silt and silty sand with some clay, gravel, cobbles, and boulders were encountered below the landfill in boring B-01 and probes SB-10, 11, 14, 18, and below the recessional outwash in piezometers PZ-01, 02, and 05. The sandy silt and silty sand are very stiff to hard with N-values ranging from 20 to 33 blows/ft. Laboratory tests indicate that the sandy silt and silty sand contain 43 to 83% fine-grained particles and exhibit medium to high plasticity with a plasticity index of 23%. The elevation, texture, and density of the sandy silt and silty sand indicate that they are likely layers of Vashon Till in the Vashon Glacial Drift sequence.

4.8 SAND (VASHON ADVANCE OUTWASH)

Fine to coarse sand and gravelly sand with a trace to some silt and trace to some cobbles and boulders were encountered below the Vashon Till or Colluvium in piezometers PZ-01 and 02 and probe SB-17. The texture and density of the sand and gravelly sand below the Vashon Till indicate the sand and gravelly sand are likely layers of Vashon Advance Outwash in the Vashon Glacial Drift sequence. The Advance Outwash is distinguished from the colluvium by its higher relative density. SPT N-values ranging from 29 to 33 blows/ft indicate the Advance Outwash is dense. One laboratory test indicates the Advance Outwash contains 11% fine-grained particles.

4.9 CLAY (VASHON LAWTON CLAY / POSSIBLE UPPER MASHAL FORMATION)

Laminated layers of clay and clayey silt were encountered below the Advance Outwash in piezometer PZ-02. The clay and clayey silt contain layers of sandy silt up to 6.5 ft thick and layers of silty sand with cobbles up to 4 ft thick. Wood fragments were also observed in the clay layers. The clay and silty clay extended to the maximum depth explored of 120 ft.

4.10 GROUNDWATER

GSI investigated groundwater conditions with 5 piezometers and 1 spring gauging station. Logs of the piezometers are provided in the Remedial Investigation/Feasibility Study report. Table 1 lists the maximum observed piezometric elevations from two measurements during the fall of 2021 and winter of 2022. The elevation of the spring is approximately 688 ft.

Table 1: Piezometric elevation

Piezometer	Ground surface elevation (ft)	Bottom elevation of well screen (ft)	Piezometric elevation (ft)
PZ-01	723	624	647
PZ-02	726	627	650
PZ-03	590	587	589
PZ-04	580	577	580
PZ-05	723	695	700

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SEISMIC DESIGN PARAMETERS

Seismic design parameters are defined based on a Contingency Level Earthquake (CLE). Ground motions associated with the CLE are defined based on a 10% probability of exceedance, which is equivalent to a 475-year return period. Subsurface investigations encountered soils ranging in consistency from medium to very dense. Topography-based correlations indicate the shear wave velocity of the upper 100 ft of soil ($V_{s,30}$) is approximately 1,100 ft/sec. Measurements from a downhole seismic array approximately 2.2 miles north of the site indicate the $V_{s,30}$ of the Vashon Glacial Drift is approximately 1,600 ft/sec. Based on the data, a designation of Site Class CD is appropriate for the project design. The 2018 National Seismic Hazard Map (USGS, 2018) indicates the 475-year peak ground acceleration (*PGA*) is 0.33 g. Disaggregation of the hazard indicates that the deep intraplate earthquake is the greatest contributor to the hazard and has a characteristic magnitude of M6.8.

5.2 GROUNDWATER FLOW

Seepage and groundwater flow could impact the stability of the slope or complicate remediation of the landfill. The spring at approximately elevation 688 ft is perennial and indicates seeps could be present below the waste. Conversely, the piezometers installed in the borings above the landfill indicate that a range of groundwater pressure is present. The piezometric elevation of groundwater could be as deep as elevation 647 ft.

To evaluate the flow of groundwater, we have developed a steady-state groundwater model using the finite element analysis program STKO by Asdea Software Technology. Appendix C provides the details and results of our analyses. The model indicates that the groundwater pressure in the Recessional Outwash and Vashon Till above an elevation of 656 ft is likely minimal. Groundwater daylighting at the spring location is likely due to water perched on the less-permeable Vashon Till. Hydraulic pressure develops in the layer of Advance Outwash below elevation 650 ft. Flow through the Advance Outwash runs downslope towards the wetland. The Lawton Clay provides a hydraulic aquitard and most of the groundwater flows through the layers of loose sand and waste that mantle the slope. Groundwater daylights at the toe of the slope at an approximate elevation of 585 ft.

5.3 SLOPE STABILITY

5.3.1 ANALYSIS METHODS

We evaluate the stability of slopes based on their factor of safety (FS), which is defined as the ratio of the forces or moments resisting slope movement (soil strength and external pressure) to the forces or moments driving slope movement (gravity, porewater pressure, and external loading). Deformation begins to increase as the factor of safety approaches 1.0 and becomes uncontrollable once the factor of safety reaches 1.0. Slopes are considered stable with a minimum factor of safety of 1.3 during construction and a minimum factor of safety of 1.5 during long-term static conditions. For new, large cuts where the risk of fatalities is low, probabilistic evaluations indicating that the probability of failure is less than 1% are also typically acceptable[4]. Reliability analyses described in Appendix C indicate that the corresponding factor of safety is approximately 1.39.

5.3.2 EXISTING SLOPES

The existing slopes adjacent to the site are very steep and marginally stable. A possible head scarp from a historic landslide was documented near the crest of the slope to the east of the landfill. The addition of landfill waste on the steep slope has resulted in an unstable condition, where waste is periodically driven downslope by a combination of gravity and precipitation-induced forces.

Limited subsurface data are available below the very steep slope of the landfill. Above the steep slope, Boring SB-17 indicates the waste is at least 25 ft thick and the underlying loose sand colluvium is approximately 10 ft thick. The geophysical survey indicates that the waste may be up to 27 ft thick.

The stability analyses described in Appendix C indicate that the landfill waste is unstable and near its angle of repose. The static factor of safety is approximately 1.0. Periodic downslope raveling of waste will continue if the landfill slope is not mitigated. Material creep and decomposition, changing hydraulic conditions, or an earthquake could result in an approximately 25 ft-thick translational landslide that extends from the crest of the steep slope near elevation 705 ft through the waste. Runout from a major landslide could result in debris inundating the wetland.

5.3.3 FINAL SLOPES

We understand that excavations to reshape the slope may extend from the top of the slope at an approximate elevation of 730 ft down to the toe of the slope at an approximate elevation of 585 ft. Based on the available subsurface data and back-analyses of the existing slopes, we recommend that the final slope should not exceed a grade 2H:1V. This final grade limits the potential for shallow surficial sliding of the newly excavated slope as well as deep translational or rotational sliding.

To establish a stable final slope, the existing waste and loose sand should be excavated to dense Vashon Glacial Drift (Outwash, Till, or Lawton Clay). Excavations to establish the 2H:1V slope through the waste and loose sand will likely extend at least 35 feet deep, but the full extent of excavation necessary is uncertain given the lack of subsurface information. Along the final slope,

[4] Washington Department of Transportation. 2022. Geotechnical Design Manual. M 46-03.16.

a series of slope drains at least 4 ft deep should be installed in areas where seepage may emerge. The final slope should be vegetated with a rooted zone that extends a minimum of 8 inches deep.

Steeper slopes may be needed along the edges of the slope to match the existing grades. A riprap buttress consisting of Federal Highway Administration (FHWA) Class I riprap[5] may be used to stabilize slopes as steep as 1.5H:1V. The layer of riprap should be at least 3.5 ft thick, and the toe of the riprap buttress should extend an additional 5.25 ft outward to provide support for the riprap buttress.

Bio-stabilization measures such as root wads, log cribs, large woody debris[6], or brush layering[7] may also be considered to stabilize final slopes no steeper than 1.5H:1V. The final selected means of bio-stabilization will depend on the final slope grades and heights, availability of materials, and accessibility during construction. While bio-stabilization solutions can reduce the erosion potential of newly excavated slopes, some localized erosion may continue to occur.

Figures 4 and 5 show the final slope geometry along Sections A and B, respectively. The stability analyses described in Appendix C indicate that the probabilities of failure of the final slopes are less than 1%. Table 1 lists a summary of the slope grade recommendations for the site.

Table 1: Summary of slope design recommendations

Final slope	Grade
Native soil, vegetated root zone 8 inches deep	2H:1V
FHWA Class I riprap	1.5H:1V

5.3.4 CONTINGENCY FOR THICKER THAN ANTICIPATED WASTE

GSI and Alta have developed 30% design-level plans for final grading based on the assumed thickness of waste near the toe of the landfill. If the waste and loose sand are thicker than anticipated, additional excavation may be needed to remove the waste. As a contingency for encountering thicker than anticipated waste, a temporary slope as steep as 1.6H:1V ft may be excavated in the dense Vashon Glacial Drift. In addition, slopes up to 10 ft tall may be graded as steep as 1H:1V in the dense Vashon Glacial Drift. Once the waste is removed to a subgrade of dense Vashon Glacial Drift, the temporary excavation should be backfilled to a final grade no steeper than 2H:1V. Approved onsite materials may be used for backfill, provided that the backfill is relatively clean with no more than 7% fines. A permanent drain surrounded by a layer of drain rock should also be installed at the bottom of the backfill.

[5] Federal Highway Administration. 2009. Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance-Third Edition. FHWA=NHI_09-111.

[6] Oregon Department of Transportation. 2014. Hydraulics Design Manual.

[7] Gray, D. H., & Sotir, R. B. (1995). Biotechnical stabilization of steepened slopes. Transportation Research Record, 23-23.

5.3.5 SLOPE DRAINS

A network of trenches and drains will likely be needed to minimize potential seepage along the face of new slopes. The slope drains may be coupled with surface runoff catchment trenches and swales, although the drains should be established at least 4 ft below the final slope grade. The drains may need to extend deeper if seepage is not fully contained. The drains should consist of at least a 4-inch-diameter, perforated, gravity drainpipes (ADS Highway Grade or better) enveloped in at least 9 inches of free-draining structural fill. An impermeable zone or membrane may be appropriate on the downslope side of the trench to avoid recharging downslope areas. Figure 6 shows a slope cutoff drain detail. The drains should be routed to the base of the slope or into an appropriate conveyance channel. Installing the drains in a herringbone pattern along the slope may help to provide an adequate slope for drainage[8].

Drains should also be installed in any backfill used to regrade sections of the slopes. Similar drain materials and free-draining structural fill should be used as the slope cutoff drains, but the free-draining fill should be wrapped in a geotextile filter fabric with a minimum 1-foot overlap at joints to prevent fines from washing into the drain rock. Drains installed on slopes steeper than 3H:1V should be established on a bench. Figure 6 shows a typical backfill drain detail.

5.3.6 SEISMIC STABILITY

During an earthquake, slopes begin to permanently deform when the acceleration is greater than the yield acceleration of the mass. The value of the yield acceleration depends on the slope geometry, soil and rock strengths, groundwater conditions, and the predominant mode of failure. Shallow disrupted slides are often evaluated using infinite slope analyses[9], whereas more complex coherent landslide failures require an evaluation of the thickness of soil, local relief, and landslide extent[10].

The final slopes proposed for this project are intended to have a static factor of safety of approximately 1.39 which results in a yield acceleration of approximately 0.26 g. Slope deformations are estimated to be less than 1 inch during a 475-year earthquake.

5.4 STRUCTURAL FILL

Structural fill should consist of sand, gravel, or crushed rock with a maximum size of up to 2 inches and with not more than 7% passing the No. 200 sieve (washed analysis). A smaller maximum particle size, such as ¾ inch, is recommended for fills less than 6 inches thick. The onsite sand and gravel may be used if the soil meets the gradation criteria, is free of organics, and meets environmental standards. Oversize materials such as cobbles will need to be removed from the onsite materials if it is to be reused. The onsite sand will likely require moisture conditioning to achieve optimum water content for compaction.

---

[8] Federal Highway Administration. 1994. Advanced Technology for Soil Slope Stability. Volume 1, Slope Stability Manual.

[9] E.g., Rathje, EM, Saygili, G. Probabilistic assessment of earthquake-induced sliding displacements of natural slopes. Bulletin of the New Zealand Society for Earthquake Engineering 2009; 42(1): 18–27.

[10] Grant, A., Wartman, J., & Abou-Jaoude, G. 2016. Multimodal method for coseismic landslide hazard assessment. Engineering Geology, 212, 146–160. https://doi.org/10.1016/j.enggeo.2016.08.005.

Onsite soils with more than 7% passing the No. 200 sieve may be used in locations where the final slope does not exceed 3H:1V. Soils containing fine-grained particles must be carefully moisture conditioned, placed in lifts of 12 inches or less, and compacted to at least 90% of the maximum dry density as determined by ASTM D1557 and/or approved by a representative of Greenfield Geotechnical by observation of a "proof roll" test, in which a loaded dump truck is driven slowly over the area to check for soft spots. The fine-grained fill must be free of organic material, construction debris, and oversize particles greater than 4 inches.

All backfill designated as free-draining structural fill for drains and wall backfill should consist of imported, angular crushed rock with a maximum size of up to 1½ inches and with not more than 2% passing the No. 200 sieve (washed analysis).

The appropriate lift thicknesses of structural fill will depend on the type of compaction equipment used. For example, hand-operated, jumping-jack compactors should be limited to lifts of about 8 inches of loose soil. If larger vibratory plate compactors are used, the thickness of each lift may be greater. Structural fill should be compacted to at least 90% of the maximum dry density as determined by ASTM D1557. The free-draining structural fill should be placed in lifts no greater than 8 inches thick and compacted to at least 90% of the maximum dry density as determined by ASTM D1557, or until well-keyed.

Riprap used to buttress steep slopes should meet the Federal Highway Administration's guidance[11] for Class I riprap, which corresponds to riprap with a maximum rock size of approximately 12 inches. Onsite cobbles and boulders may be used as riprap, provided the rocks meet environmental standards, meet the gradation criteria, and are separated from the soil matrix material.

5.5 CONSTRUCTION CONSIDERATIONS

5.5.1 HAUL ROADS AND WORK PADS

The surficial sand soils may be sensitive to moisture and are easily remolded. During wet weather conditions, upland construction traffic should be limited to haul roads and work pads constructed of relatively clean structural fill. A minimum of 18 inches of structural fill with less than 7% fines content is generally necessary to support heavy construction traffic and protect the subgrade. An 8 to 12-inch-thick structural fill work pad may be sufficient for occasional truck traffic and light construction operations. A geotextile separation fabric between the subgrade and the work pad may also improve its performance. Design-elevation subgrade soils disturbed during construction should be over-excavated and backfilled with granular structural fill.

5.5.2 EXCAVATION

Temporary slope and excavation safety are the responsibility of the contractor. All excavations should be made per applicable Occupational Safety and Health Administration (OSHA) and State regulations. Due to the potential for weak layers in the unconsolidated waste, vertical cuts should

[11] Federal Highway Administration. 2009. Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance-Third Edition. FHWA=NHI_09-111.

not exceed 4 ft without shoring. Additional considerations for temporary excavations are provided in the Slope Stability section of this report.

The Fill, Recessional Outwash, and Vashon Glacial Drift may contain boulders, requiring excavation and processing with hydraulic hammers to break the boulders into smaller pieces.

5.5.3 RUNOFF AND GROUNDWATER SEEPAGE

Limited subsurface data is available near the toe of the slope, but the presence of a spring at higher elevations and the piezometer information imply that seeps may be present under the waste. Groundwater seepage should be managed along the face of recently constructed slopes to avoid seeps that could trigger instability or erosion of the newly excavated slope. A series of sumps, ditches, and pumps may be needed during construction to manage seepage and overland flow.

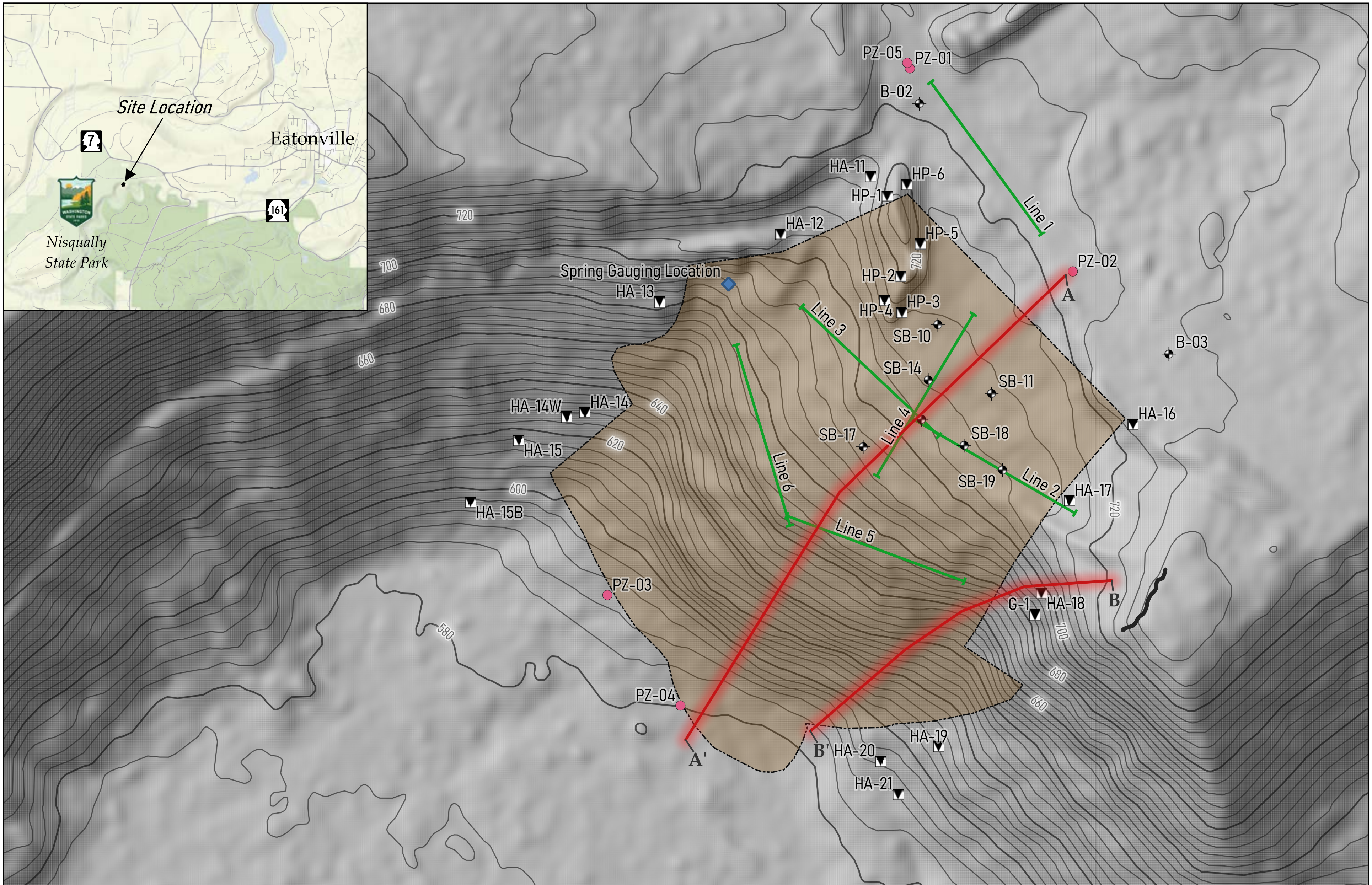
5.5.4 SUBGRADE SOILS

The final slope should be established in Vashon Glacial Drift, which likely consists of medium-dense to dense sand or very stiff clay along the proposed finished grade.

Organic material, soft soils, or poorly compacted fill encountered at the subgrade elevation along the planned slopes should also be over-excavated to medium-stiff or stiffer subgrade soils and replaced with structural fill. A qualified geotechnical engineer should observe the exposed soil at the final slope grades to determine the suitability of the materials to support the slope. All exposed subgrades should also be evaluated before fill placement.

6.0 DESIGN REVIEW

We welcome the opportunity to review and discuss construction plans and specifications for this project as they are being developed. Also, Greenfield Geotechnical should review all geotechnical-related portions of the construction plans and specifications to evaluate whether they are in conformance with the recommendations provided in this report. Greenfield Geotechnical should observe construction operations dealing with earthwork to confirm compliance with the intent of the recommendations, design concepts, plans, and specifications. Greenfield Geotechnical's construction phase services will allow for timely design changes if site conditions are different from those described in this report.



LEGEND

- Estimated Extent of Landfill
- Potential Headscarp
- Cross Sections

Subsurface Investigations

- 2024 Hand Augers & Grab Samples
- Seismic Refraction Surveys
- Spring Gauging Location
- Sept. 2021 Explorations
- Piezometers

25 0 25 50 75 100 125 ft

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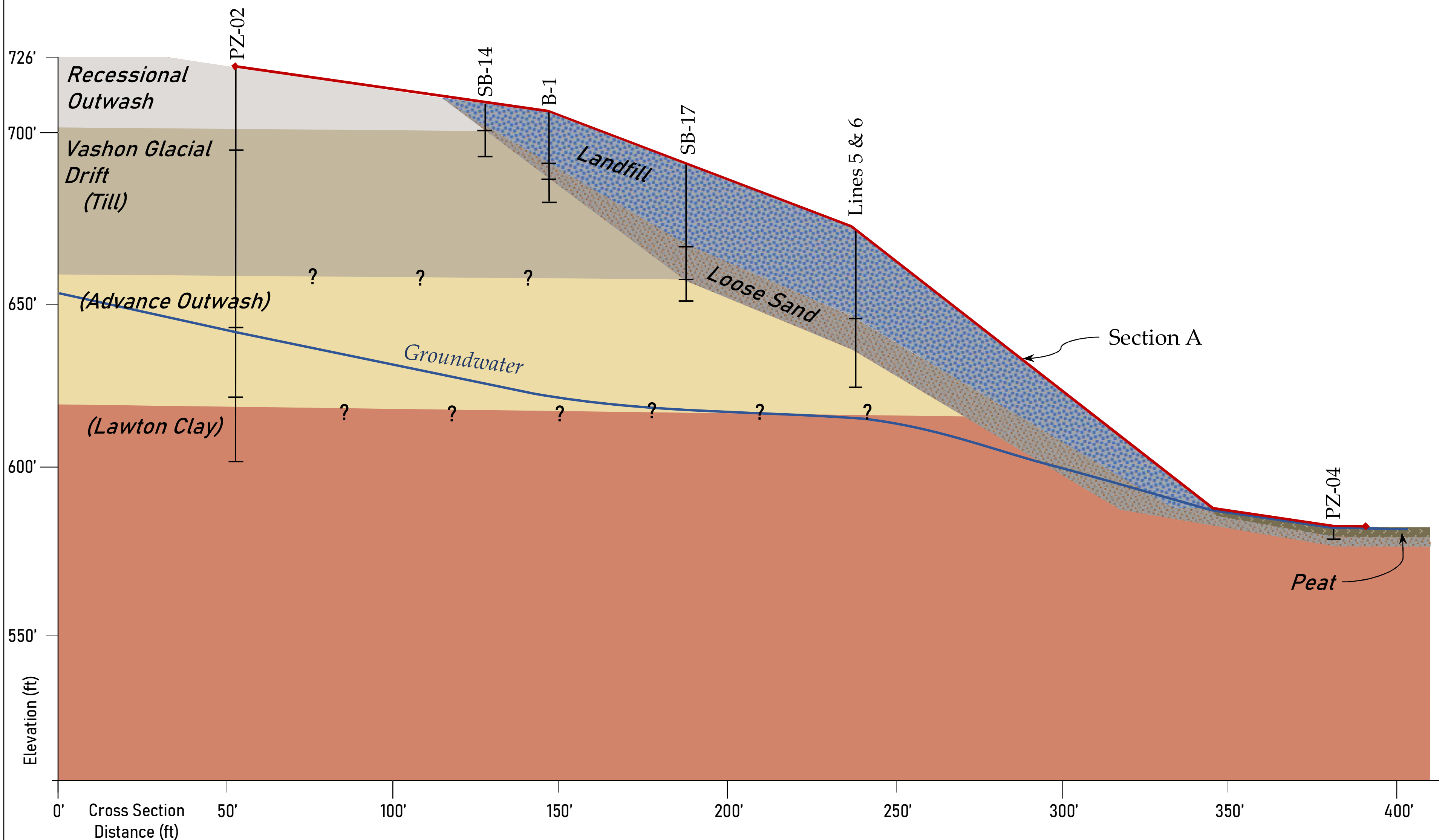
Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN
Geotechnical Evaluation Report

SITE PLAN/SUBSURFACE INVESTIGATIONS
Figure 1

Contour Interval of 4'



Prepared for GSI Water Solutions

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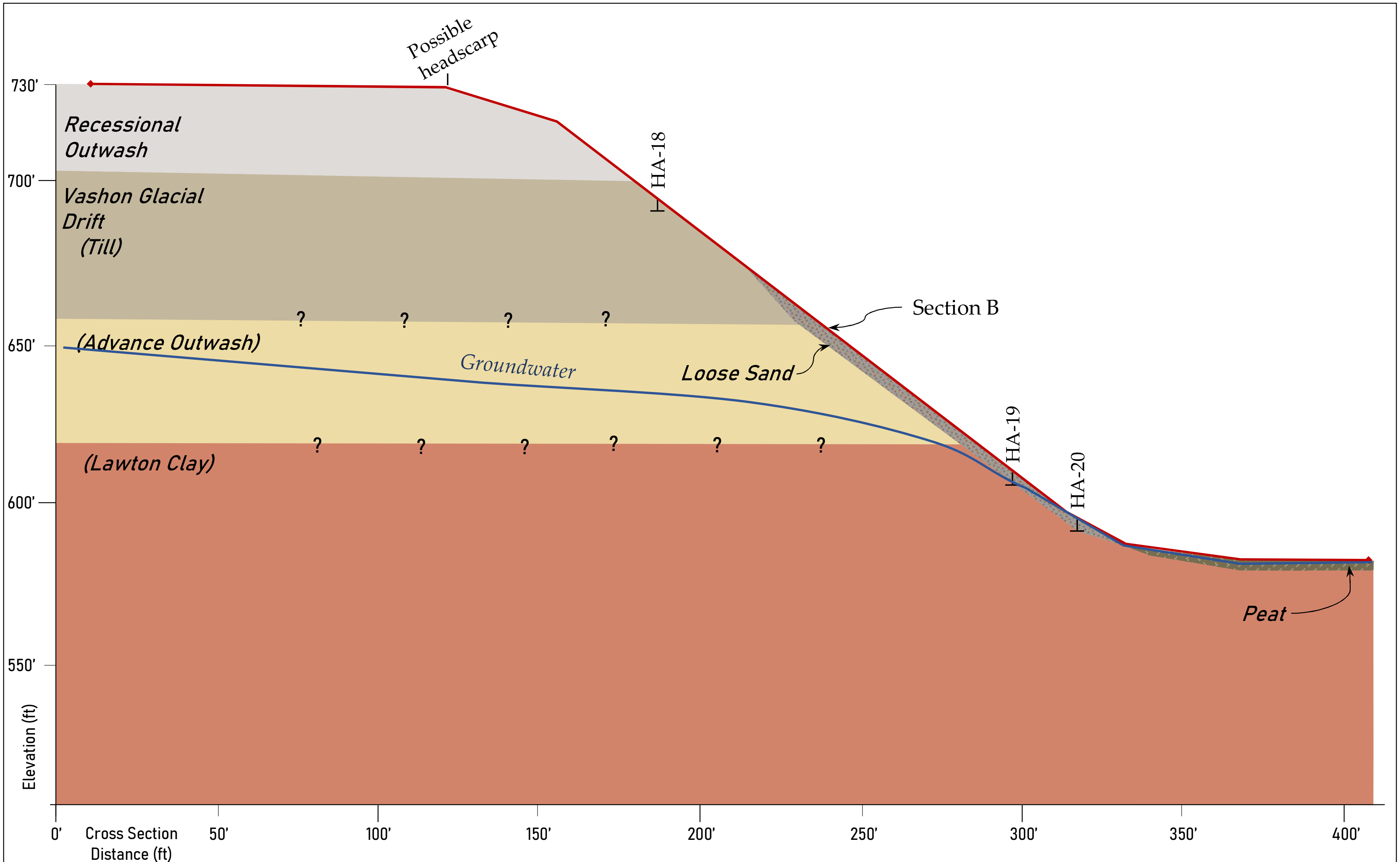
Geotechnical Evaluation Report

SECTION A: TYPICAL SLOPE GEOMETRY

Figure 2



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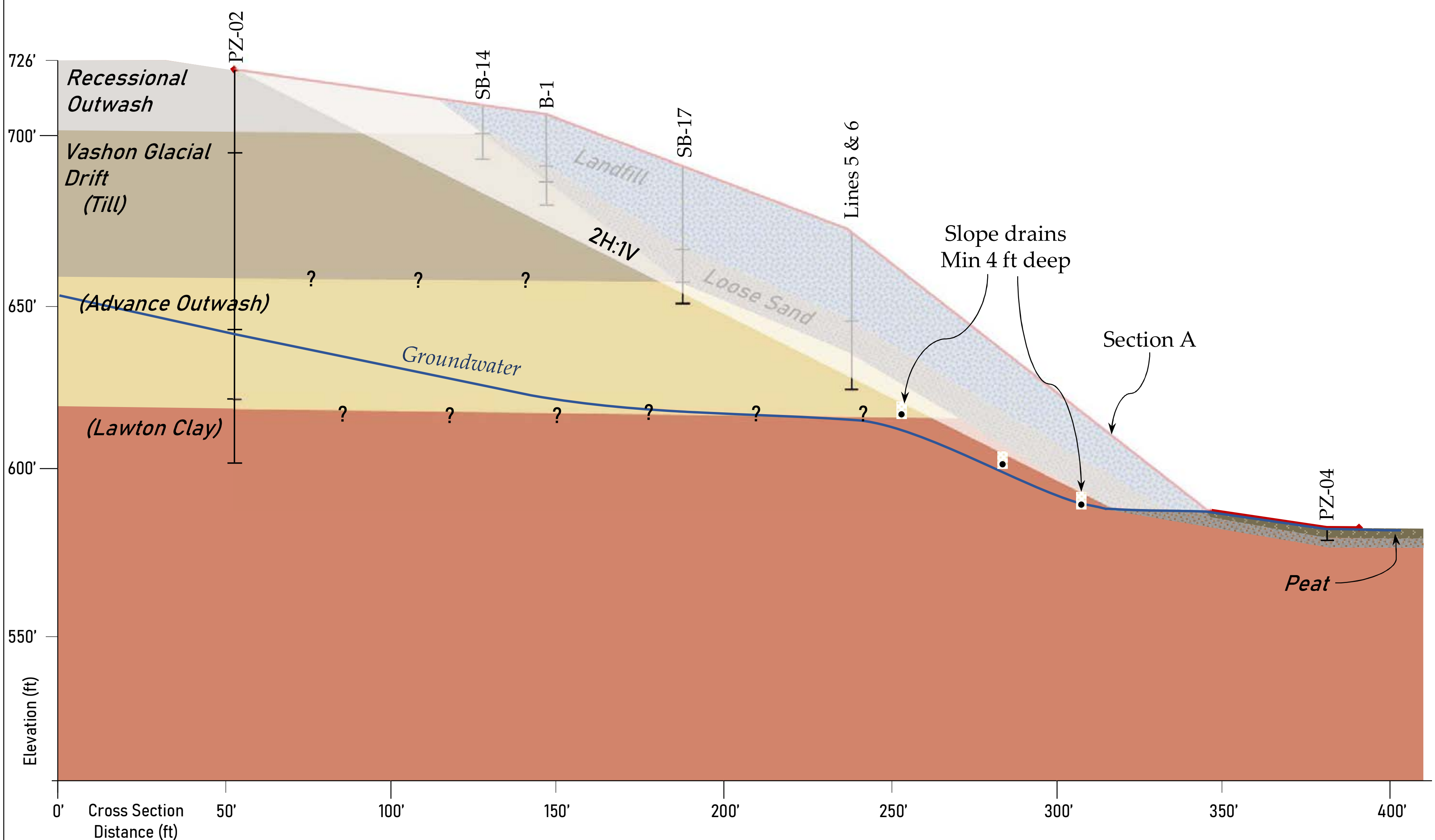
SECTION B: TYPICAL SLOPE GEOMETRY

Figure 3



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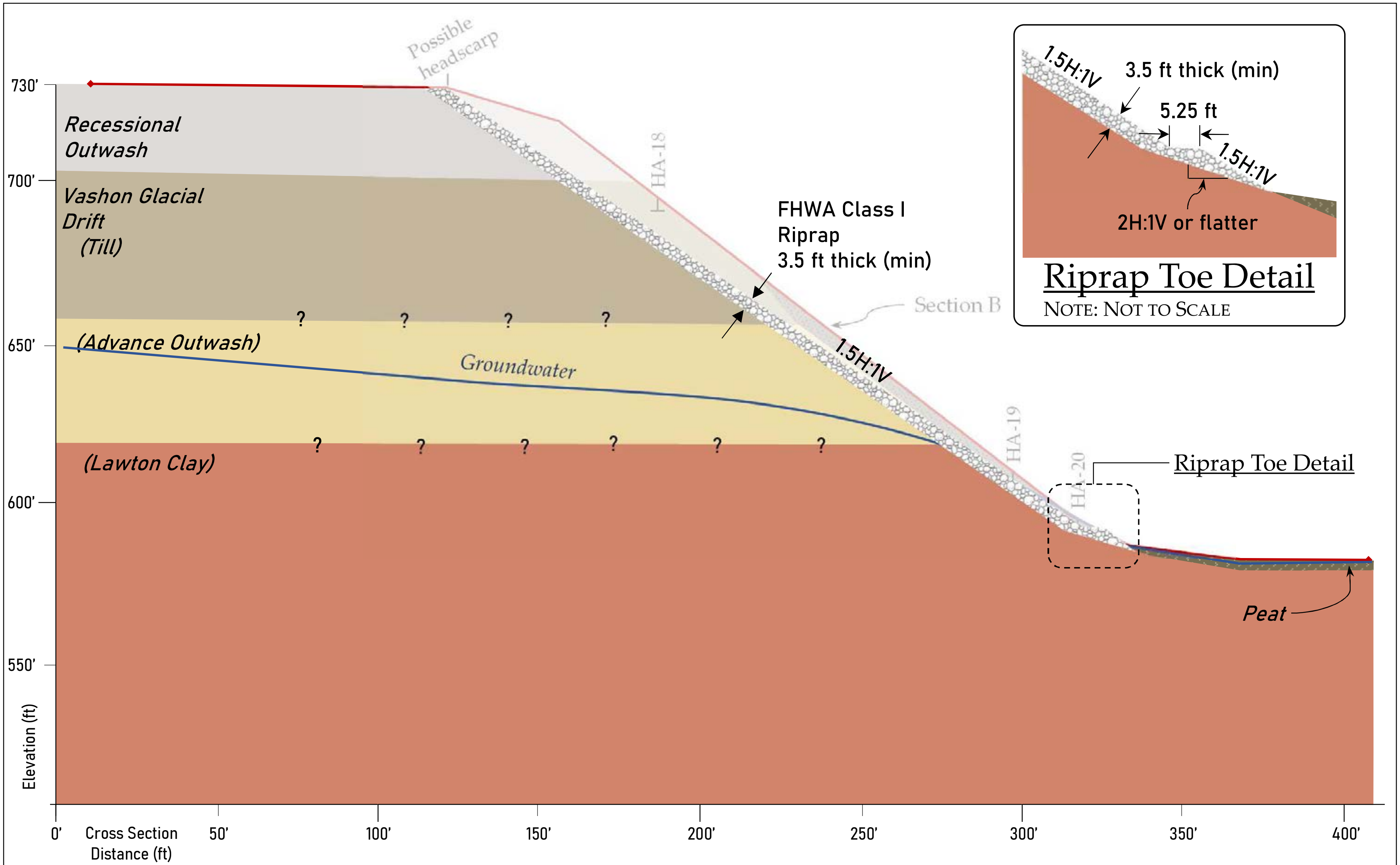
SECTION A: FINAL SLOPE GEOMETRY

Figure 4



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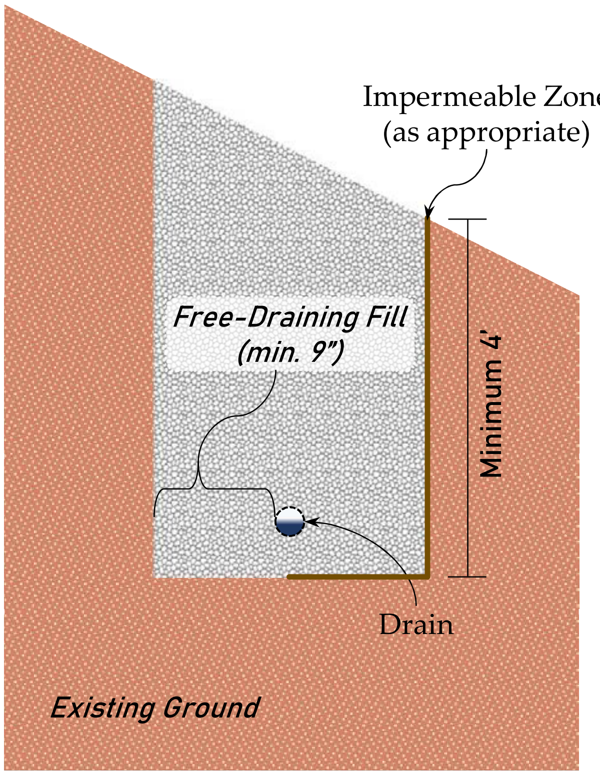
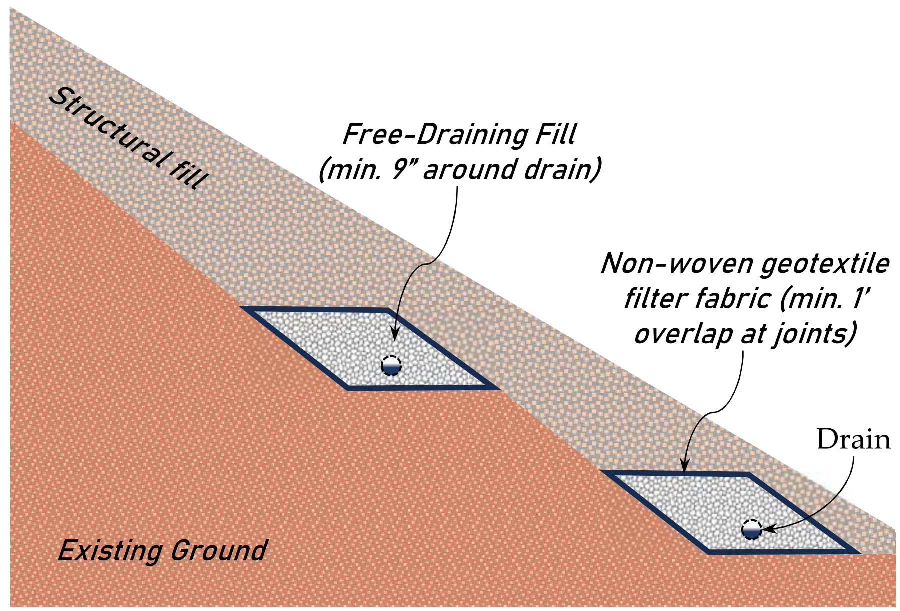
SECTION B: FINAL SLOPE GEOMETRY

Figure 5



<u>Slope Cutoff Drain</u>

NOTE: NOT TO SCALE



<u>Slope Backfill Drain</u>

NOTE: NOT TO SCALE

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Geotechnical Evaluation Report

TYPICAL DRAIN DETAILS

Figure 6

EATONVILLE LANDFILL REMEDIAL DESIGN

GEOTECHNICAL EVALUATION REVISED REPORT
APPENDIX A: PRE-DESIGN FIELD INVESTIGATION SUMMARY LOGS & LABORATORY TEST RESULTS

PREPARED FOR GSI GROUNDWATER SOLUTIONS
EATONVILLE, WASHINGTON

GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HA-11

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL at 0.8 ft	GRAB S-1	100				

Bottom of exploration at 0.8 feet.

EXPLORATION HA-12

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80; PL MC LL 20 40 60 80; ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SANDY GRAVEL (GW), some cobbles and boulders; fine to coarse, subrounded to rounded, tan-brown (Till), 3-in.-thick layer of organic debris at ground surface REFUSAL at 0.7 ft	GRAB S-1	100				

Bottom of exploration at 0.7 feet.

GEOTECH_SHALLOW - GINT STD US LAB.GDT - 9/3/24 16:26 - C:\USERS\SMART\GREENFIELD DROPBOX\ACTIVE PROJECTS\EATONVILLE LANDFILL\FIELD INVESTIGATION\PRE-DESIGN HAND AUGERS\EATONVILLE_HA.GPJ

EXPLORATION HA-13

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.		**PROJECT NAME** Eatonville Landfill	
PROJECT NUMBER		**PROJECT LOCATION** Eatonville, Washington	
DATE STARTED 8/20/24	**COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES** ,	
DRILLING METHOD Solid Stem Auger		**GROUND WATER LEVELS:**	
LOGGED BY M. Greenfield	**CHECKED BY**	**AT TIME OF DRILLING** ---	
NOTES Hand auger		**AFTER DRILLING** ---	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 3-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.1 ft	GRAB S-1	100				

Bottom of exploration at 1.1 feet.

EXPLORATION HA-14

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		WASTE; organic debris, cobbles and boulders (LANDFILL CONTENTS) REFUSAL at 0.5 ft						

Bottom of exploration at 0.5 feet.

EXPLORATION HA-14W

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 6-in.-thick layer of organic debris at ground surface						
1.0								
2.0		REFUSAL on cobbles at 2.0 ft	GRAB S-1	100				

Bottom of exploration at 2.0 feet.

EXPLORATION HA-15

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT	GSI Water Solutions, Inc.	**PROJECT NAME**	Eatonville Landfill
PROJECT NUMBER		**PROJECT LOCATION**	Eatonville, Washington
DATE STARTED 8/20/24	**COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES**	,
DRILLING METHOD	Solid Stem Auger	**GROUND WATER LEVELS:**	
LOGGED BY M. Greenfield	**CHECKED BY**	**AT TIME OF DRILLING**	---
NOTES	Hand auger	**AFTER DRILLING**	---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 12-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.7 ft	GRAB S-1	100				

Bottom of exploration at 1.7 feet.

EXPLORATION HA-15B

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.		**PROJECT NAME** Eatonville Landfill	
PROJECT NUMBER		**PROJECT LOCATION** Eatonville, Washington	
DATE STARTED 8/20/24	**COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES** ,	
DRILLING METHOD Solid Stem Auger		**GROUND WATER LEVELS:**	
LOGGED BY M. Greenfield	**CHECKED BY**	**AT TIME OF DRILLING** ---	
NOTES Hand auger		**AFTER DRILLING** ---	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 8-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.5 ft	GRAB S-1	100				

Bottom of exploration at 1.5 feet.

EXPLORATION HA-16

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0 – 1.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, brown, scattered roots and wood debris (FILL), 2-in.-thick layer of metal and organic debris at ground surface REFUSAL at 1.0 ft	GRAB S-1	100				

Bottom of exploration at 1.0 feet.

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Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HA-17

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, brown, scattered roots and wood debris (FILL), 2-in.-thick layer of metal and organic debris at ground surface REFUSAL at 0.5 ft						

Bottom of exploration at 0.5 feet.

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Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HA-18

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some gravel; fine to coarse, tan to white (Colluvium), 2-in.-thick layer of organic debris at ground surface						
1.0								
2.0		REFUSAL at 2.0 ft	GRAB S-1	100				

Bottom of exploration at 2.0 feet.

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Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HA-19

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/21/24 **COMPLETED** 8/21/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some silt and gravel; fine to coarse, brown (Colluvium), 2-in.-thick layer of organic debris at ground surface						
1.0		REFUSAL at 1.5 ft	GRAB S-1	100				

Bottom of exploration at 1.5 feet.

EXPLORATION HA-20

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/21/24 **COMPLETED** 8/21/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		WASTE; silt with some clay, trace sand, wet (LANDFILL CONTENTS)						
1.0		REFUSAL at 1.0 ft	GRAB S-1	100				

Bottom of exploration at 1.0 feet.

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EXPLORATION HA-21

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.		**PROJECT NAME** Eatonville Landfill	
PROJECT NUMBER		**PROJECT LOCATION** Eatonville, Washington	
DATE STARTED 8/21/24	**COMPLETED** 8/21/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES** ,	
DRILLING METHOD Solid Stem Auger		**GROUND WATER LEVELS:**	
LOGGED BY M. Greenfield	**CHECKED BY**	**AT TIME OF DRILLING** ---	
NOTES Hand auger		**AFTER DRILLING** ---	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		SAND (SP), trace to some silt and gravel; fine to coarse, brown (Colluvium), 2-in.-thick layer of organic debris at ground surface						
1.0								
2.0		REFUSAL at 2.2 ft	GRAB S-1	100				

Bottom of exploration at 2.2 feet.

Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HP-1

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0								
1.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL on gravel at 1.2 ft	GRAB S-1	100				

Bottom of exploration at 1.2 feet.

EXPLORATION HP-2

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL on gravel at 0.8 ft	GRAB S-1	100				

Bottom of exploration at 0.8 feet.

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EXPLORATION HP-3

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT	GSI Water Solutions, Inc.	**PROJECT NAME**	Eatonville Landfill
PROJECT NUMBER		**PROJECT LOCATION**	Eatonville, Washington
DATE STARTED	8/20/24 **COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES**	,
DRILLING METHOD	Solid Stem Auger	**GROUND WATER LEVELS:**	
LOGGED BY	M. Greenfield **CHECKED BY**	**AT TIME OF DRILLING**	---
NOTES	Hand auger	**AFTER DRILLING**	---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80; PL MC LL 20 40 60 80; ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of glass and organic debris at ground surface						
1.0		WASTE; possible wallboard, white fiber, fine- to coarse-gravel-size fragments (LANDFILL CONTENTS)	GRAB S-1	100				
2.0		REFUSAL at 2.4 ft						

Bottom of exploration at 2.4 feet.

Greenfield Geotechnical LLC
Portland, Oregon

EXPLORATION HP-4

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80; PL MC LL 20 40 60 80; ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0 – 1.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL at 1.0 ft	GRAB S-1	100				

Bottom of exploration at 1.0 feet.

EXPLORATION HP-5

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT GSI Water Solutions, Inc.
PROJECT NAME Eatonville Landfill
PROJECT NUMBER
PROJECT LOCATION Eatonville, Washington
DATE STARTED 8/20/24 **COMPLETED** 8/20/24
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR
GPS COORDINATES ,
DRILLING METHOD Solid Stem Auger
GROUND WATER LEVELS:
LOGGED BY M. Greenfield **CHECKED BY**
AT TIME OF DRILLING ---
NOTES Hand auger
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots, wood, and plastic debris (FILL), 3-in.-thick layer of organic debris at ground surface REFUSAL at 0.5 ft						

Bottom of exploration at 0.5 feet.

EXPLORATION HP-6

Greenfield Geotechnical LLC
Portland, Oregon

CLIENT	GSI Water Solutions, Inc.	**PROJECT NAME**	Eatonville Landfill
PROJECT NUMBER		**PROJECT LOCATION**	Eatonville, Washington
DATE STARTED	8/20/24 **COMPLETED** 8/20/24	**GROUND ELEVATION**	**HOLE SIZE** 4 inches
DRILLING CONTRACTOR		**GPS COORDINATES**	,
DRILLING METHOD	Solid Stem Auger	**GROUND WATER LEVELS:**	
LOGGED BY	M. Greenfield **CHECKED BY**	**AT TIME OF DRILLING**	---
NOTES	Hand auger	**AFTER DRILLING**	---

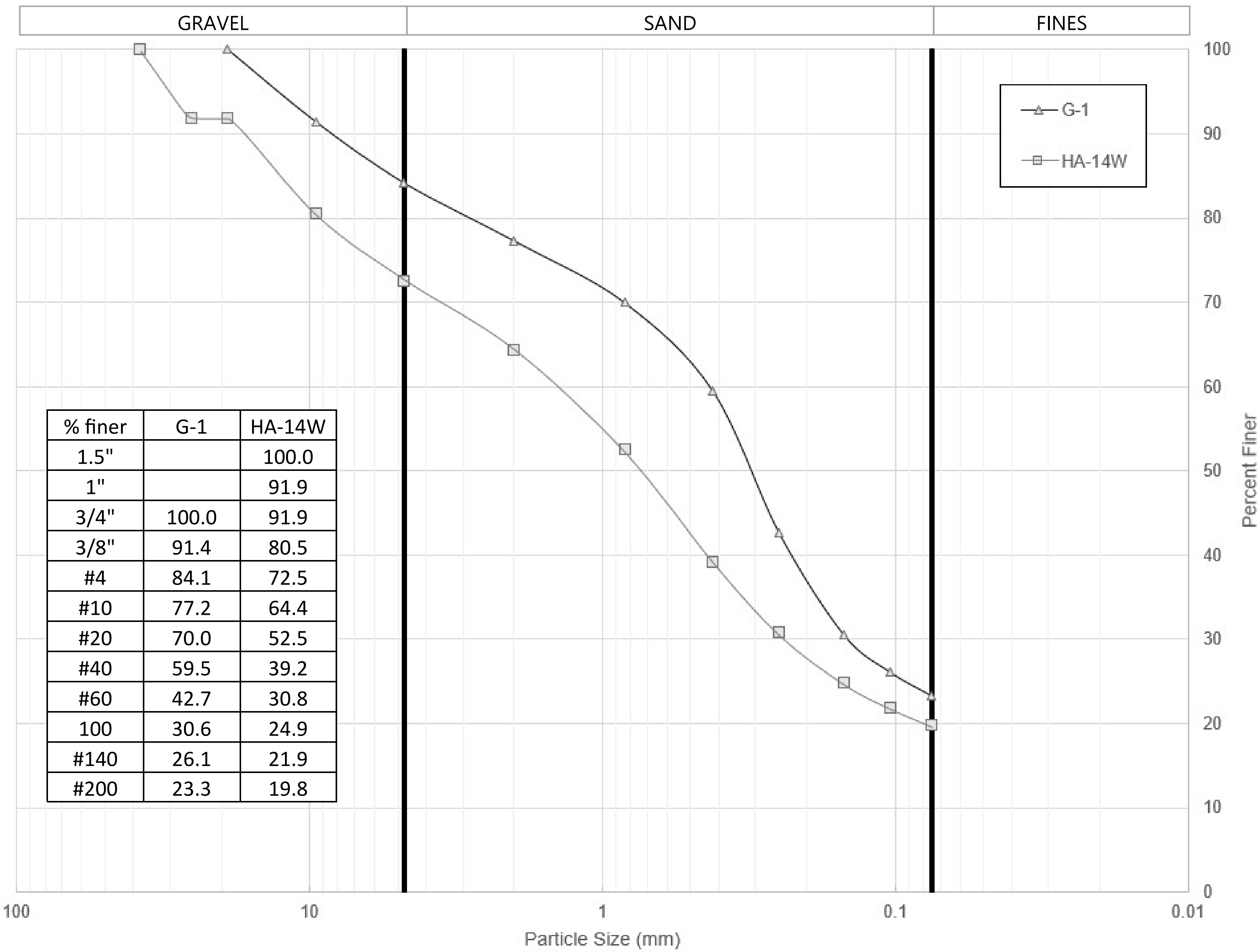
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF COMPR (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80; PL MC LL 20 40 60 80; ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		GRAVELLY SAND (SW), some cobbles, trace to some silt; fine to coarse, tan-brown, scattered roots and wood debris (FILL), 3-in.-thick layer of metal and organic debris at ground surface	GRAB S-1	100				
1.0		REFUSAL at 1.0 ft						

Bottom of exploration at 1.0 feet.

Natural Moisture Content
and Percent Finer than No. 200 Sieve

Boring	Sample	depth (ft)	Container #	Tare (g)	Wet + Tare (g)	Dry + Tare (g)	Washed + Tare (g)	Moisture Content (%)	Fines Content (%)
G-1	G-1	0.0	98	131.03	488.56	477.9	397.94	3.1	23.1
HA-14W	S-1	1.5	96	129.07	700.73	645.27	546.65	10.7	19.1
HA-15B	S-1	1.0	D1	40.85	212.13	189.36	164.43	15.3	16.8
HA-19	S-1	1.0	B4	42.43	245.38	218.3	149.85	15.4	38.9

Particle Size Gradation Curve



% finer	G-1	HA-14W
1.5"		100.0
1"		91.9
3/4"	100.0	91.9
3/8"	91.4	80.5
#4	84.1	72.5
#10	77.2	64.4
#20	70.0	52.5
#40	59.5	39.2
#60	42.7	30.8
100	30.6	24.9
#140	26.1	21.9
#200	23.3	19.8

GREENFIELD GEOTECHNICAL
Eatonville Landfill
Pre-Design Field Investigation
September 2024

EATONVILLE LANDFILL REMEDIAL DESIGN

GEOTECHNICAL EVALUATION REVISED REPORT
APPX. B: REMEDIAL INVESTIGATION / FEASIBILITY STUDY
SELECTED SUMMARY LOGS & LABORATORY TEST RESULTS

PREPARED FOR GSI GROUNDWATER SOLUTIONS
EATONVILLE, WASHINGTON

GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**B-1**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 2**
DRILLED BY	**Stratus**	TOTAL DEPTH	**26.5'**
DRILL METHOD	**Hollow Stem Auger**	DATE START	**9/14/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/14/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
								0 to 8.5 feet: SANDY GRAVEL (GW), fine to coarse, subrounded to rounded, trace roots and glass. (FILL DEPOSIT)				
<1"	0-1-1 (2)	2.5'-4.0'	S-1						--	--	--	--
--	1-1-2 (3)	5.0'-6.5'	S-2		5			@ 5.0 feet: some wood debris, glass and plastic.	--	--	--	--
--	9-8-1 (9)	7.5'-9.0'	S-3						--	--	--	--
								8.5 to 15.0 feet: WASTE, paper, plastic, organic debris, fine to coarse, gravel-sized, some sand, 23 percent organic content. (LANDFILL)				
<1"	0-0-1 (1)	10.0'-11.5'	S-4		10				--	--	--	34.6
--	0-1-1 (2)	12.5'-14.0'	S-5						--	--	--	--
--	2-3-3 (6)	15.0'-16.5'	S-6		15			**15.0 to 20.0 feet: GRAVELLY SAND (SW)**, medium, trace to some silt, fine rounded gravel, possible brick debris, white. (NATIVE)	--	--	15	14.6
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**B-1**
LOCATION	**Eatonville, Washington**	PAGE	**2 of 2**
DRILLED BY	**Stratus**	TOTAL DEPTH	**26.5'**
DRILL METHOD	**Hollow Stem Auger**	DATE START	**9/14/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/14/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
--	4-7-13 (20)	20.0'-21.5'	S-7					**20.0 to 26.5 feet: SILTY CLAY (CH)**, gray and brown mottled, high plasticity, (LL = 52%, PL = 29%, PI = 23%), some sand and trace rounded gravel.	--	--	83.6	30.4
--	6-14-19 (33)	25.0'-26.5'	S-8		25			@ 25.0 feet: gray, sandy below.	48.4	0.5	51.1	18.7
					30			Bottom of hole = 26.5 feet.				
					35							
					40							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**B-2***
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**10.8'**
DRILL METHOD	**Hollow Stem Auger**	DATE START	**9/13/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/13/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
								0 to 10.0 feet: GRAVELLY SAND (SW), brown, trace silt, medium to coarse, subrounded to rounded gravel, scattered roots, wood debris and cobbles. (FILL DEPOSIT)				
--	2-3-4 (7)	2.5'-4.0'	S-1						--	--	--	--
--	7-6-4 (10)	5.0'-6.5'	S-2		5			@ 5.0 feet: driller says very difficult drilling.	--	--	--	3.8
--	9-9-7 (16)	7.5'-9.0'	S-3					@ 7.5 feet: roots and wood debris absent below 7.5 feet. @ 8.0 feet: auger refusal after sampling, move 5.0 feet west and re-drill to 10.0 feet.	--	--	--	--
--	7-50/4" (50/4")	10.0'-10.8'	S-4		10			**10.0 to 10.8 feet: GRAVEL (GW)**, fine to coarse, rounded to subangular, some sand. (NATIVE)	--	--	--	--
								Refusal = 10.8 feet.				
					15							
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

*Boring B-2 was previously referred to as PZ-01. Renamed to avoid confusion with permanent well PZ-01.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**B-3***
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**3.0'**
DRILL METHOD	**Hollow Stem Auger**	DATE START	**9/13/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/13/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
--	7-10-8 (18)	1.5'-3.0'	S-1					**0 to 3.0 feet: SANDY GRAVEL (GW)**, brown, fine to coarse, subrounded to rounded, cobbles visible at ground surface. (NATIVE) @ 1.5 feet: sampler becomes bent during sampling.	--	--	--	3.7
					5 10 15 20			Refusal during sampling at 1.5 feet. Bottom of hole = 3.0 feet.				

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

*Boring B-3 was previously referred to as PZ-02. Renamed to avoid confusion with permanent well PZ-02.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-01**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 5**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**100.0'**
DRILL METHOD	**Sonic**	DATE START	**11/9/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/10/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
55%	--	--	--		5			**0 to 35.0 feet: SILTY AND SANDY GRAVEL (GW)**, brown-gray, damp, unconsolidated, and clast-supported with subrounded to subangular cobble up to 5 inches (mostly >2 inches). @ 0.0 to 1.0 feet: silty matrix with rooty and organic fragments. @ 1.0 to 2.0 feet: short interval with >70 percent medium and coarse sand without clast-supported cobbles.	--	--	--	--
27%	--	--	--		10 15 20			@ 10.0 to 30.0 feet: Drive was potentially compacted to a few bore-sized cobbles.	--	--	--	--

REMARKS

Groundwater measured at 73.13 feet below ground surface at 10:25 on 11/10/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-01**
LOCATION	**Eatonville, Washington**	PAGE	**2 of 5**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**100.0'**
DRILL METHOD	**Sonic**	DATE START	**11/9/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/10/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
					25			**0 to 35.0 feet: SILTY AND SANDY GRAVEL (GW)**, continued.				
20%	--	--	--		30			@ 30.0 to 35.0 feet: Bag tore open while collecting this drive but material on the ground appears similar.	--	--	--	--
110%	--	--	--		35			**35.0 to 49.0 feet: SILTY AND GRAVELLY SAND (SW)**, blue-gray, damp, with <10 percent 1 inch subrounded cobbles. @ 36.0 to 40.0 feet: grades into very moist, light brown and moderately sorted sands with up to 1.5 inch cobbles, firm consistency that retains molded shape.	--	--	--	--
					40							

REMARKS

Groundwater measured at 73.13 feet below ground surface at 10:25 on 11/10/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-01**
LOCATION	**Eatonville, Washington**	PAGE	**3 of 5**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**100.0'**
DRILL METHOD	**Sonic**	DATE START	**11/9/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/10/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
110%	--	--	--		45			**35.0 to 49.0 feet: SILTY AND GRAVELLY SAND (SW)**, continued. @ 40.0 to 49.0 feet: returns to silty blue-gray sand with <10 percent subrounded cobbles K1.5 inches, firm and notably less moist than previous interval. @ 44.0 feet: bore-cut cobbles. @ 45.5 feet: bore-cut cobbles. **49.0 to 79.0 feet: SANDY SILT (ML)**, blue-gray, damp, with <10 percent 1 inch subrounded cobbles up to 2 inches and lesser coarse sands; matrix contains scattered oxidized pink blebs throughout..	--	--	--	--
110%	--	--	--		50 55 60			@ 49.0 feet: bore-cut cobbles.	--	--	--	--

REMARKS

Groundwater measured at 73.13 feet below ground surface at 10:25 on 11/10/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-01**
LOCATION	**Eatonville, Washington**	PAGE	**4 of 5**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**100.0'**
DRILL METHOD	**Sonic**	DATE START	**11/9/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/10/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
110%	--	--	--		65			**49.0 to 79.0 feet: SANDY SILT (ML)**, continued. @ 68.0 feet: below a bore-cut cobble, matrix is entirely silty.	--	--	--	--
100%	--	--	--	@ 10:25 11/10/21	70 75 80			@ 78.0 to 79.0 feet: sharp upper contact with a coarse sandy interval; very well sorted, moist and coinciding with groundwater level; grades at the base into gravels.	--	--	--	--

REMARKS

Groundwater measured at 73.13 feet below ground surface at 10:25 on 11/10/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-01**
LOCATION	**Eatonville, Washington**	PAGE	**5 of 5**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**100.0'**
DRILL METHOD	**Sonic**	DATE START	**11/9/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/10/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
100%	--	--	--		85			**79.0 to 87.5 feet: SANDY GRAVEL (GW)**, blue-gray, wet, clast-supported cobbles and unconsolidated with a coarse sandy matrix; very large bore-cut cobbles throughout; matrix is slightly below 84.0 feet; very sharp lower contact into sands.	--	--	--	--
								87.5 to 91.0 feet: SILTY SAND (SP), blue-gray, oxidized orange below 89.5 feet; well-sorted, massive, friable, with a fine to medium grain size and sharp basal contact into gravels.				
90%	--	--	--		90				--	--	--	--
					95			**91.0 to 100.0 feet: SANDY GRAVEL (GW)**, blue-gray sandy gravel; moist, unconsolidated, and clast-supported with a coarse sandy matrix and cobbles up to 2 inches.				
					100			Boring terminated = 100.0 feet; installed well to 99.0 feet (see well details).				

REMARKS

Groundwater measured at 73.13 feet below ground surface at 10:25 on 11/10/2021.

GSI Water Solutions, Inc.

WEYEREATONVILLE-2.GDS:5.4/8/22.WEYEREATONVILLE-2...0171.067

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-02**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 6**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**120.0'**
DRILL METHOD	**Sonic**	DATE START	**11/8/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/8/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
67%	--	--	--		0–10			**0 to 27.5 feet: SANDY GRAVEL (GW)**, light gray-brown, damp, poorly sorted, unconsolidated and capped by a dark brown 4 inch cap or organic debris, sharp lower contact into sands.	--	--	--	--
70%	--	--	--		10–20			@ 11.0 feet: scattered, large 1- to 6-inch cobbles.	--	--	--	--

REMARKS

Groundwater measured at 80.66 feet below ground surface at 7:42 on 11/19/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-02**
LOCATION	**Eatonville, Washington**	PAGE	**2 of 6**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**120.0'**
DRILL METHOD	**Sonic**	DATE START	**11/8/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/8/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
100%	--	--	--		25			**0 to 27.5 feet: SANDY GRAVEL (GW)**, continued. **27.5 to 88.0 feet: SILTY SAND (SM)**, light gray, poorly sorted and well indurated with <10 percent subrounded <1 inch cobbles, grading to dark gray by 32.0 feet. Short cobbly zones throughout, with up to 20 percent clasts up to 4 inches.	--	--	--	--
120%	--	--	--		30 35 40			@ 35.0 feet: increasingly indurated and very firm.	--	--	--	--

REMARKS

Groundwater measured at 80.66 feet below ground surface at 7:42 on 11/19/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-02**
LOCATION	**Eatonville, Washington**	PAGE	**3 of 6**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**120.0'**
DRILL METHOD	**Sonic**	DATE START	**11/8/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/8/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
100%	--	--	--					**27.5 to 88.0 feet: SILTY SAND (SM)**, continued.	--	--	--	--
100%	--	--	--		45				--	--	--	--
120%	--	--	--		50			@ 50.0 to 60.0 feet: bore-cut cobbles at base of this drive. @ 50.0 to 70.0 feet: large 5- to 6-inch unsupported cobbles scattered throughout.	--	--	--	--
					55			@ 55.0 feet: slightly moist.				
					60							

REMARKS

Groundwater measured at 80.66 feet below ground surface at 7:42 on 11/19/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-02**
LOCATION	**Eatonville, Washington**	PAGE	**4 of 6**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**120.0'**
DRILL METHOD	**Sonic**	DATE START	**11/8/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/8/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
100%	--	--	--					**27.5 to 88.0 feet: SILTY SAND (SM)**, continued.	--	--	--	--
					65							
90%	--	--	--		70			@ 70.0 feet: sand becomes increasingly silty and dark gray below. @ 72.5 to 76.0 feet: well-sorted sandy interval without cobbles.	--	--	--	--
75%	--	--	--		75				--	--	--	--
					80							

REMARKS

Groundwater measured at 80.66 feet below ground surface at 7:42 on 11/19/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-02**
LOCATION	**Eatonville, Washington**	PAGE	**5 of 6**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**120.0'**
DRILL METHOD	**Sonic**	DATE START	**11/8/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/8/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
				∇ @ 7:42 11/9/21				**27.5 to 88.0 feet: SILTY SAND (SM)**, continued. @ 80.0 feet: wood chips encountered.				
120%	--	--	--		85			@ 86.0 feet: groundwater definitively encountered in basal interval of wet medium sand.	--	--	--	--
								88.0 to 99.0 feet: SANDY GRAVEL (GW), gray, very moist, unconsolidated and poorly indurated with 15- to 70 percent subrounded 1- to 4-inch cobbles with teal and pink oxidized blebs throughout matrix, sharp lower contact into clay, sand is very coarse-grained.				
100%	--	--	--		90				--	--	--	--
					95							
					100			**99.0 to 100.0 feet: CLAY (CL)**, description on following page.				

REMARKS

Groundwater measured at 80.66 feet below ground surface at 7:42 on 11/19/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-02**
LOCATION	**Eatonville, Washington**	PAGE	**6 of 6**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**120.0'**
DRILL METHOD	**Sonic**	DATE START	**11/8/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/8/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
100%	--	--	--					**99.0 to 100.0 feet: CLAY (CL)**, light gray, laminated, well indurated and blocky with slightly silty matrix and abundant 1/2 inch charcoal fragments, sharp lower contact into top of next drive, suggesting that transition to sand may be missing.	--	--	--	--
								100.0 to 102.5 feet: SILTY SAND (SM), dark gray, moist, with 1- to 4-inch subrounded cobbles in upper 1.5 feet.				
100%	--	--	--		105			**102.5 to 105.0 feet: CLAYEY SILT (ML)**, green, less moist and more indurated than sand above; dark green 0.5 to 1 inch oxidized blebs and charcoal fragments throughout.	--	--	--	--
								105.0 to 105.5 feet: SILTY CLAY (CL), distinctive dark green, laminated, well indurated, with a 2-inch base of loose black charcoal wood fragments.				
								105.5 to 112.0 feet: SANDY SILT (ML), medium gray, moist, blocky, friable and without cobbles with a gradual basal transition into sand.				
110%	--	--	--		110				--	--	--	--
								112.0 to 116.0 feet: SILTY SAND (SM), medium gray, moist, well sorted, massive and unconsolidated sharp lower compact into clay.				
					115							
								116.0 to 120.0 feet: SILTY CLAY (CL), gray, slightly moist, well indurated and contains laminated charcoal beds up to 3-inches thick retaining whole wood chips.				
								Boring terminated = 120.0 feet, backfilled with bentonite (120.0 to 99.0 feet) and installed well to 99.0 feet (see well details).				
					120							

REMARKS

Groundwater measured at 80.66 feet below ground surface at 7:42 on 11/19/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-03**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**3.0'**
DRILL METHOD	**Hand Auger**	DATE START	**9/15/21**
FIELD PERSONNEL	**Scott and Thomas**	DATE COMPLETED	**9/15/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
N/A	--	--	--					**0 to 2.7 feet: ORGANIC SOIL (OH)**, dark brown, wet, loose, with roots.	--	--	--	--
								2.7 to 3.0 feet: SAND (SP), gray, medium to coarse, wet, loose. Refusal = 3.0 feet on cobbles; installed well to 2.83 feet (see well details).				
					5							
					10							
					15							
					20							

REMARKS

Groundwater measured at 3.9 feet below ground surface at 10:22 on 9/15/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-04**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**3.5'**
DRILL METHOD	**Hand Auger**	DATE START	**9/15/21**
FIELD PERSONNEL	**Scott and Thomas**	DATE COMPLETED	**9/15/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
N/A	--	--	--					**0 to 3.2 feet: ORGANIC SOIL (OH)**, dark brown, moist to wet, loose, with roots.	--	--	--	--
								3.2 to 3.5 feet: SAND (SP), gray, wet, loose, medium to coarse, refusal on cobbles at 3.5 feet.				
					5			Refusal = 3.5 feet on cobbles; installed well to 3.44 feet (see well details).				
					10							
					15							
					20							

REMARKS

Groundwater measured at 3.94 feet below ground surface at 10:42 on 9/15/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-05**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 2**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**30.0'**
DRILL METHOD	**Sonic**	DATE START	**11/10/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/10/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
67%	--	--	--					**0 to 28.0 feet: GRAVEL WITH SAND (GW)**, brown to grayish brown, well graded, loose to medium dense, dry to damp, gravel clasts appear 0.2- to 0.7-inch diameter (rounded to subrounded), sand appears medium to coarse with intermixed fine sand pockets, trace silt.	--	--	--	--
95%	--	--	--		5			@ 0.5 feet: fine to medium gravel increasing. @ 7.5 feet: 16-inch cobble.	--	--	--	--
60%	--	--	--		10			@ 10.0 feet: 6-inch fine to medium sand lense with medium gravel. @ 12.0 feet: increasing silt and medium gravel. @ 15.0 feet: increasing from damp to moist.	--	--	--	--
					15							
					20							

REMARKS

Groundwater not encountered during drilling, but observed after well was installed. Groundwater was measured at 28.30 feet below top of casing on 11/17/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**PZ-05**
LOCATION	**Eatonville, Washington**	PAGE	**2 of 2**
DRILLED BY	**Holt Services**	TOTAL DEPTH	**30.0'**
DRILL METHOD	**Sonic**	DATE START	**11/10/21**
FIELD PERSONNEL	**B. Warner and J. Sherrod**	DATE COMPLETED	**11/10/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
50%	--	--	--		25			**0 to 28.0 feet: GRAVEL WITH SAND (GW)**, continued.	--	--	--	--
					30			**28.0 to 30.0 feet: SILT (ML)**, brownish gray, medium stiff to stiff, dry to damp, with 10 percent coarse gravel and 30 percent fine to medium sand, low plasticity and medium to rapid dilatancy.				
					35			Refusal = 30.0 feet; installed well PZ-05 to 28.0 feet (see well details).				
					40							

REMARKS

Groundwater not encountered during drilling, but observed after well was installed. Groundwater was measured at 28.30 feet below top of casing on 11/17/2021.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-10**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 3**
DRILLED BY	**Stratus**	TOTAL DEPTH	**47.5'**
DRILL METHOD	**Geoprobe**	DATE START	**9/14/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/14/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
20%	--	--	--					**0 to 25.0 feet: SANDY GRAVEL (GW)**, trace silt, rounded to subangular, fine to coarse, scattered root debris, 2-inch rooted zone at ground surface. (FILL DEPOSIT)	--	--	7.8	2.7
14%	--	--	--		5			@ 5.0 feet: roots absent, some sand below.	--	--	--	--
24%	--	--	--		10			@ 10.0 feet: scattered roots and glass debris.	--	--	--	--
21%	--	--	--		15			@ 16.5 feet: wet, sandy below. @ 17.0 feet: driller says soft.	--	--	--	--
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-10**
LOCATION	**Eatonville, Washington**	PAGE	**2 of 3**
DRILLED BY	**Stratus**	TOTAL DEPTH	**47.5'**
DRILL METHOD	**Geoprobe**	DATE START	**9/14/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/14/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
7%	--	--	--					**0 to 25.0 feet: SANDY GRAVEL (GW)**, continued.	--	--	--	--
46%	--	--	--		25			**25.0 to 30.7 feet: CLAYEY SAND (SC)**, gray to brown, some silt and gravel, rounded gravel particles. (NATIVE)	43.5	13.9	42.7	12.1
--	--	--	--		30			**30.7 to 35.0 feet: SANDY GRAVEL (GW)**, gray, trace to some silt, medium, rounded to subangular gravel.	--	--	--	--
25%	--	--	--		35			**35.0 to 47.5 feet: GRAVELLY CLAY (CL)**, gray, some sand and silt, rounded gravel, medium to high plasticity.	--	--	--	--
					40							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-10**
LOCATION	**Eatonville, Washington**	PAGE	**3 of 3**
DRILLED BY	**Stratus**	TOTAL DEPTH	**47.5'**
DRILL METHOD	**Geoprobe**	DATE START	**9/14/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/14/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
--	--	--	--					**35.0 to 47.5 feet: GRAVELLY CLAY (CL)**, continued.	--	--	--	--
--	--	--	--		45				--	--	43.2	19.2
								Refusal = 47.5 feet.				
					50							
					55							
					60							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-11**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**10.0'**
DRILL METHOD	**Microcore to 5' dual tube**	DATE START	**9/16/21**
FIELD PERSONNEL	**Ben and Scott**	DATE COMPLETED	**9/16/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
44%	--	--	--					**0 to 6.8 feet: GRAVELLY SAND (SW)**, fine to coarse sands and gravels, rounded to subrounded, dry, gray, firm. (FILL DEPOSIT)	--	--	--	--
74%	--	--	--		5				--	--	--	--
								6.8 to 10.0 feet: SILT WITH SAND AND GRAVEL (ML), fine sand and subrounded fine to medium gravels, firm, damp. (NATIVE) @ 8.6 to 9.1 feet: sand layer.				
					10			Refusal = 10.0 feet due to gravel clast size of tube.				
					15							
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-14**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**15.0'**
DRILL METHOD	**Geoprobe**	DATE START	**9/14/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/14/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
--	--	--	--					**0 to 7.5 feet: SANDY GRAVEL (GW)**, brown, trace to some silt, fine to coarse, rounded to subangular.	--	--	--	--
--	--	--	--		5				32	57.1	10.9	5.5
								7.5 to 15.0 feet: GRAVELLY CLAY (CL), brown, some sand and silt, medium to high plasticity, rounded to subrounded gravel.				
--	--	--	--		10			@ 12.0 feet: loose. @ 14.0 feet: gray.	--	--	--	--
					15			Refusal = 15.0 feet, damage to tube.				
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-16**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**19.5'**
DRILL METHOD	**Geoprobe**	DATE START	**9/14/21**
FIELD PERSONNEL	**M. Greenfield**	DATE COMPLETED	**9/14/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
<1"	--	--	--		0–5			**0 to 16.0 feet: SANDY GRAVEL (GW)**, fine to coarse, subrounded to rounded, trace glass and plastic fragments. Very little recovery, very soft, no hammering, driller said pushing through air. (FILL DEPOSIT)	--	--	--	--
0	--	--	--		5–10							
0	--	--	--		10–15				--	--	--	--
--	--	--	--		15–19.5			**16.0 to 19.5 feet: SANDY GRAVEL (GW)**, some silt to silty, rounded to subangular. (NATIVE) @ 16.0 feet: geoprobe resistance starts.	--	--	22.8	12.8
					20			Refusal = 19.5 feet.				

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-17**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 3**
DRILLED BY	**Stratus**	TOTAL DEPTH	**41.5'**
DRILL METHOD	**Auger/SPT**	DATE START	**9/15/21**
FIELD PERSONNEL	**Ben, Scott and Thomas**	DATE COMPLETED	**9/16/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
					0			**0 to 10.0 feet: SANDY GRAVEL (GW)**, fine to coarse, subrounded to rounded, trace glass and plastic fragments. (FILL DEPOSIT)				
--	3-1-1 (2)	5.0'-6.5'	S-1		5				--	--	--	--
--	3-1-2 (3)	7.5'-9.0'	S-2						--	--	--	--
--	1-1-6 (7)	10.0'-11.5'	S-3		10			**10.0 to 25.0 feet: WASTE**, silt with sand and gravel, plastic, organic debris, glass, 10 percent organic content. (LANDFILL)	--	--	--	21.1
								@ 12.0 feet: concrete fragments.				
--	33-4-1 (5)	12.5'-14.0'	S-4						--	--	--	--
--	1-0-0 (0)	15.0'-16.5'	S-5		15				--	--	--	--
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-17**
LOCATION	**Eatonville, Washington**	PAGE	**2 of 3**
DRILLED BY	**Stratus**	TOTAL DEPTH	**41.5'**
DRILL METHOD	**Auger/SPT**	DATE START	**9/15/21**
FIELD PERSONNEL	**Ben, Scott and Thomas**	DATE COMPLETED	**9/16/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
--	5-4-3 (7)	20.0-21.5'	S-6					**10.0 to 25.0 feet: WASTE**, continued.	--	--	--	--
--	2-3-3 (6)	25.0'-26.5'	S-7		25			**25.0 to 41.5 feet: SAND (SW)**, gray mottled orange, some silt, trace rounded to subrounded gravel. (NATIVE)	--	--	11.3	5.5
--	3-4-3 (7)	30.0'-31.5'	S-8		30				--	--	--	--
--	9-12-17 (29)	35.0'-36.5'	S-9		35				--	--	--	--
					40							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-17**
LOCATION	**Eatonville, Washington**	PAGE	**3 of 3**
DRILLED BY	**Stratus**	TOTAL DEPTH	**41.5'**
DRILL METHOD	**Auger/SPT**	DATE START	**9/15/21**
FIELD PERSONNEL	**Ben, Scott and Thomas**	DATE COMPLETED	**9/16/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN		SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
--	8-16-17 (33)	40.0'-41.5'	S-10					**25.0 to 41.5 feet: SAND (SW)**, continued. @ 40.0 feet: damp, some silt or clay to silty/clayey below.	74.8	4.7	20.5	38.3
								Bottom of hole = 41.5 feet.				
					45							
					50							
					55							
					60							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-18**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**15.0'**
DRILL METHOD	**Geoprobe**	DATE START	**9/16/21**
FIELD PERSONNEL	**Ben, Scott and Thomas**	DATE COMPLETED	**9/16/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
No recovery					0			**0 to 5.0 feet: SANDY GRAVEL (GW)**, no recovery. (FILL DEPOSIT)				
20%	--	--			5			**5 to 10.0 feet: GRAVELLY SILTY SAND (SM)**, brown to dark brown, dry, medium density, plastic and glass. (LANDFILL)	--	--	--	--
			Enviro. Sample SB-18-9-10-0921 @14:35					@ 9.0 feet: black.				
55%					10			**10.0 to 15.0 feet: SILT WITH SAND (ML)**, gray with brown mottling, firm, damp. (NATIVE)				
					15			Bottom of hole = 15.0 feet. Installed temporary screen between 5.0 to 9.0 feet bgs and collected landfill gas measurements. CH4 - 0.001%, CO2 - 3 9%, O2 - 16%, LEL - 2%. After monitoring, abandoned and backfilled the borehole with hydrated bentonite chips.				
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

LOG OF SOIL BORING

PROJECT NAME	**Weyerhaeuser Eatonville Landfill**	BORING NO.	**SB-19**
LOCATION	**Eatonville, Washington**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	TOTAL DEPTH	**10.0'**
DRILL METHOD	**Geoprobe**	DATE START	**9/16/21**
FIELD PERSONNEL	**Ben, Scott and Thomas**	DATE COMPLETED	**9/16/21**

RECOVERY (PERCENT)	SPT (N)	LAB SAMPLE INTERVAL	GEO-TECHNICAL SAMPLE ID	GROUND WATER LEVEL	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	DESCRIPTION	SAND %	GRAVEL %	FINES %	MOISTURE CONTENT %
24%	--	--	--					**0 to 7.0 feet: SAND WITH SILT (SW)**, brown to gray, fine to medium subrounded gravel, medium density, dry. (TILL)	--	--	--	--
72%	--	--	--		5				--	--	--	--
								7.0 to 7.2 feet: SAND WITH SILT (SW), black sand, glass and gravel. (LANDFILL)				
								7.2 to 10.0 feet: SAND (SP), gray, fine to medium, medium density, slightly damp. (NATIVE)				
					10			Bottom of hole = 10.0 feet. Installed temporary screen between 5.0 to 9.0 feet bgs and collected landfill gas measurements. CH4 - 0.1%, CO - 54 ppm, H2S 0 ppm (0.0%), LEL - 3%. After monitoring, abandoned and backfilled the borehole with bentonite chips.				
					15							
					20							

REMARKS

Groundwater not encountered during drilling. Abandoned borehole with bentonite chips.

GSI Water Solutions, Inc.

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4736

REPORT NUMBER: 21-273-040 **CLIENT NO:** 1180-D

SEND TO: GREENFIELD GEOTECHNICAL
7085 SW SCHOLLS FRY
BEAVERTON, OR 97008

SUBMITTED BY: MELANI BANKS

CUSTOMER:

LAB NO: 23311 **DATE:** 10/07/2021

ORGANIC FERTILIZER REPORT

PAGE: 1

SAMPLE ID	REPORT OF ANALYSIS IN PERCENT									REPORT OF ANALYSIS IN PARTS PER MILLION						
	Nitrogen N	Phosphorus P	Phosphate P_2O_5	Potassium K	Potash K_2O	Sulfur S	Magnesium Mg	Calcium Ca	Sodium Na	Iron Fe	Aluminum Al	Manganese Mn	Copper Cu	Zinc Zn		
SB-17																

SAMPLE ID	POUNDS OF NUTRIENTS / TON															
	Nitrogen N	Phosphorus P	Phosphate P_2O_5	Potassium K	Potash K_2O	Sulfur S	Magnesium Mg	Calcium Ca	Sodium Na	Iron Fe	Aluminum Al	Manganese Mn	Copper Cu	Zinc Zn		
SB-17																

☐ **Reported on an as-received basis** **Moisture =**

Organic Matter = 10.42 %

☒ **Reported on a dry basis** **Moisture =** 21.06%

Remarks: To convert to pounds of nutrients/ton as received, multiply pounds of nutrients/ton as reported by (100 - moisture %)/100.

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

Kathryn Butterfield-Byrne
A & L WESTERN LABORATORIES, INC.

A & L WESTERN AGRICULTURAL LABORATORIES

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REPORT NUMBER: 21-273-040 **CLIENT NO:** 1180-D

SEND TO: GREENFIELD GEOTECHNICAL
7085 SW SCHOLLS FRY
BEAVERTON, OR 97008

SUBMITTED BY: MELANI BANKS

CUSTOMER:

LAB NO: 23312 **DATE:** 10/07/2021

ORGANIC FERTILIZER REPORT

SAMPLE ID	REPORT OF ANALYSIS IN PERCENT									REPORT OF ANALYSIS IN PARTS PER MILLION						
	Nitrogen N	Phosphorus P	Phosphate P_2O_5	Potassium K	Potash K_2O	Sulfur S	Magnesium Mg	Calcium Ca	Sodium Na	Iron Fe	Aluminum Al	Manganese Mn	Copper Cu	Zinc Zn		
CM-B1 *																

SAMPLE ID	POUNDS OF NUTRIENTS / TON															
	Nitrogen N	Phosphorus P	Phosphate P_2O_5	Potassium K	Potash K_2O	Sulfur S	Magnesium Mg	Calcium Ca	Sodium Na	Iron Fe	Aluminum Al	Manganese Mn	Copper Cu	Zinc Zn		
CM-B1 *																

☐ **Reported on an as-received basis** **Moisture =**

Organic Matter = 23.08 %

☒ **Reported on a dry basis** **Moisture =** 34.61%

Remarks: To convert to pounds of nutrients/ton as received, multiply pounds of nutrients/ton as reported by (100 - moisture %)/100.

*Composite sample from boring B-1

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

Kathryn Butterfield-Byrne
A & L WESTERN LABORATORIES, INC.

CENTRAL
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10240 SW Nimbus Ave., Suite L6
Portland, Oregon 97223
(503) 616-9419
www.centralgeotech.com

Percent Passing No. 200 Seive: ASTM D 1140			
Project Name:	Greenfield- Eatonville	Date:	10/5/21
Project Number:	21-118	Tech:	LMB

B/TP No.	Sample #	Sample Type	Depth (ft)	Soak	Soak Time (hrs)	Sample Preparation Method	Mass Determination	Tare for Total (g)	Total Dry Mass + Pan (g)	Tare for Retained (g)	Retained Dry Mass + Pan (g)	Percent Passing No. 200 Sieve		
B-1		SS	15	YES	2	Method A	Direct	429.4	549.6	429.4	531.6	15.0		
B-1		SS	20	YES	2	Method A	Direct	427.4	669.6	427.4	467.2	83.6		
SB-10		SS	0	YES	2	Method A	Direct	428.2	986.1	428.2	942.8	7.8		
SB-10		SS	45	YES	2	Method A	Direct	431	781.3	431	630.1	43.2		
SB-16		SS	15	YES	2	Method A	Direct	116	271.6	116	236.1	22.8		
SB-17		SS	25	YES	2	Method A	Direct	119.3	286.2	119.3	267.4	11.3		

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ATTERBERG LIMITS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Greenfield-Eatonville	Greenfield-Eatonville	21-118	B-1 20'
		REPORT DATE	FIELD ID
		10/8/21	B-1 20'
		DATE SAMPLED	SAMPLED BY
		9/28/21	MG

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
	Boring B-1 at 20 feet	Elastic SILT (ML)

LABORATORY TEST DATA

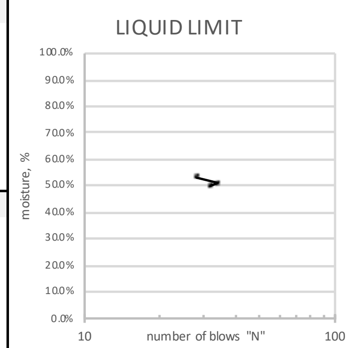
METHOD	TEST PROCEDURE
Wet preparation, Method A - Multipoint	ASTM D4318 & D2216

ATTERBERG LIMITS

liquid limit = 52
plastic limit = 29
plasticity index = 23

LIQUID LIMIT DETERMINATION

	1	2	3	4
wet soil + pan mass, g =	8.5	9.6	10.2	10.3
dry soil + pan mass, g =	5.8	6.5	6.8	6.9
pan mass =	0.4	0.4	0.4	0.4
N (blows) =	32	34	28	31
moisture, % =	50.0%	50.8%	53.1%	52.3%

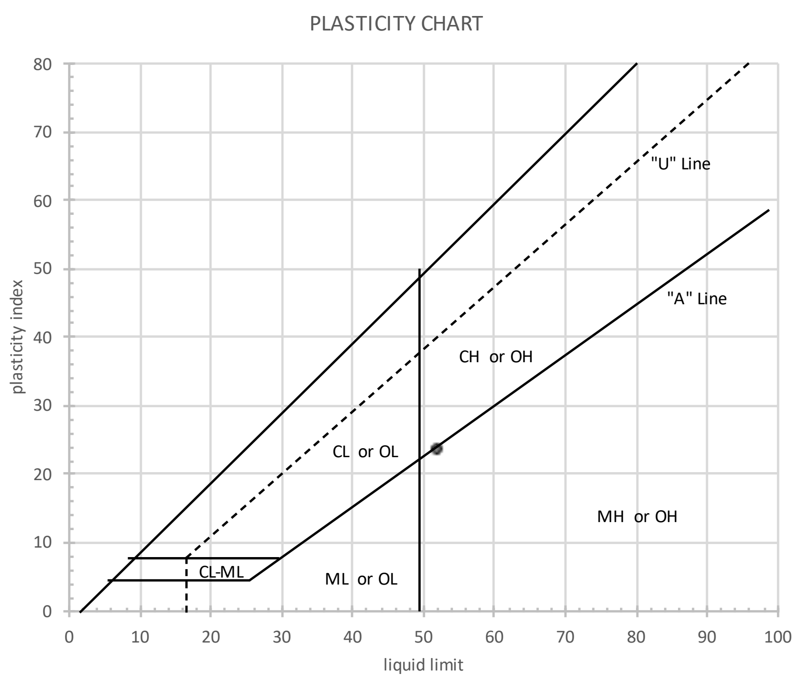


SHRINKAGE

shrinkage limit =
shrinkage ratio =

PLASTIC LIMIT DETERMINATION

	1	2	3	4
wet soil + pan mass, g =	7.1	9.3	8.5	9.3
dry soil + pan mass, g =	5.6	7.3	6.6	7.4
pan mass, g =	0.4	0.4	0.4	0.4
moisture, % =	28.8%	29.0%	30.6%	27.1%



ADDITIONAL DATA

% gravel =
% sand =
% silt and clay = 83.6
% silt =
% clay =
moisture content =

DATE TESTED	TESTED BY
10/6/21	LMB

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Portland, Oregon 97223
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MOISTURE CONTENT and DRY DENSITY: ASTM D 2216 & D 2937

Project Name:	Greenfield- Eatonville	Date:	10/5/21
Project Number:	21-118	Tech:	LMB

B/TP No.	S#	Sample Type	Depth (ft)	Pan	Tare (g)	Wet + PAN (g)	Dry + PAN (g)	Moisture (%)	Diameter (in)	Length (in)	DDensity (pcf)
PZ-1	*		5.0		0.8	74.2	71.5	3.8			
PZ-2	*		1.5		0.8	73.5	70.9	3.7			
B-1			15.0		429.4	567.2	549.6	14.6			
B-1			20.0		0.8	20.1	15.6	30.4			
B-1			25.0		0.8	40.2	34.0	18.7			
SB-10			0.0		0.8	57.8	56.3	2.7			
SB-10			25.0		0.8	49.1	43.9	12.1			
SB-10			45.0		0.8	62.5	52.6	19.1			
SB-14			5.0		0.8	35.3	33.5	5.5			
SB-16			15.0		0.8	46.7	41.5	12.8			
SB-17			25.0		0.8	62.5	59.3	5.5			
SB-17			40.0		0.8	22.1	16.2	38.3			

*these samples correspond to boring logs B-2 and B-3, respectively

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PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Greenfield-Eatonville	Greenfield-Eatonville	21-118	B-1 @ 25'
		REPORT DATE	FIELD ID
		10-Oct-21	B-1 @ 25'
		DATE SAMPLED	SAMPLED BY
		28-Sep-21	MG

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
B-1 @ 25'	B-1 @ 25'	Sandy SILT (SM)
SPECIFICATIONS		AASHTO SOIL TYPE

LABORATORY TEST DATA

LABORATORY EQUIPMENT	TEST PROCEDURE
Humboldt Standard Sieves - Auto Shaker - Wet Sieve	ASTM C136 AND D1140

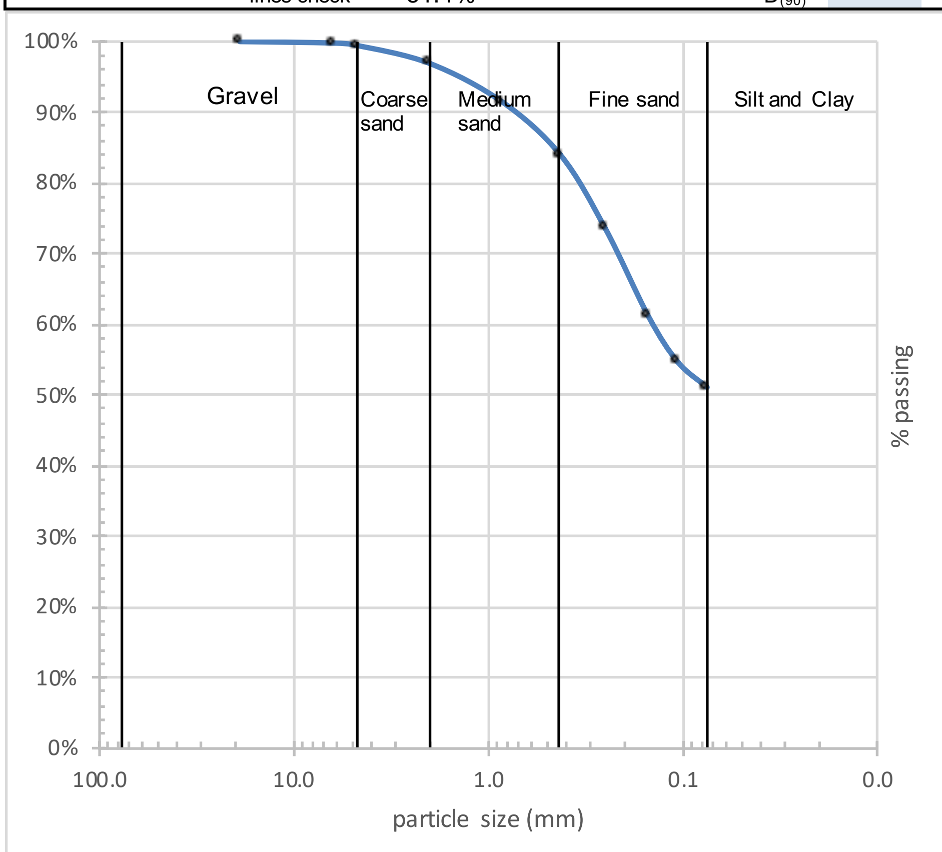
ADDITIONAL DATA

initial dry mass (g) =	386.9			
as-received moisture content =		coefficient of curvature	C_c =	
liquid limit =	0	coefficient of uniformity	C_u =	
plastic limit =	0	effective size (mm)	$D_{(10)}$ =	
plasticity index =	0		$D_{(30)}$ =	
fineness modulus =			$D_{(60)}$ =	
fines check =	51.1%		$D_{(90)}$ =	

SIEVE DATA

% gravel = 0.5%
% sand = 48.4%
% silt and clay = 51%

	SIEVE SIZE US	mm	PERCENT PASSING mass (g)	Indiv %	Cumul %	% Pass
GRAVEL	6.00"	150.0		0%	0%	100%
	4.00"	100.0		0%	0%	100%
	3.00"	75.0		0%	0%	100%
	2.50"	63.0		0%	0%	100%
	2.00"	50.0		0%	0%	100%
	1.75"	45.0		0%	0%	100%
	1.50"	37.5		0%	0%	100%
	1.25"	31.5		0%	0%	100%
	1.00"	25.0		0%	0%	100%
	7/8"	22.4		0%	0%	100%
	3/4"	19.0		0%	0%	100%
	5/8"	16.0				
	1/2"	12.5				
	3/8"	9.50				
	1/4"	6.30	0.80	0%	0%	100%
	#4	4.75	1.30	0%	1%	99%
SAND	#8	2.36				
	#10	2.00	9.90	2.56%	3%	97%
	#16	1.18				
	#20	0.850	21.00	5.43%	9%	91%
	#30	0.600				
	#40	0.425	29	7.55%	16%	84%
	#50	0.300				
	#60	0.250	40.30	10.42%	26%	74%
	#80	0.180				
	#100	0.150	48.10	12.43%	39%	61%
	#140	0.106	24.90	6.44%	45%	55%
	#170	0.900				
	#200	0.075	13.80	3.57%	49%	51%



DATE TESTED	TESTED BY
5-Oct-21	LMB

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PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Greenfield-Eatonville	Greenfield-Eatonville	21-118	SB-10 @ 25'
		REPORT DATE	FIELD ID
		10-Oct-21	SB-10 @ 25'
		DATE SAMPLED	SAMPLED BY
		28-Sep-21	MG

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
SB-10 @ 25'	SB-10 @ 25'	Silty/Clayey SAND (SC-SM)
SPECIFICATIONS		AASHTO SOIL TYPE

LABORATORY TEST DATA

LABORATORY EQUIPMENT	TEST PROCEDURE
Humboldt Standard Sieves - Auto Shaker - Wet Sieve	ASTM C136 AND D1140

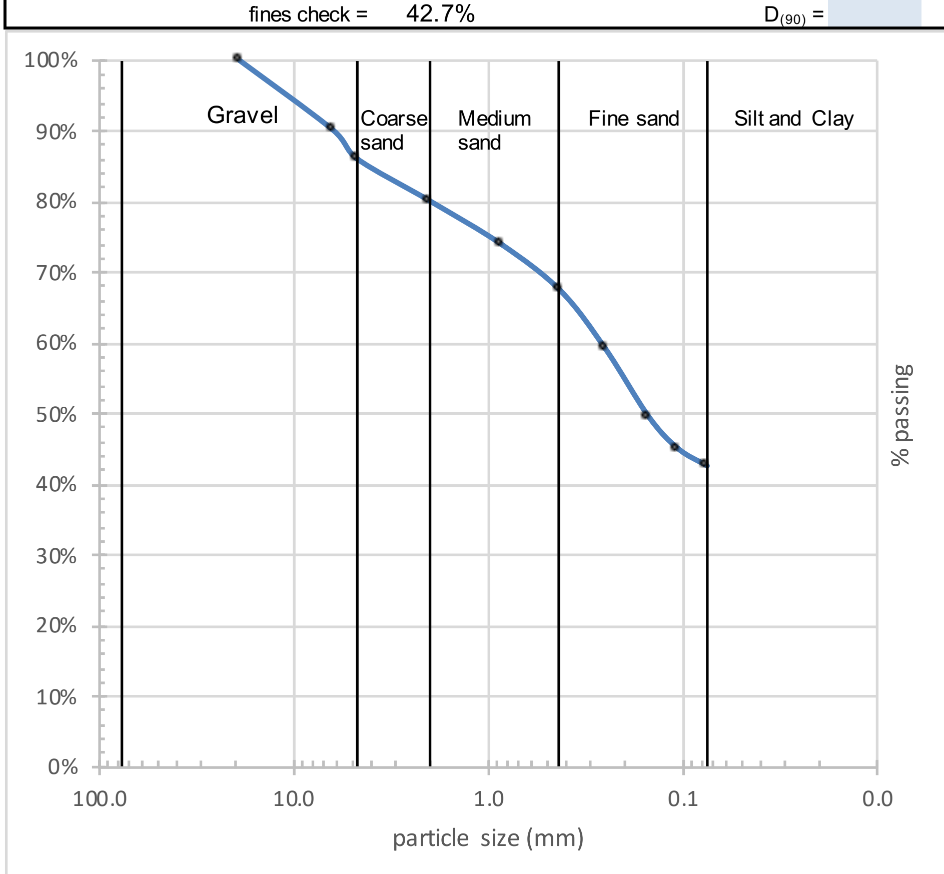
ADDITIONAL DATA

initial dry mass (g) =	435.4		
as-received moisture content =		coefficient of curvature C_c =	
liquid limit =	0	coefficient of uniformity C_u =	
plastic limit =	0	effective size (mm) $D_{(10)}$ =	
plasticity index =	0	$D_{(30)}$ =	
fineness modulus =		$D_{(60)}$ =	
fines check =	42.7%	$D_{(90)}$ =	

SIEVE DATA

% gravel = 13.9%
% sand = 43.5%
% silt and clay = 43%

	SIEVE SIZE US	mm	PERCENT PASSING mass (g)	Indiv %	Cumul %	% Pass
GRAVEL	6.00"	150.0		0%	0%	100%
	4.00"	100.0		0%	0%	100%
	3.00"	75.0		0%	0%	100%
	2.50"	63.0		0%	0%	100%
	2.00"	50.0		0%	0%	100%
	1.75"	45.0		0%	0%	100%
	1.50"	37.5		0%	0%	100%
	1.25"	31.5		0%	0%	100%
	1.00"	25.0		0%	0%	100%
	7/8"	22.4		0%	0%	100%
	3/4"	19.0		0%	0%	100%
	5/8"	16.0				
	1/2"	12.5				
	3/8"	9.50				
	1/4"	6.30	42.80	10%	10%	90%
	#4	4.75	17.60	4%	14%	86%
SAND	#8	2.36				
	#10	2.00	26.10	5.99%	20%	80%
	#16	1.18				
	#20	0.850	27.00	6.20%	26%	74%
	#30	0.600				
	#40	0.425	28	6.52%	33%	67%
	#50	0.300				
	#60	0.250	35.70	8.20%	41%	59%
	#80	0.180				
	#100	0.150	41.70	9.58%	50%	50%
	#140	0.106	19.70	4.52%	55%	45%
	#170	0.900				
	#200	0.075	10.70	2.46%	57%	43%



DATE TESTED	TESTED BY
5-Oct-21	LMB

CENTRAL
Geotechnical Services, LLC

10240 SW Nimbus Ave., Suite L6
Portland, OR 97223
503.616.9419
www.centralgeotech.com

PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Greenfield-Eatonville	Greenfield-Eatonville	21-118	SB-14 @ 5'
		REPORT DATE	FIELD ID
		10-Oct-21	SB-14 @ 5'
		DATE SAMPLED	SAMPLED BY
		28-Sep-21	MG

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
SB-14 @ 5'	SB-14 @ 5'	GRAVEL with sand and silt (GW)
SPECIFICATIONS		AASHTO SOIL TYPE

LABORATORY TEST DATA

LABORATORY EQUIPMENT	TEST PROCEDURE
Humboldt Standard Sieves - Auto Shaker - Wet Sieve	ASTM C136 AND D1140

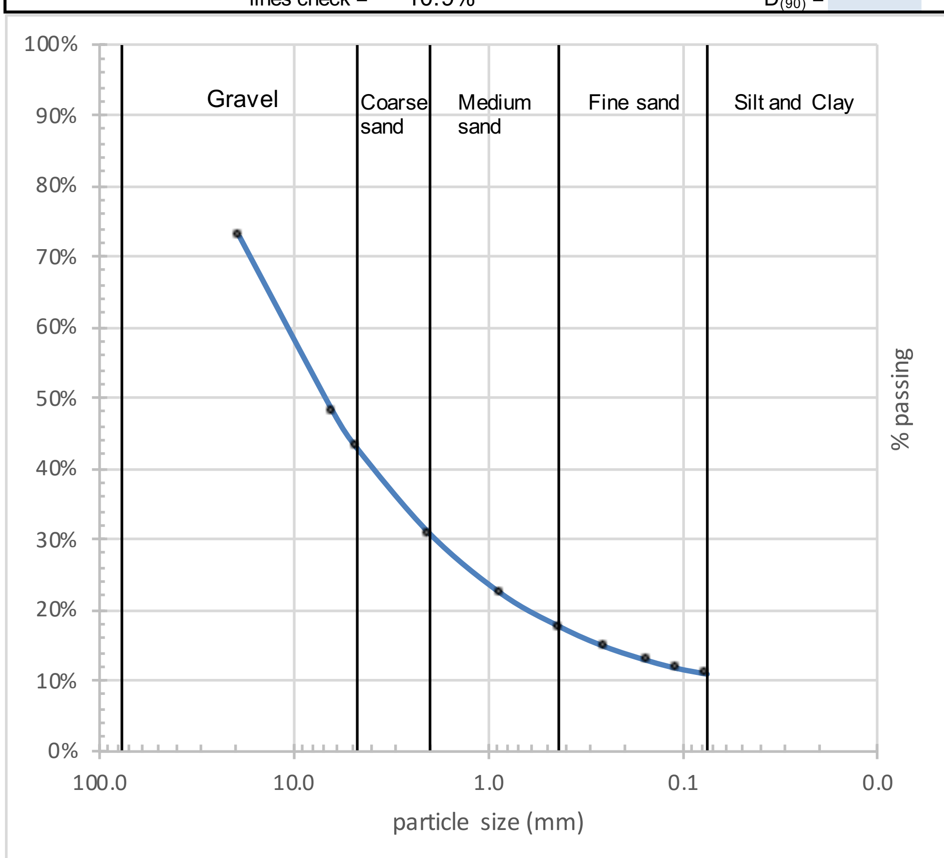
ADDITIONAL DATA

initial dry mass (g) =	422.5			
as-received moisture content =		coefficient of curvature	C_c =	
liquid limit =	0	coefficient of uniformity	C_u =	
plastic limit =	0	effective size (mm)	$D_{(10)}$ =	
plasticity index =	0		$D_{(30)}$ =	2.0
fineness modulus =			$D_{(60)}$ =	11.0
fines check =	10.9%		$D_{(90)}$ =	

SIEVE DATA

% gravel = 57.1%
% sand = 32.0%
% silt and clay = 11%

	SIEVE SIZE US	SIEVE SIZE mm	PERCENT PASSING mass (g)	Indiv %	Cumul %	% Pass
GRAVEL	6.00"	150.0		0%	0%	100%
	4.00"	100.0		0%	0%	100%
	3.00"	75.0		0%	0%	100%
	2.50"	63.0		0%	0%	100%
	2.00"	50.0		0%	0%	100%
	1.75"	45.0		0%	0%	100%
	1.50"	37.5		0%	0%	100%
	1.25"	31.5		0%	0%	100%
	1.00"	25.0		0%	0%	100%
	7/8"	22.4		0%	0%	100%
	3/4"	19.0	115.10	27%	27%	73%
	5/8"	16.0				
	1/2"	12.5				
	3/8"	9.50				
	1/4"	6.30	104.40	25%	52%	48%
	#4	4.75	21.70	5%	57%	43%
SAND	#8	2.36				
	#10	2.00	51.30	12.14%	69%	31%
	#16	1.18				
	#20	0.850	36.10	8.54%	78%	22%
	#30	0.600				
	#40	0.425	20	4.66%	82%	18%
	#50	0.300				
	#60	0.250	11.80	2.79%	85%	15%
	#80	0.180				
	#100	0.150	8.40	1.99%	87%	13%
	#140	0.106	4.60	1.09%	88%	12%
	#170	0.900				
	#200	0.075	3.30	0.78%	89%	11%



DATE TESTED	TESTED BY
5-Oct-21	LMB

CENTRAL
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PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Greenfield-Eatonville	Greenfield-Eatonville	21-118	SB-17 @ 40'
		REPORT DATE	FIELD ID
		10-Oct-21	SB-17 @ 40'
		DATE SAMPLED	SAMPLED BY
		28-Sep-21	MG

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
SB-17 @ 40'	SB-17 @ 40'	Silty SAND (SM)
SPECIFICATIONS		AASHTO SOIL TYPE

LABORATORY TEST DATA

LABORATORY EQUIPMENT	TEST PROCEDURE
Humboldt Standard Sieves - Auto Shaker - Wet Sieve	ASTM C136 AND D1140

ADDITIONAL DATA

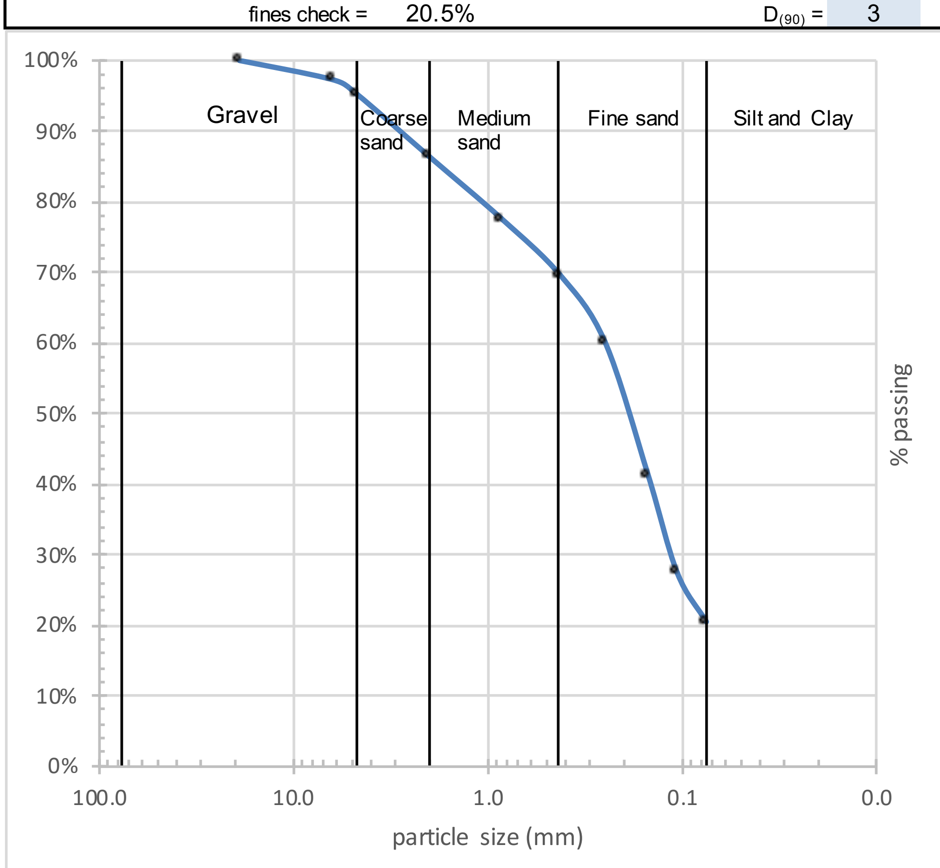
initial dry mass (g) =	169.5			
as-received moisture content =		coefficient of curvature	C_c =	
liquid limit =	0	coefficient of uniformity	C_u =	
plastic limit =	0	effective size (mm)	$D_{(10)}$ =	
plasticity index =	0		$D_{(30)}$ =	0.1
fineness modulus =			$D_{(60)}$ =	0.25
fines check =	20.5%		$D_{(90)}$ =	3

SIEVE DATA

% gravel = 4.7%
% sand = 74.8%
% silt and clay = 20%

	SIEVE SIZE		PERCENT PASSING			
	US	mm	mass (g)	Indiv %	Cumul %	% Pass
GRAVEL	6.00"	150.0		0%	0%	100%
	4.00"	100.0		0%	0%	100%
	3.00"	75.0		0%	0%	100%
	2.50"	63.0		0%	0%	100%
	2.00"	50.0		0%	0%	100%
	1.75"	45.0		0%	0%	100%
	1.50"	37.5		0%	0%	100%
	1.25"	31.5		0%	0%	100%
	1.00"	25.0		0%	0%	100%
	7/8"	22.4		0%	0%	100%
	3/4"	19.0		0%	0%	100%
	5/8"	16.0				
	1/2"	12.5				
	3/8"	9.50				
	1/4"	6.30	4.60	3%	3%	97%
	#4	4.75	3.40	2%	5%	95%
SAND	#8	2.36				
	#10	2.00	15.10	8.91%	14%	86%
	#16	1.18				
	#20	0.850	14.90	8.79%	22%	78%
	#30	0.600				
	#40	0.425	14	7.96%	30%	70%
	#50	0.300				
	#60	0.250	16.00	9.44%	40%	60%
	#80	0.180				
	#100	0.150	31.90	18.82%	59%	41%
	#140	0.106	23.60	13.92%	73%	27%
	#170	0.900				
	#200	0.075	11.80	6.96%	80%	20%

DATE TESTED	TESTED BY
5-Oct-21	LMB



EATONVILLE LANDFILL REMEDIAL DESIGN

GEOTECHNICAL EVALUATION REVISED REPORT
APPX. C: GROUNDWATER & SLOPE STABILITY ANALYSES

PREPARED FOR GSI GROUNDWATER SOLUTIONS
EATONVILLE, WASHINGTON

GREENFIELD GEOTECHNICAL
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1.0 SLOPE STABILITY ANALYSES

The stability of slopes is evaluated based on the factor of safety (FS), which is defined as the ratio of the forces or moments resisting slope movement to the forces or moments driving slope movement. Deformation begins to increase as the factor of safety approaches 1.0 and then becomes uncontrollable once the factor of safety reaches 1.0. Because fine-grained soils are sensitive to the timing and rate of loading, slope stability analyses are often grouped into categories of short-term and long-term loading. Slopes are considered stable with a minimum factor of safety of 1.3 during short-term construction loading and a minimum factor of safety of 1.5 during long-term static conditions. For new, large cuts, such as the proposed excavation of the Eatonville landfill, a probability of failure of less than 1% is typically acceptable. For temporary excavations where there is no potential for loss of life and repair costs are low, the acceptable probability of failure may be as high as 10%[1].

1.1 SOIL STRENGTH PROPERTIES

Forces that resist slope movement are developed from a combination of soil cohesion (interparticle attractive forces), intergranular friction, and external pressures. Interparticle attractive forces are typically limited to fine-grained soils. In granular soils, the intergranular frictional capacity is based on the contact stress between soil grains. Pore pressure between the soil grains counteracts the intergranular stresses, and so the effective stress (total stress minus pore pressure) is used to calculate the frictional capacity of the soil. In well-drained conditions, hydrostatic pore pressure is assumed, and soil strength is calculated based on an effective stress cohesion and friction angle. Table C.1 lists the soil properties for the Waste, Loose Sand, Recessional Outwash, Till, Advance Outwash, and Lawton Clay. The values in Table C.1 were calculated based on correlations with subsurface SPT data, the existing slope conditions, and regional average values[2].

Table C.1: Soil properties for slope stability analysis

Deposit	Unit weight	Cohesion	Friction angle
Waste	105 pcf	60 psf	34^{o}
Loose Sand	120 pcf	0 psf	34^{o}
Recessional Outwash	135 pcf	0 psf	36^{o}
Till	135 pcf	100 psf	40^{o}
Advance Outwash	135 pcf	0 psf	36^{o}
Lawton Clay	135 pcf	100 psf	40^{o}
Peat	80 pcf	190 psf	0^{o}
Riprap	145 pcf	0 psf	39^{o}

In addition to the material strengths in Table C.1, we also apply a small amount of capillary tension above the water table for short-term construction loading conditions. The capillary

[1] Washington Department of Transportation. 2022. Geotechnical Design Manual. M 46-03.16.

[2] Harp, E.L., Michael, J.A. and Laprade, W.T., 2008. Shallow landslide hazard map of Seattle, Washington.

tension, or negative pore pressure, increases the effective stress in the soil at shallow depths, resulting in slightly greater strengths of very shallow soils. Leshchinsky et al.[3] provide estimates of capillary tension based on water content and soil classification. Based on the water content and gradation of the loose sand, we apply a maximum of 150 psf of capillary tension to the soil for short-term loading conditions. Capillary tension is not assumed for long-term loading conditions, as cracks in the soil may develop.

In addition to the material strengths in Table C.1, we also apply a small amount of root cohesion to the near-surface soils. Root cohesion is not applied during conditions where the ground surface may be stripped free of vegetation, such as during construction. Schmidt et al.[4] provide estimates of root cohesion values in the Oregon Coast Range. We use their results in conjunction with the analyses provided by Pollock[5] to estimate root cohesion values of 60 psf for revegetated areas along the slope. This value assumes light to moderate vegetation is established on the slope once groundwater flow has equilibrated.

1.2 GROUNDWATER FLOW

As discussed previously, pore pressure reduces the frictional capacity of the soil. Likewise, hydraulic gradients can impose differential hydraulic pressures on soils, potentially causing local instability. Piezometric measurements indicate that the groundwater head elevation ranges from 647 to 700 ft beneath the crest of the slope. The perennial spring on the western side of the landfill daylights at an approximate elevation of 688 ft, or 103 ft above the bottom of the slope.

Since the flow of groundwater could impact the stability of the slope, we have developed a steady-state groundwater flow model with the finite element program STKO by Asdea Software Technology. STKO and the underlying equation solver OpenSees provide a comprehensive finite element framework, which we set up to solve the equations of motion for water in a poroelastic medium[6]. The typical slope geometry for Sections A and B is shown in Figures C.1 and C.2. In our analysis, the piezometric head is fixed at the depth of the well screens on the upslope side of the model; the piezometric head is fixed at elevation 650 ft along the screen of PZ-01 and at elevation 700 ft along the screen of PZ-02. Hydraulic pressure is also fixed to zero at the ground surface of the wetland below elevation 585 ft. The saturated hydraulic conductivity is estimated based on correlations with the grain size distribution from laboratory tests and regional averages[7].

---

[3] Leshchinsky, B.A., Booth, A., Olsen, M.J., Matthews, N. and Kingen, K., 2021. Enhanced Assessment of Projected Landslide Activity Under Precipitation and Seismicity (No. FHWA-OR-RD-22-02). Oregon. Dept. of Transportation. Research Section.

[4] Schmidt, K.M., Roering, J.J., Stock, J.D., Dietrich, W.E., Montgomery, D.R. and Schaub, T., 2001. The variability of root cohesion as an influence on shallow landslide susceptibility in the Oregon Coast Range. Canadian Geotechnical Journal, 38(5), pp.995-1024.

[5] Pollock, W., 2020. A framework for regional scale quantitative landslide risk analysis. University of Washington.

[6] Yang, Z., Lu, J., and Elgamal, A. (2008). "OpenSees soil models and solid-fluid fully coupled elements: User's manual." Dept. of Structural Engineering, Univ. of California, San Diego.

[7] Savage, W.Z., Morrissey, M.M. and Baum, R.L., 2000. Geotechnical properties for landslide-prone Seattle; area glacial deposits (No. 2000-228). US Department of the Interior, US Geological Survey.

Table C.2 lists the applicable soil properties. No flow is assumed to occur at pressures less than the capillary tension threshold of -150 psf.

Table C.2: Soil properties for groundwater flow analysis

Deposit	Saturated permeability (ft/day)
Waste	3×10^{-2}
Loose Sand	3×10^{-3}
Recessional Outwash	3×10^{-3}
Till	3×10^{-5}
Advance Outwash	3×10^{-3}
Lawton Clay	3×10^{-5}
Peat	3×10^{-2}

The model results indicate that the pore pressure in the Recessional Outwash and Vashon Till above elevation 656 ft is likely minimal. Groundwater daylighting at the spring is likely due to infiltrated surface water perched on the Vashon Till. The model indicates that positive pore pressure develops in the layer of Advance Outwash below elevation 650 ft. The Lawton Clay provides a hydraulic aquitard and most of the groundwater flows through the layers of loose sand and waste that mantle the slope. Groundwater daylights at the toe of the slope at an approximate elevation of 585 ft. Figures C.3 and C.4 show the resulting profiles of the static pore pressure along sections A and B.

1.3 SURCHARGE LOADING

Typical live load surcharges from construction or traffic may be estimated using an additional surface pressure of 250 psf per the WSDOT *Geotechnical Design Manual*[8]. This load is only applied during short-term construction loading. The typical surcharge applies to loads from haul trucks and light equipment operations. Surcharge loads associated with material storage, the operation of heavily loaded cranes, or special equipment such as yarder high leads, drill rigs, and material conveyors should be considered separately.

2.0 SLOPE STABILITY RESULTS

2.1 ANALYSIS METHODS

For the site-specific layered geometry and loading conditions, we evaluate the stability of select cross sections using 2D limit analyses with the finite element program STKO by Asdea Software Technology. The finite element method provides advantages over the conventional method of slices in that seepage pore pressures and interactions from structures can be explicitly modeled as part of the analysis. In addition, the failure surface is found automatically and failure

[8] Washington Department of Transportation. 2022. Geotechnical Design Manual. https://wsdot.wa.gov/engineering-standards/all-manuals-and-standards/manuals/geotechnical-design-manual.

mechanisms involving deforming wedges of soil can be analyzed[9]. The finite element method has been extensively validated and compared to the conventional method of slices[10].

In the finite element method, the strength of the soil is iteratively reduced until deformation becomes uncontrolled and the model no longer converges, as defined by the norm of the displacement matrix[11] in our analyses. The ratio of the material strength at the first iteration to the reduced strength at the final converged iteration defines the factor of safety[12]. While the computed deformation at the final converged iteration is often very large, the resulting patterns of deformation provide a cross-section of soils that are potentially unstable. We also validate the results against simplified design chart solutions[13].

2.2 EXISTING SLOPES

The entire slope of the landfill is approximately 141 ft tall. The bottom 85 ft of the landfill slope becomes very steep and is sloped at approximately 1.25H:1V. Sections of the slope up to 6 ft tall are nearly vertical. To the east of the landfill, the existing slope is steeper than 1.25H:1V over a height of approximately 90 ft. Hand auger logs indicate that the slope adjacent to the landfill is likely composed of colluvium, but waste associated with the landfill is also exposed near the base of the slope. The Typical Landfill Sections, Figures C.1 and C.2 show the subsurface profiles associated with sections A and B and the relevant material properties.

Field observations indicate that the existing waste slope along Section A is unstable. The waste is likely near its angle of repose, such that waste is periodically driven downslope by a combination of gravity and precipitation-induced forces. Likewise, along Section B, a possible head scarp from a historic landslide was documented near the crest of the slope. The presence of colluvium near the base of Section B also supports the conclusion that the very steep native slopes adjacent to the landfill are marginally stable.

We use the typical sections and subsurface properties described previously to develop two 2D finite element models representing Sections A and B. Figures C.5 and C.6 show the model results, respectively. The spectral color gradient in the figures represents the relative patterns of deformation during the final converged iteration of the model, where the soil strength has been reduced nearly to the point where the soil can no longer support the slope. Blue indicates no deformation and stable locations, whereas red indicates large deformations and potentially unstable locations. Note that the computed deformations at the final iteration are not the expected deformations of the designed slope.

The finite element analyses indicate that the factor of safety along Section A is approximately 1.01. Small perturbations of material strength or loading due to material creep and decomposition,

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[9] Dawson, E.M. and Roth, W.H., 2020. Slope stability analysis with FLAC. In FLAC and numerical modeling in geomechanics (pp. 3-9). CRC Press.

[10] Matsui, T. and San, K.C., 1992. Finite element slope stability analysis by shear strength reduction technique. Soils and foundations, 32(1), pp.59-70.

[11] https://opensees.berkeley.edu/wiki/index.php/Norm_Displacement_Increment_Test

[12] Griffiths, D.V. and Lane, P.A., 1999. Slope stability analysis by finite elements. Geotechnique, 49(3), pp.387-403.

[13] Duncan, J.M., Wright, S.G. and Brandon, T.L., 2014. *Soil strength and slope stability*. John Wiley & Sons.

changes in hydraulic conditions, or an earthquake could result in an approximately 25 ft-thick translational slide. Such slides are not self-stabilizing and could result in debris inundating the wetland below the landfill.

The finite element analyses indicate that the factor of safety along Section B is approximately 1.23, implying marginal stability. Failure of the slope would likely extend upslope of the possible head scarp and continue downslope towards the bottom of the Advance Outwash at approximately elevation 620 ft. Depositional waste and loose sand were observed below this elevation, suggesting that shallow failures have occurred in the past on this slope.

The results from the finite element analyses support the geologic interpretation of subsurface layering and the estimated material properties. The existing waste is unstable and near its angle of repose such that the factor of safety is approximately 1.01. The very steep incised slope and hydraulic conditions in the Advance Outwash result in marginally stable slopes, consistent with the general geologic interpretations of incised Vashon Glacial Drift deposits[14,15]. Since limited subsurface explorations are available, these analyses are necessary to validate the material properties for subsequent analyses.

2.3 FINAL SLOPES

2.3.1 SECTION A

With the validated material properties, simple design chart solutions indicate that a 2H:1V grade is appropriate to develop a final slope grade. GSI and Alta Engineering have developed preliminary plans for final grading based on the assumed thickness of waste near the toe of the landfill. These plans show a 2H:1V slope that extends from the estimated bottom of the waste to the crest of the slope with heights up to 141 ft tall.

Based on the provided grading plans, we have developed a 2D finite element model of the 2H:1V final slope through Sections A. Figure C.7 shows the results of the finite element analyses, with the factor of safety at the final converged iteration of approximately 1.45. The model results also indicate that a series of cutoff drains at least 4 ft deep is necessary along the final slope to prevent seepage from emerging near the base. We have also assumed that the final slope is vegetated with a rooted zone that extends a minimum of 8 inches deep.

WSDOT[16] recommends a probability of failure of less than 1% for large, new excavations. We evaluate the probability of slope failure using simple reliability analyses[17], assuming that the strength of the soil is largely derived from friction. The frictional component of strength is log-normally distributed with a standard deviation of $\ln \tan \phi$ equal to 0.13. This value is consistent

---

[14] Savage, W.Z., Morrissey, M.M. and Baum, R.L., 2000. Geotechnical properties for landslide-prone Seattle; area glacial deposits (No. 2000-228). US Department of the Interior, US Geological Survey.
[15] Harp, E.L., Michael, J.A. and Laprade, W.T., 2008. Shallow landslide hazard map of Seattle, Washington.
[16] Washington Department of Transportation. 2022. Geotechnical Design Manual. M 46-03.16.
[17] Christian, J.T., Ladd, C.C. and Baecher, G.B., 1994. Reliability applied to slope stability analysis. Journal of geotechnical engineering, 120(12), pp.2180-2207.

with previously published estimates[18]. The results of the probabilistic analysis suggest that the probability of failure of a new 2H:1V slope through Section A is less than 1%.

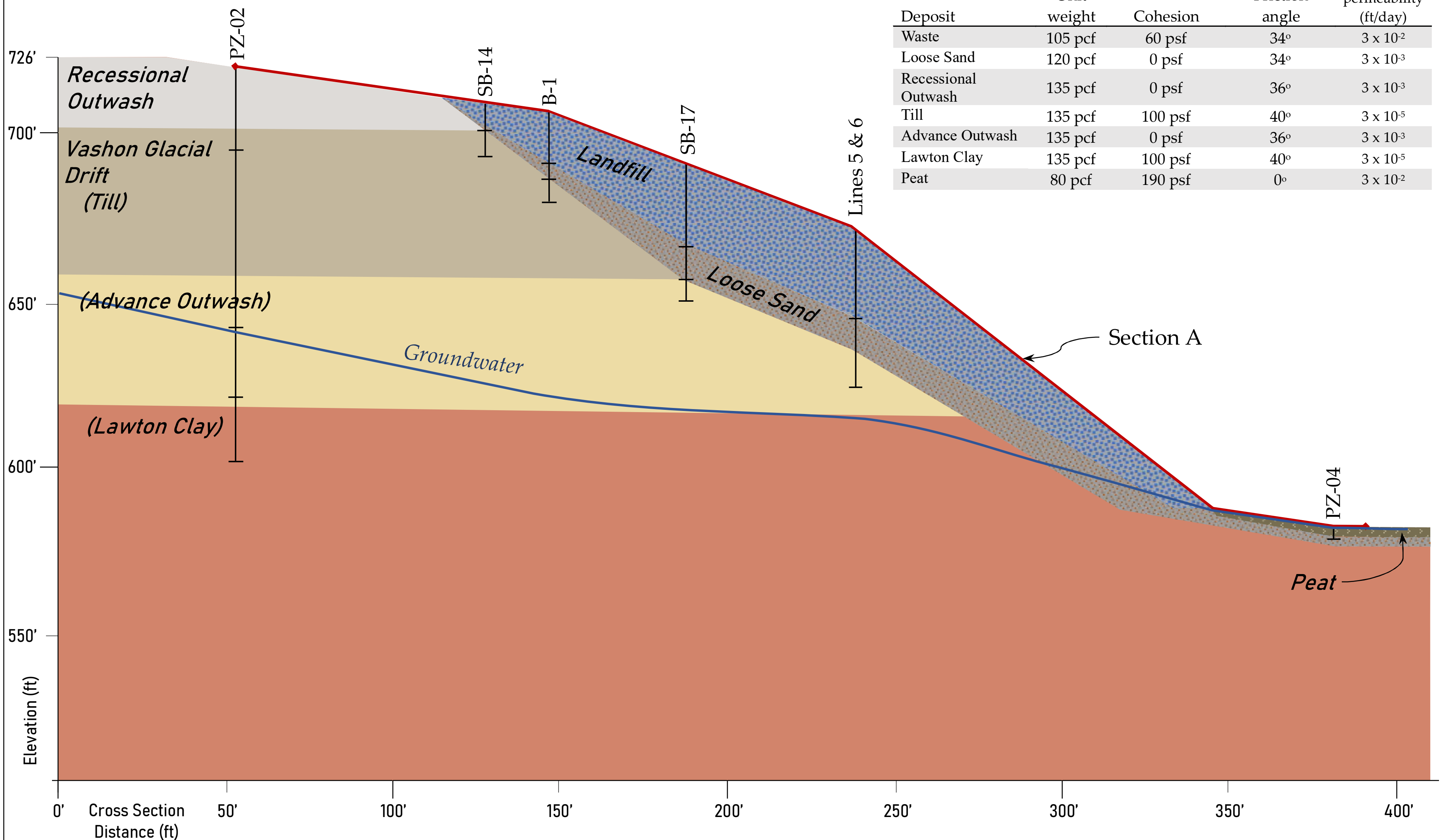
2.3.2 SECTION B

Slopes steeper than 2H:1V may be needed along the edges of the main excavation to remove the waste and match the existing grade. Through Section B, the planned excavation will be graded as steep 1.4H:1V above elevation 650 ft and 1.6H:1V below elevation 650 ft. An excavation as steep as 1H:1V up to 10 ft tall may also be needed at the top of the slope to match existing grades. We have developed a 2D finite element model of the planned excavation through Section B and Figure C.8 shows the results of the analyses. The factor of safety at the final converged iteration is approximately 1.28, which is appropriate for temporary construction stability.

The excavated slope along Section B will require additional stabilization measures to maintain an appropriate long-term factor of safety. Figure C.9 shows the results of the finite element analysis through Section B with a 3.5 ft-thick layer of riprap providing additional support. The resulting factor of safety is 1.35. Reliability analysis indicates that the probability of failure is approximately 1% with the riprap buttress, which is acceptable for the planned use conditions.

[18] Duncan, J.M., 2000. Factors of safety and reliability in geotechnical engineering. Journal of geotechnical and geoenvironmental engineering, 126(4), pp.307-316.

Deposit	Unit weight	Cohesion	Friction angle	Saturated permeability (ft/day)
Waste	105 pcf	60 psf	34°	3×10^{-2}
Loose Sand	120 pcf	0 psf	34°	3×10^{-3}
Recessional Outwash	135 pcf	0 psf	36°	3×10^{-3}
Till	135 pcf	100 psf	40°	3×10^{-5}
Advance Outwash	135 pcf	0 psf	36°	3×10^{-3}
Lawton Clay	135 pcf	100 psf	40°	3×10^{-5}
Peat	80 pcf	190 psf	0°	3×10^{-2}



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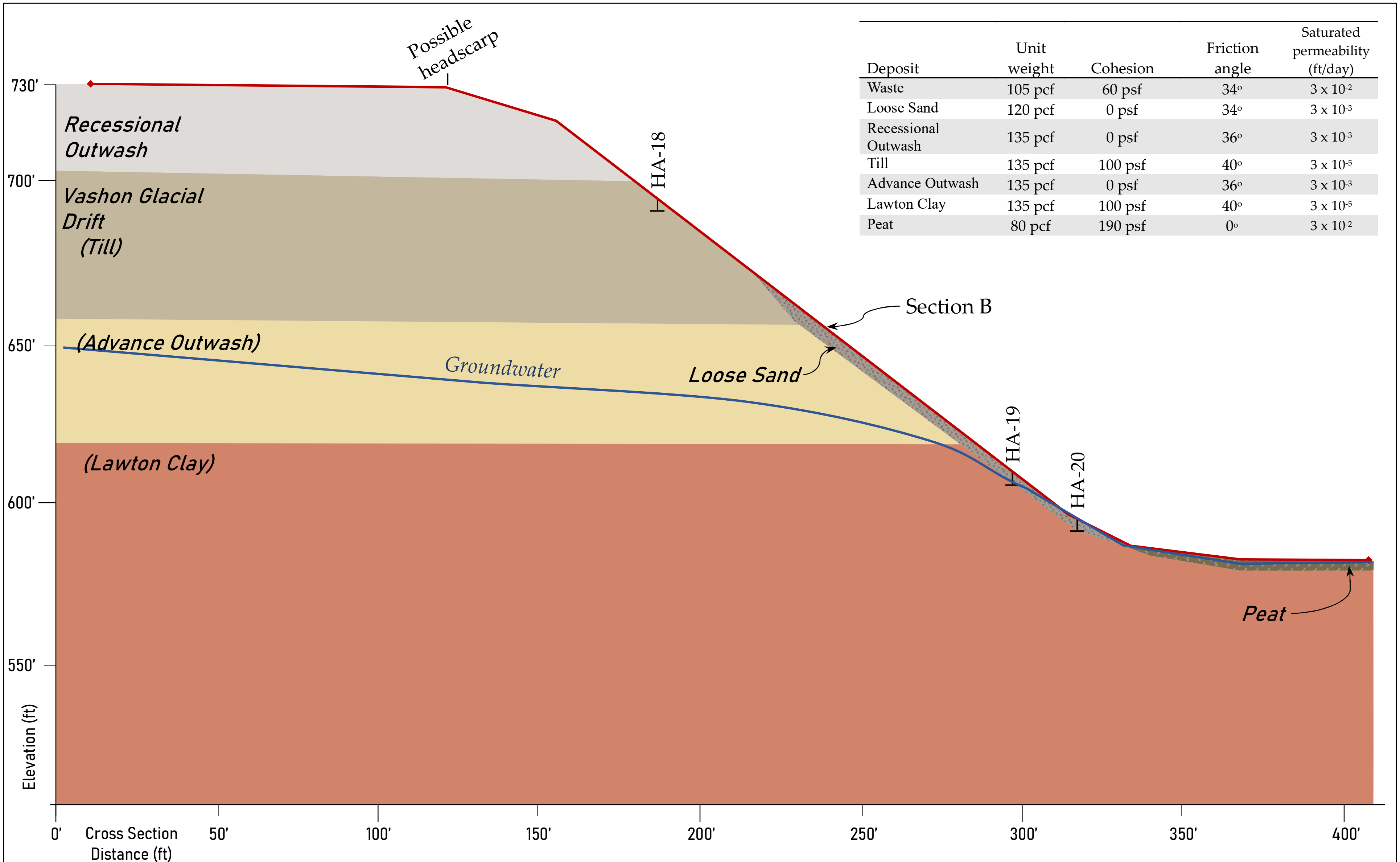
Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION A: TYPICAL SLOPE GEOMETRY

Figure C.1



Deposit	Unit weight	Cohesion	Friction angle	Saturated permeability (ft/day)
Waste	105 pcf	60 psf	34°	3×10^{-2}
Loose Sand	120 pcf	0 psf	34°	3×10^{-3}
Recessional Outwash	135 pcf	0 psf	36°	3×10^{-3}
Till	135 pcf	100 psf	40°	3×10^{-5}
Advance Outwash	135 pcf	0 psf	36°	3×10^{-3}
Lawton Clay	135 pcf	100 psf	40°	3×10^{-5}
Peat	80 pcf	190 psf	0°	3×10^{-2}

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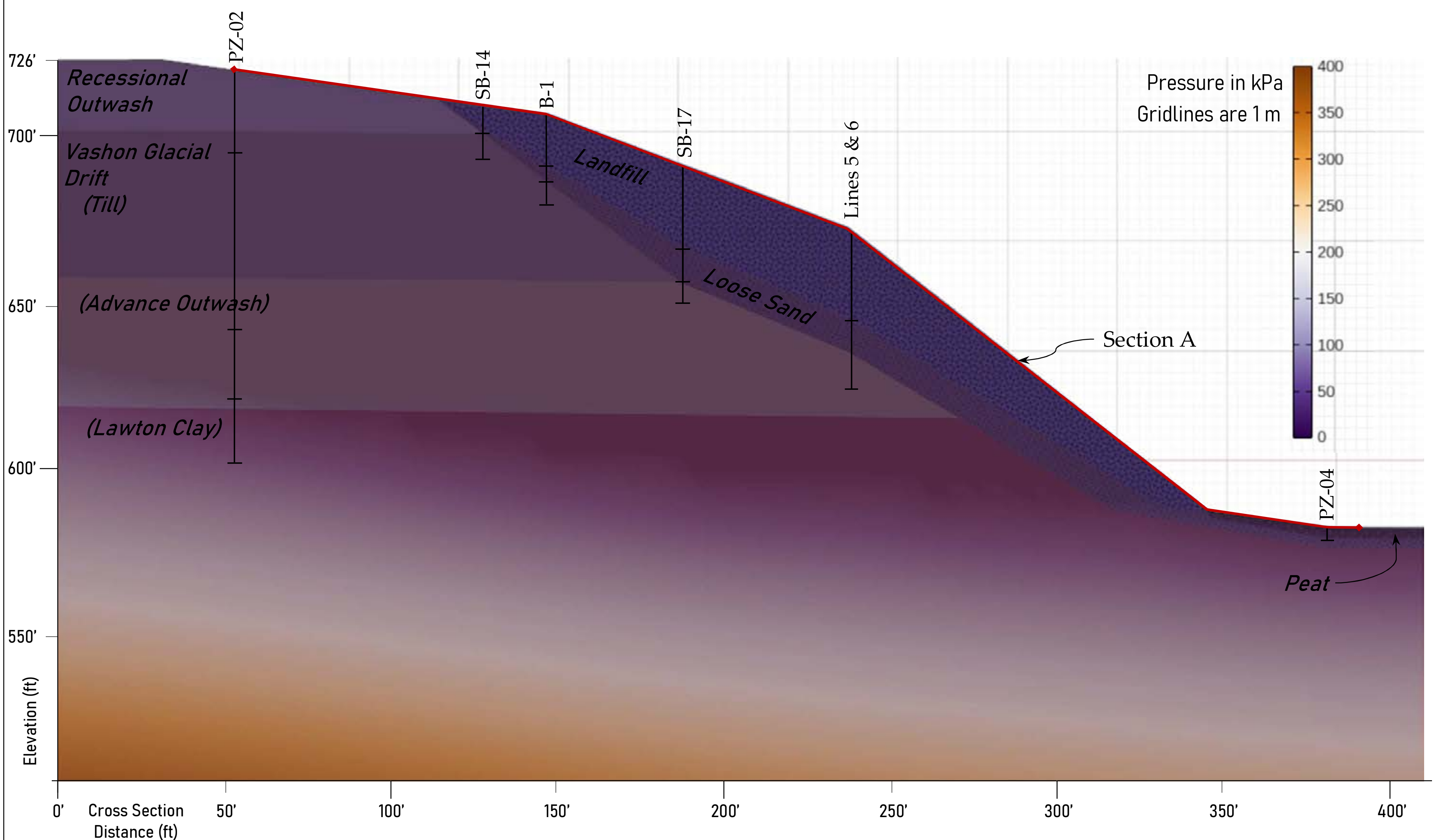
Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION B: TYPICAL SLOPE GEOMETRY

Figure C.2



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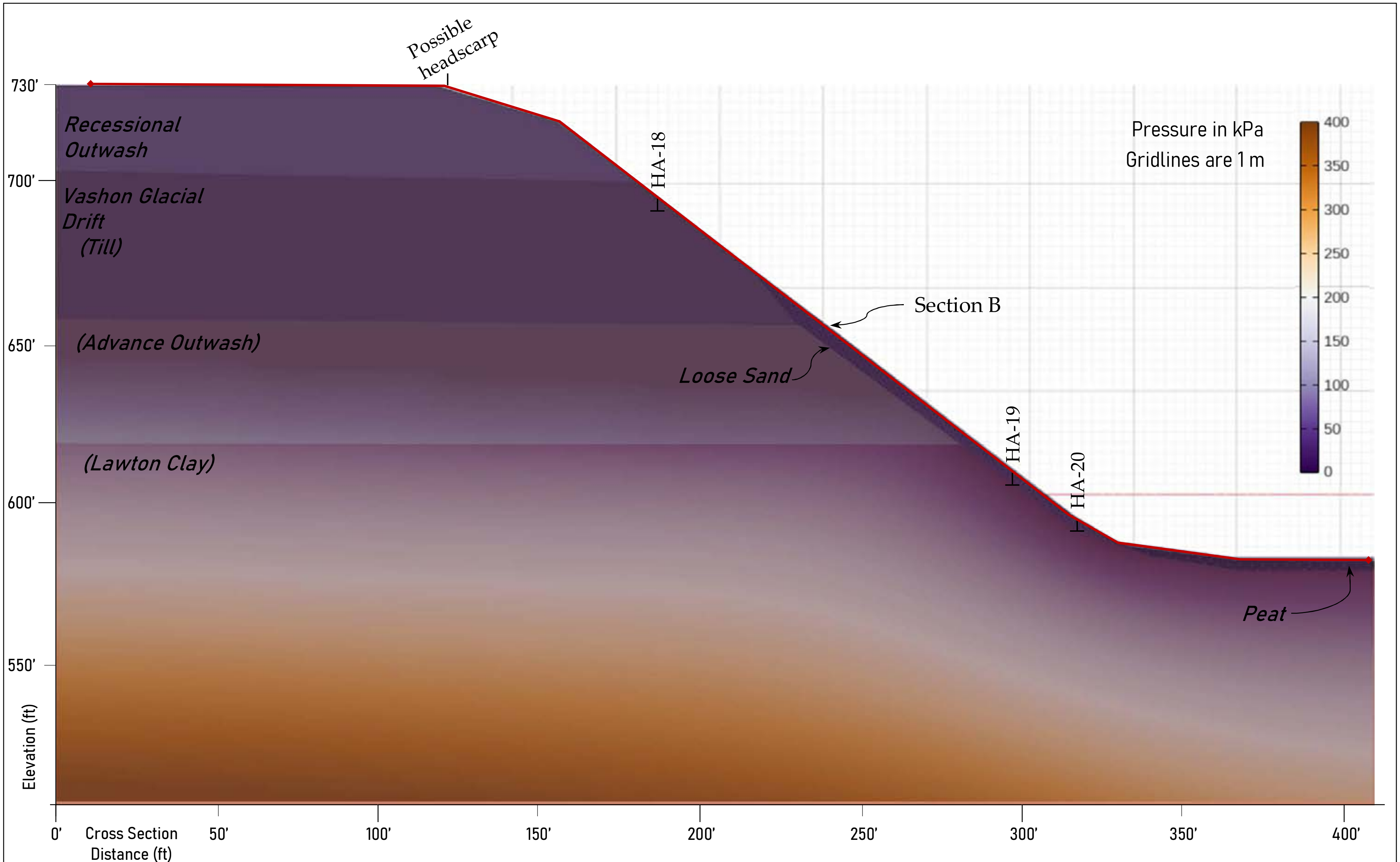
Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION A: PIEZOMETRIC PRESSURE

Figure C.3



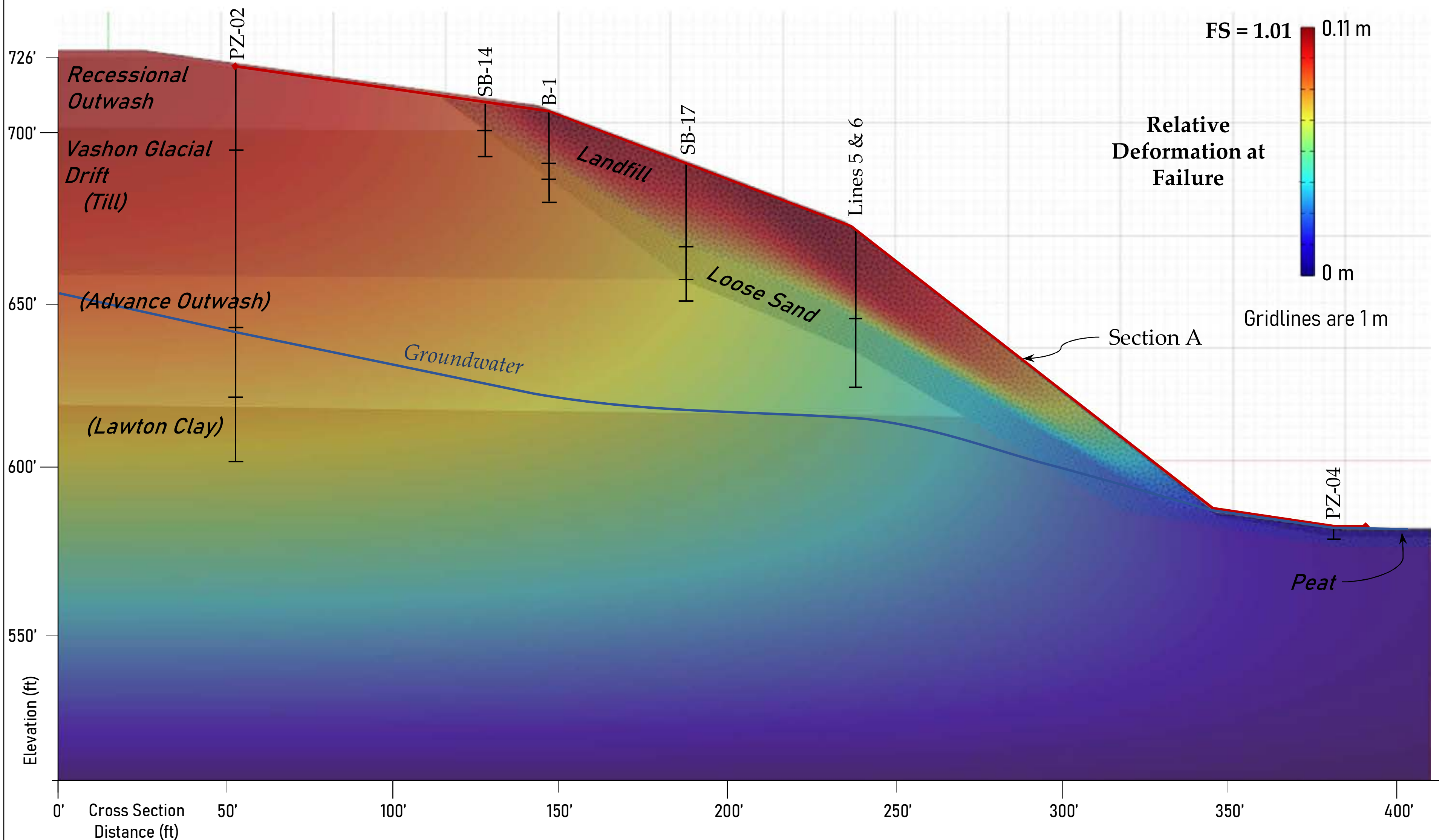
Prepared for GSI Water Solutions

GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN
Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION A: PIEZOMETRIC PRESSURE

Figure C.4



Prepared for GSI Water Solutions

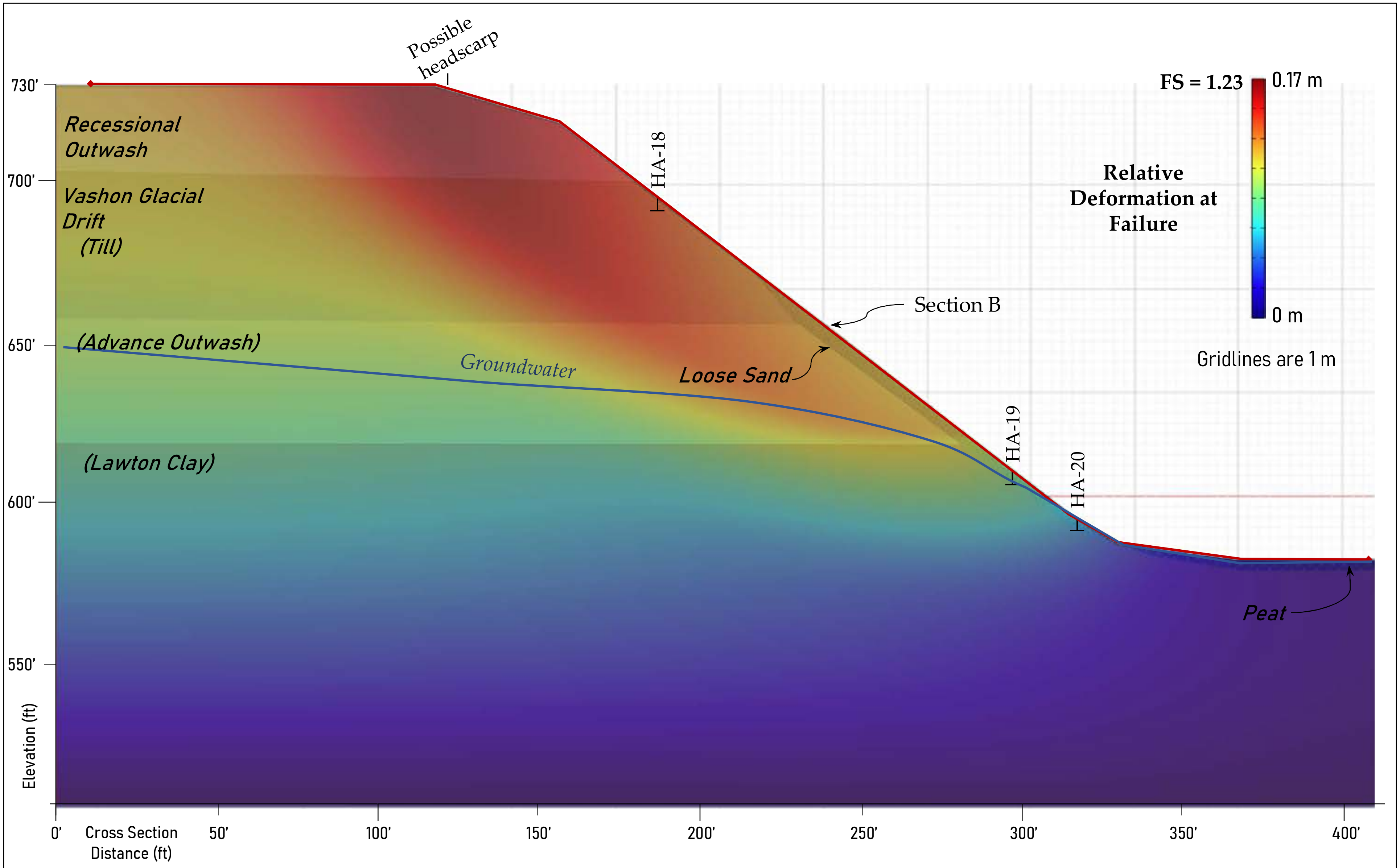
GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN

Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION A: EXISTING SLOPE STABILITY

Figure C.5



Prepared for GSI Water Solutions

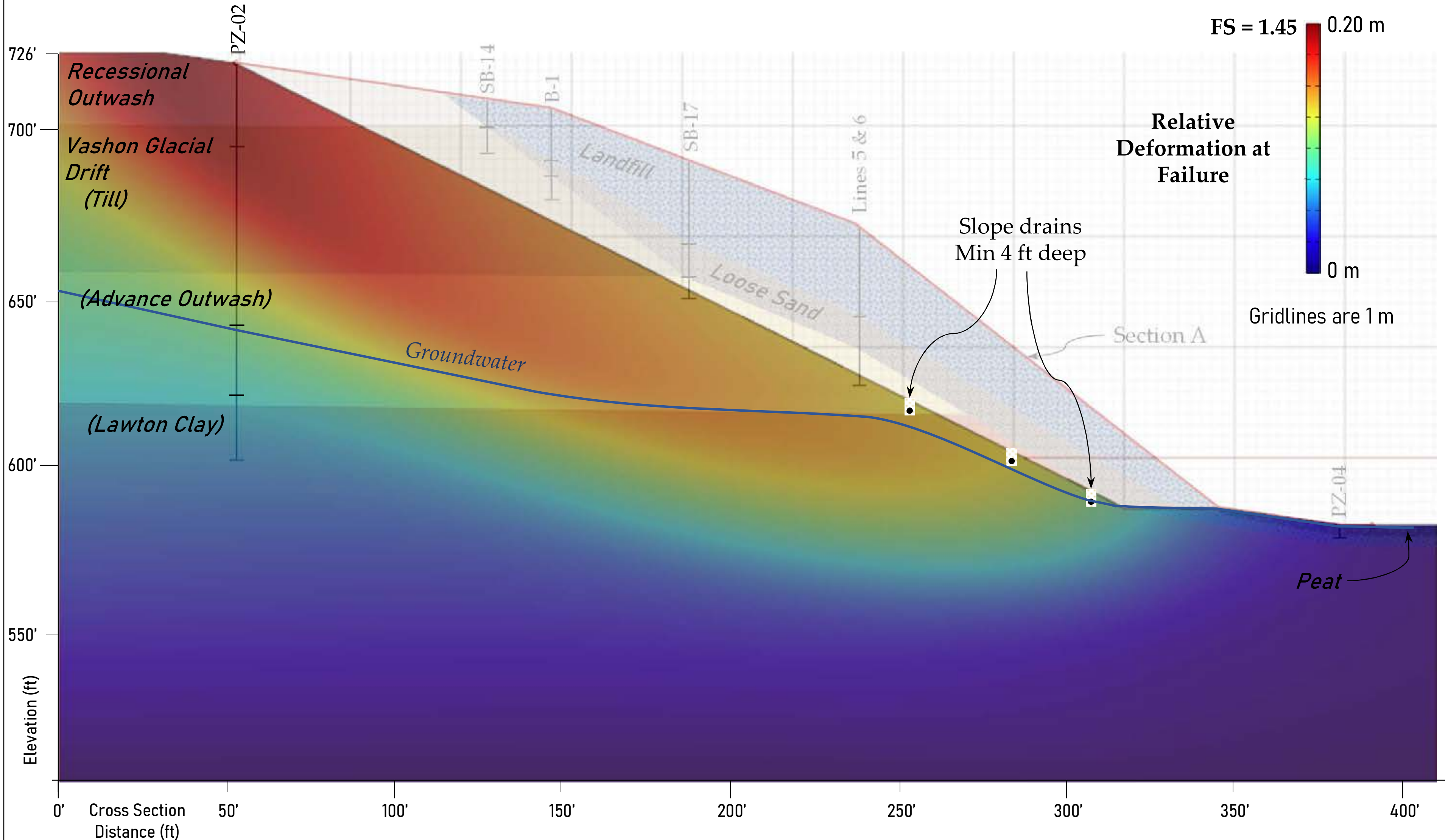
GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN

Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION B: EXISTING SLOPE STABILITY

Figure C.6



Prepared for GSI Water Solutions

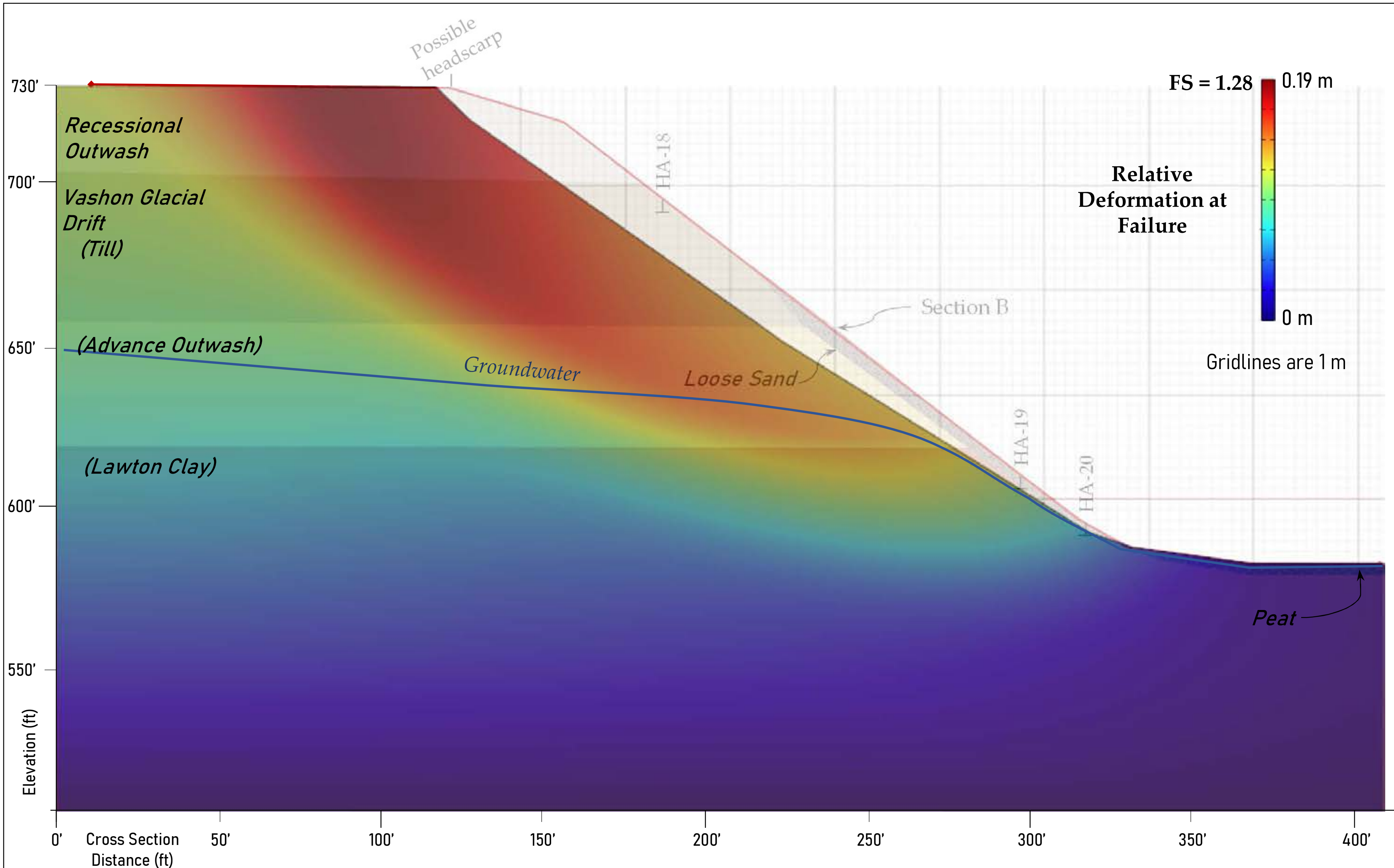
GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN

Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION A: FINAL SLOPE GEOMETRY

Figure C.7



Prepared for GSI Water Solutions

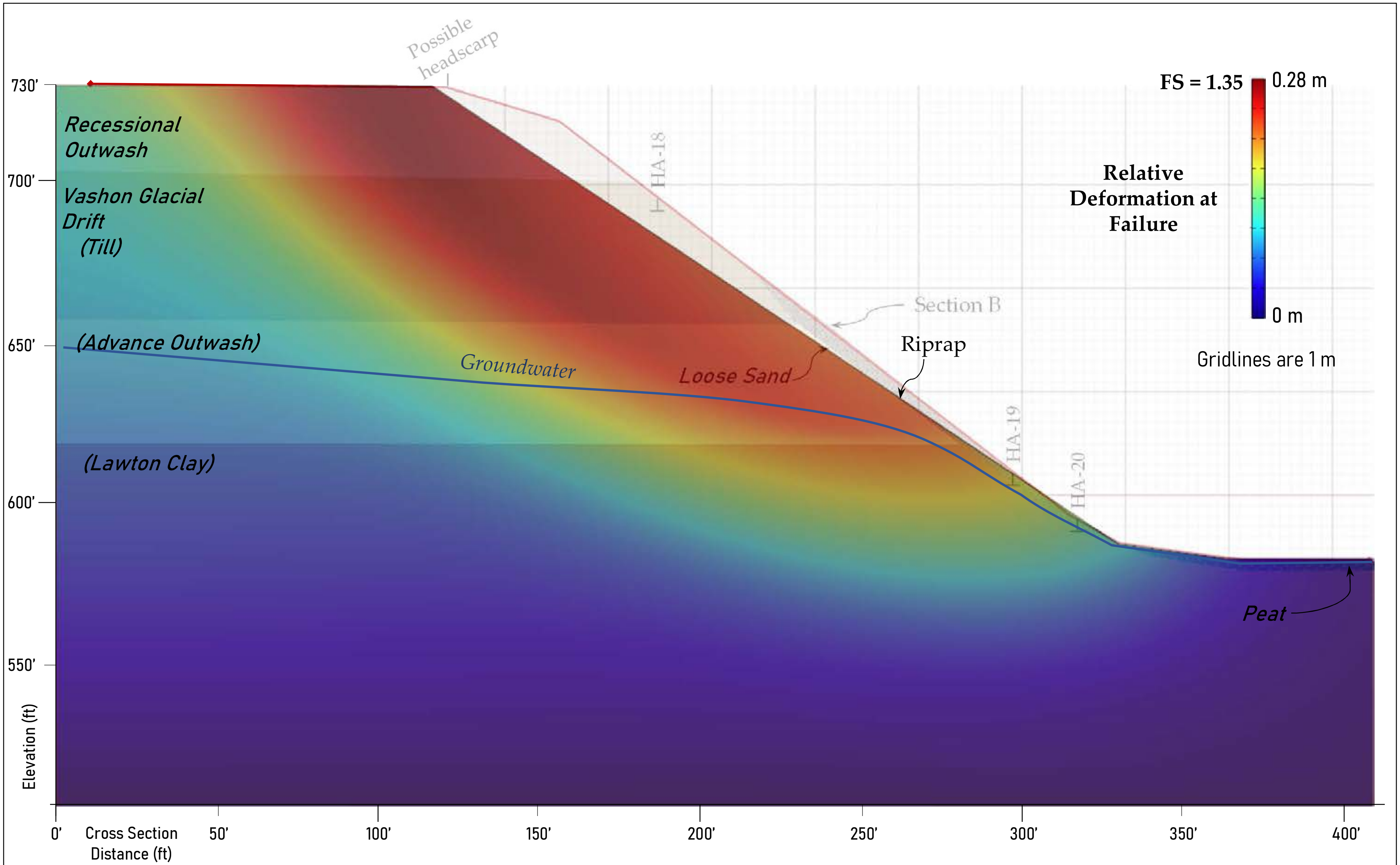
GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN

Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION B: TEMPORARY EXCAVATION STABILITY

Figure C.8



Prepared for GSI Water Solutions

GREENFIELD GEOTECHNICAL
Advanced geotechnical and earthquake engineering solutions

EATONVILLE LANDFILL REMEDIAL DESIGN

Geotechnical Evaluation Report – Appendix C: Slope Stability Analyses

SECTION B: FINAL SLOPE STABILITY

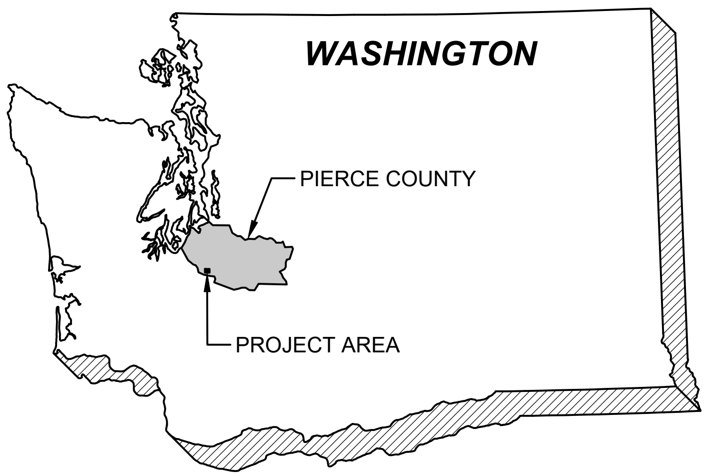
Figure C.9

GREENFIELD
GEOTECHNICAL

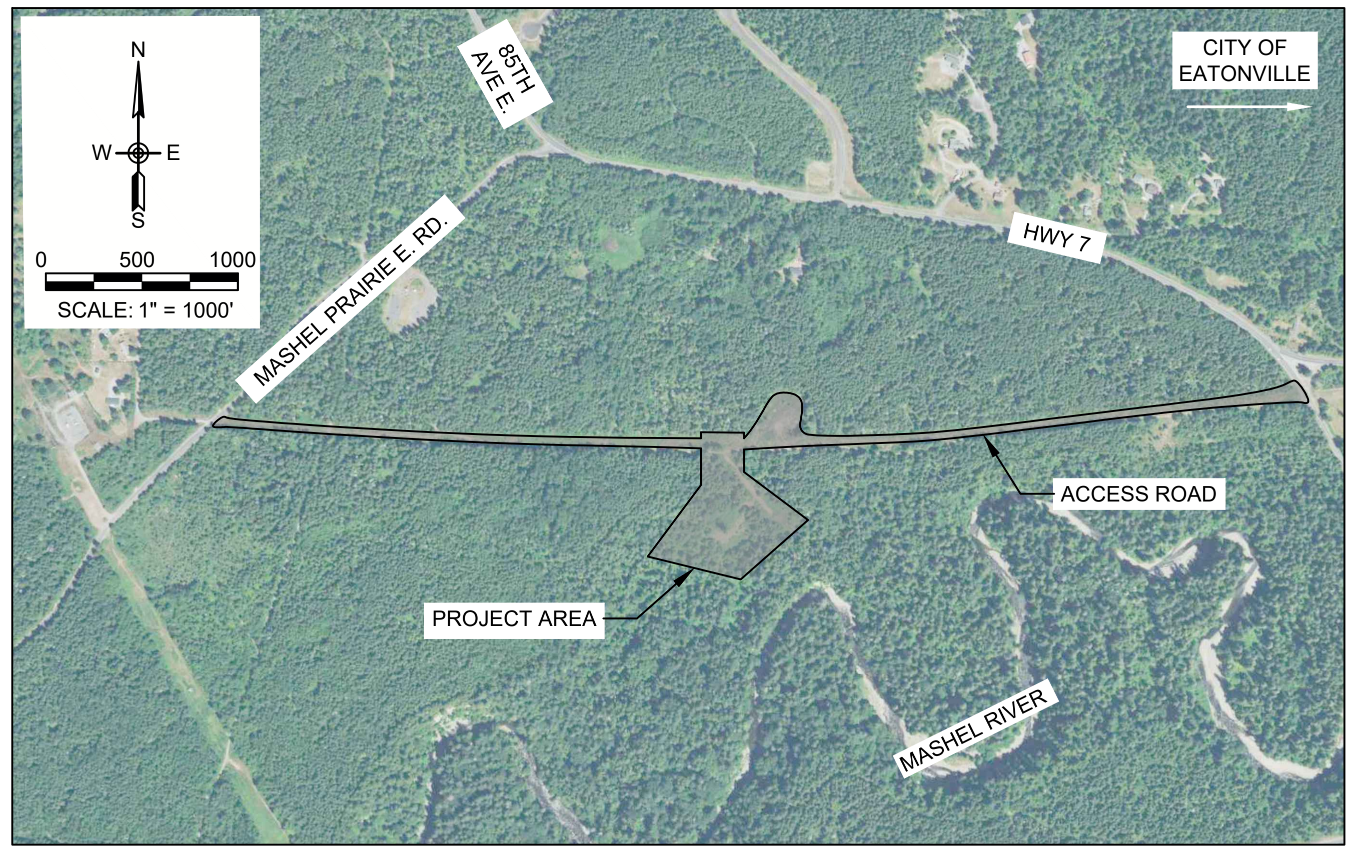
APPENDIX D

50% Design Construction Plans and Specifications

EATONVILLE LANDFILL
50% DRAFT DESIGN
PIERCE COUNTY, WASHINGTON
FEBRUARY 2025



VICINITY MAP
SCALE: NTS



LOCATION MAP
SCALE: 1" = 1000'

ENGINEER:
ALTA SCIENCE & ENGINEERING, INC.
1220 BIG CREEK RD.
KELLOGG, IDAHO 83837
TELEPHONE: (208) 786-1206

Alta Science & Engineering, Inc.

GSI WATER SOLUTIONS, INC.
650 NE HOLLADAY STREET, SUITE 900
PORTLAND, OR 97232
TELEPHONE: (503) 239-8799

GSI Water Solutions, Inc.

PREPARED FOR:

WEYERHAEUSER COMPANY
220 OCCIDENTAL AVENUE SOUTH
SEATTLE, WA 98104
TELEPHONE: (206) 539-3000

Weyerhaeuser

TOWN OF EATONVILLE
201 CENTER STREET WEST
P.O. BOX 309
EATONVILLE, WA 98328
TELEPHONE: (360) 832-3361

Town of Eatonville

SHEET INDEX

NOT FOR CONSTRUCTION

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: AS NOTED
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL
PIERCE COUNTY, WA

COVER SHEET

GENERAL NOTES AND SPECIFICATIONS

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THIS CONTRACT, AND AS REQUIRED BY THE WASHINGTON DEPARTMENT OF ECOLOGY, AND ALL OTHER APPLICABLE LOCAL, STATE, AND NATIONAL REQUIREMENTS, UNLESS OTHERWISE NOTED.
2. ALL LOCATIONS SHOWN ON PLANS ARE APPROXIMATE AND SUBJECT TO FIELD VERIFICATION/MODIFICATION IN CONSULTATION WITH THE ENGINEER. THESE PLANS WERE BASED UPON LIMITED INFORMATION, AND WORK WILL BE FIELD FIT BASED UPON CONDITIONS DURING CONSTRUCTION.
3. A COPY OF THESE APPROVED PLANS MUST BE POSTED AT THE JOB SITE FOR PUBLIC VIEWING AT ALL TIMES DURING CONSTRUCTION.
4. THE CONTRACTOR SHALL BE FAMILIAR WITH AND COMPLY WITH ALL CONDITIONS OF THE PERMITS OBTAINED FOR THE PROJECT.
5. THE CONTRACTOR SHALL MEET OR EXCEED ALL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REQUIREMENTS, AND THE REQUIREMENTS OF THE STATE OF WASHINGTON PRESENTED IN RCD 49.17; WAC 173-340-410; AND WAC 296-843-12005 FOR ALL WORK ASSOCIATED WITH THIS PROJECT AT ALL TIMES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH AND IMPLEMENT ALL CURRENT SAFETY REQUIREMENTS AND STANDARDS.
6. THE CONTRACTOR SHALL ALSO ABIDE BY THE PROJECT TECHNICAL SPECIFICATIONS IN THE CONTRACT DOCUMENTS (UNDER SEPARATE COVER) AND ALL GENERAL NOTES AND SPECIFICATIONS.
7. SURVEY CONTROL POINTS ARE SHOWN ON SHEETS G3 THROUGH G5. LOCATIONS AND ELEVATIONS ARE GROUND COORDINATES. ALL MONUMENTS MAY NOT BE SHOWN ON THESE DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING MONUMENTS AND ANY OTHER SURVEY MARKERS DURING CONSTRUCTION. ALL SUCH MONUMENTS OR MARKERS DISTURBED DURING CONSTRUCTION SHALL BE REPLACED BY A PROFESSIONAL SURVEYOR LICENSED IN THE STATE OF IDAHO OR AT CONTRACTOR'S EXPENSE.
8. LOCATIONS OF EXISTING SITE FEATURES ARE APPROXIMATE. CONTRACTOR SHALL FIELD-VERIFY THE EXACT LOCATION OF FEATURES AND ALL EXISTING UTILITIES BEFORE COMMENCING WORK. UNDERGROUND UTILITIES SHALL BE LOCATED AND MARKED PRIOR TO EXCAVATION. CALL THE ONE-CALL UTILITY LOCATE SERVICE AT 1-800-424-5555 (OR 811) AT LEAST TWO (2) WORKING DAYS PRIOR TO START OF CONSTRUCTION.
9. CONTRACTOR SHALL LOCATE, PROTECT, AND IF DAMAGED DURING CONSTRUCTION, REPAIR ALL ABOVE GROUND AND BELOW GROUND UTILITIES INCLUDING GAS, ELECTRIC, SEPTIC, WATER, SANITARY, STORM, COMMUNICATION, SPRINKLERS, IRRIGATION, ETC.
10. CONTRACTOR SHALL PROTECT ADJACENT PROPERTIES AND RIGHTS-OF-WAY FROM DAMAGE AND DEBRIS DURING CONSTRUCTION.
11. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY IF THEY DISCOVER ANY DISCREPANCIES BETWEEN THE CONSTRUCTION DOCUMENTS AND EXISTING CONDITIONS ENCOUNTERED. ALLOW (48) HOURS FOR ENGINEER TO MODIFY THE DESIGN, IF NECESSARY, UNLESS OTHERWISE SPECIFIED.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SIZING OF EQUIPMENT USED DURING THE PROJECT AND FOR WEIGHT RESTRICTIONS ON EXISTING BRIDGES AND ROADS.
13. TRAFFIC CONTROL MEETING MUTCD STANDARDS SHALL BE IMPLEMENTED BY CONTRACTOR WHEN WORKING IN OR ADJACENT TO PUBLIC RIGHTS-OF-WAY. CONTRACTOR SHALL BE FAMILIAR WITH CURRENT MUTCD STANDARDS AND HAVE THE ABILITY TO EMPLOY CERTIFIED FLAGGERS AT THE JOB SITE WHEN NEEDED. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER ACTIONS NEEDED TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC AND PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACT.
14. MATERIALS HANDLING: STOCKPILE ALL IMPORTED MATERIALS IN AN APPROVED LOCATION. EXCAVATED MATERIAL THAT IS POTENTIALLY CONTAMINATED SHALL BE DIRECTLY LOADED ONTO TRUCKS FOR DISPOSAL UNLESS OTHERWISE NOTED OR DIRECTED BY ENGINEER.
15. EXCAVATED CONTAMINATED MATERIAL SHALL BE HAULED TO A LOCATION THAT IS TBD.
16. DECONTAMINATION OF EQUIPMENT AND PERSONNEL IS REQUIRED FOR ACTIVITIES THAT INVOLVE CONTACT WITH CONTAMINATED SOILS.
17. EROSION AND SEDIMENT CONTROL IS REQUIRED AND WILL BE EMPLOYED AT ALL TIMES IN ACCORDANCE WITH THE SWPPP (STORMWATER POLLUTION PREVENTION PLAN) TO ACHIEVE BEST MANAGEMENT PRACTICES FOR STORM WATER MANAGEMENT AND SEDIMENT CONTROL, INCLUDING MATERIAL TRACKING.
18. CONTRACTOR SHALL DEVELOP AND ADHERE TO A SITE-SPECIFIC HAZARD ANALYSIS AND HEALTH AND SAFETY PLAN TO BE APPROVED BY WEYERHAEUSER AND THE ENGINEER.

PROJECT SPECIFIC NOTES

1. THE PROJECT SITE IS LOCATED APPROXIMATELY 2.7 MILES WEST OF THE TOWN OF EATONVILLE AND IS SURROUNDED BY THE NISQUALLY STATE PARK. SOIL AND WATER ENCOUNTERED DURING EXCAVATION MAY BE CONTAMINATED.
2. CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF ALL EXCESS EXCAVATED MATERIAL AS DIRECTED BY THE ENGINEER. CONTRACTOR SHALL COORDINATE DISPOSAL WITH TBD.
3. CONTRACTOR SHALL PROVIDE ACCESS CONTROL, TEMPORARY BARRIERS, DUST CONTROL, AND EROSION AND SEDIMENT BMPs AS NECESSARY TO PREVENT PUBLIC EXPOSURE TO EXCAVATED SOILS. THERE SHALL BE NO TRACKING OR MIGRATION OF SEDIMENT AWAY FROM THE CONSTRUCTION SITE.

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: N/A
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

GENERAL PLAN SET INFORMATION

SHEET:	G1
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	2 OF 24

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

ABBREVIATIONS

AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
ALTA-SE	ALTA SCIENCE & ENGINEERING
APPROX.	APPROXIMATE
BMPs	BEST MANAGEMENT PRACTICES
℄	CENTER LINE
DEG	DEGREE
Ø OR DIA.	DIAMETER
E	EASTING
EX.	EXISTING
ELEV.	ELEVATION
FT	FEET
GPS	GLOBAL POSITIONING SYSTEM
H	HORIZONTAL
IE	INVERT ELEVATION
LF	LINEAR FEET
MAX	MAXIMUM
MIN	MINUMUM
MUTCD	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
N	NORTHING
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM
NTS	NOT TO SCALE
NO.	NUMBER
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
±	PLUS OR MINUS
ROW	RIGHT-OF-WAY
STA	STATION
SPEC	SPECIFICATION
SWPPP	STORMWATER PREVENTION POLLUTION PLAN
TYP	TYPICAL
WSPS	WASHINGTON STATE PLANE SOUTH

LEGEND & SYMBOLS

SURVEY MARKER (MONS, CTRL)
TREE (APPROX. LOCATION)
PIEZOMETER/MONITORING WELL
POWER POLE
PROPERTY BOUNDARY
INFERRED WETLANDS
WASTE PRISM
WETLAND AREA WASTE REMOVAL
WETLAND INSTITUTIONAL CONTROL MONITORING AREA
WETLANDS
EXISTING WATER (FLOW PATH OR CHANNEL)
EXISTING LANDFILL AREA
EXISTING UNPAVED ROAD
EXISTING PAVED ROAD
EXISTING OVER-HEAD POWER
DESIGN SILT FENCE
DESIGN ROAD
DESIGN ROAD CENTERLINE

ROCK (SIZE/TYPE PER DETAIL)
SOIL
SOIL/HYDROSEED

CALL BEFORE YOU DIG
1-800-424-5555 or 811

1. THE LOCATION OF THE EXISTING UTILITIES SHOWN IN THIS DESIGN ARE APPROXIMATE. DESIGN MAY NOT INCLUDE ALL OF THE UTILITIES PRESENT AT THE SITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT ALL ABOVE-GRADE AND BELOW-GRADE UTILITIES.
2. THE CONTRACTOR SHALL SCHEDULE ALL INSPECTIONS REQUIRED BY THE UTILITY COMPANIES WHILE WORKING AROUND UTILITIES.

EMERGENCY CONTACT AND UTILITY INFORMATION

FIRE/EMS DEPARTMENT
129 Mashell Ave. N.
Eatonville, WA 98328
911 or (253) 847-4333

POLICE DEPARTMENT
201 Center Street West
Eatonville, WA 98328
911 or (360) 832-3361

SECTION AND DETAIL DESIGNATION

POINT AT WHICH SECTION OR DETAIL IS TAKEN

PAGE ON WHICH SECTION OR DETAIL IS SHOWN

1 / C1
NUMBER INDICATES DESIGNATION OF SECTION
INDICATES SHEET WHERE SECTION IS SHOWN. A DASH (-) INDICATES SECTION IS SHOWN ON SAME SHEET AS TAKEN

NUMBER INDICATES DESIGNATION OF SECTION
1 / - SECTION
SCALE

1 / -
NUMBER INDICATES DESIGNATION OF DETAIL
INDICATES SHEET WHERE DETAIL IS SHOWN. A DASH (-) INDICATES DETAIL IS SHOWN ON SAME SHEET AS TAKEN

NUMBER INDICATES DESIGNATION OF DETAIL
1 / - DETAIL
SCALE

NOT FOR CONSTRUCTION

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B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: N/A
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL
PIERCE COUNTY, WA

GENERAL PLAN SET INFORMATION

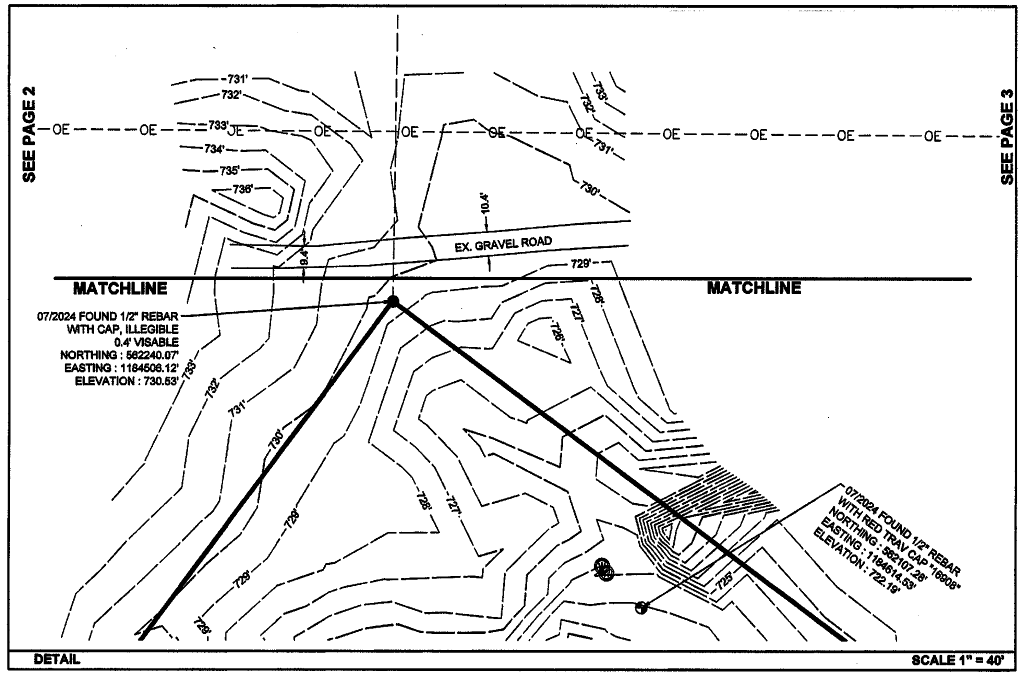
SHEET:	G2
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	3 OF 24

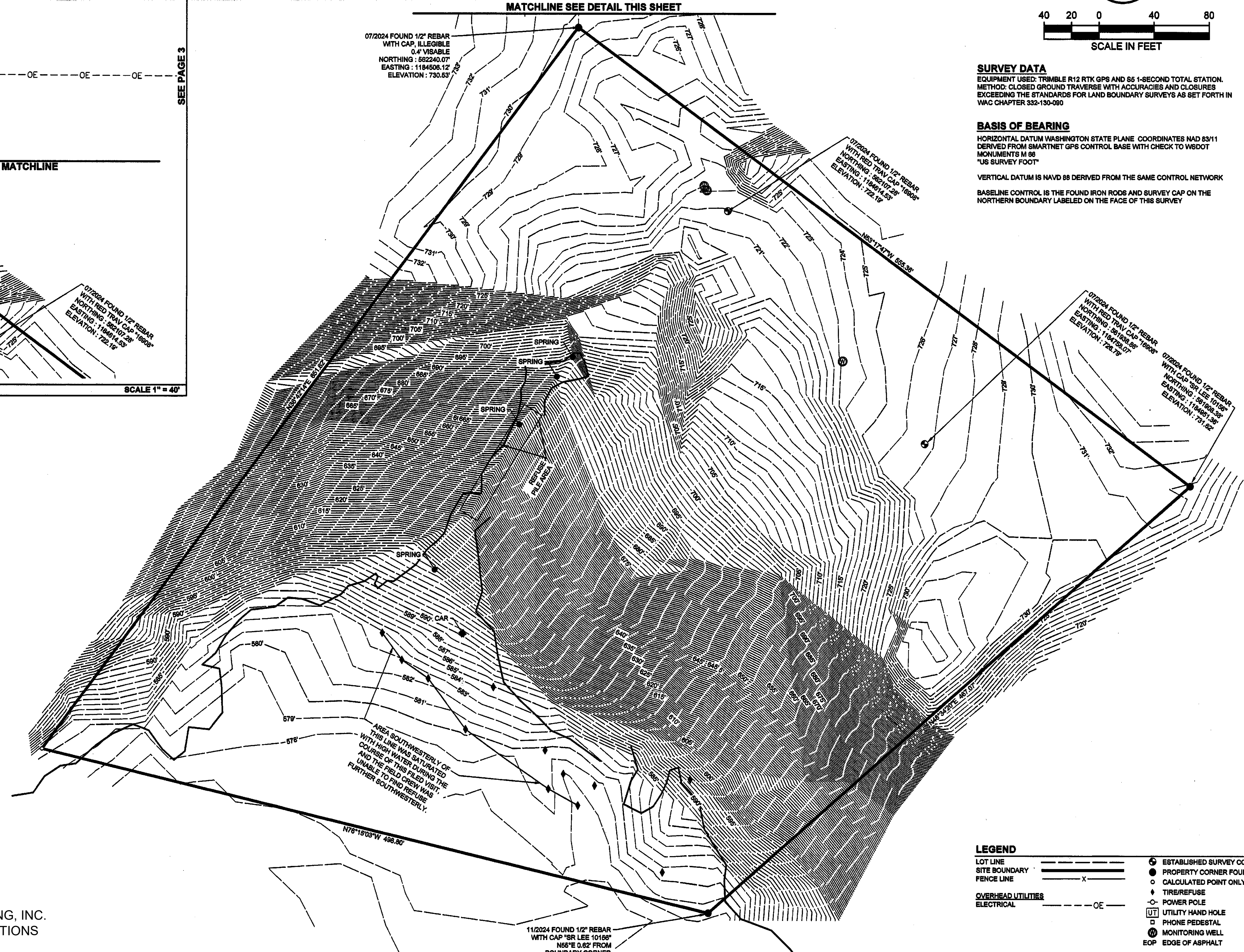
V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

PORTION OF THE NE 1/4 NE 1/4 & SE 1/4 NE, 1/4 SEC 20, T 16 N, R 4 E; W.M.

PIERCE COUNTY, WASHINGTON





40 20 0 40 80

SCALE IN FEET

SURVEY DATA

EQUIPMENT USED: TRIMBLE R12 RTK GPS AND S5 1-SECOND TOTAL STATION.
METHOD: CLOSED GROUND TRAVERSE WITH ACCURACIES AND CLOSURES EXCEEDING THE STANDARDS FOR LAND BOUNDARY SURVEYS AS SET FORTH IN WAC CHAPTER 332-130-090

BASIS OF BEARING

HORIZONTAL DATUM WASHINGTON STATE PLANE COORDINATES NAD 83/11 DERIVED FROM SMARTNET GPS CONTROL BASE WITH CHECK TO WSDOT MONUMENTS M 66
"US SURVEY FOOT"

VERTICAL DATUM IS NAVD 88 DERIVED FROM THE SAME CONTROL NETWORK

BASELINE CONTROL IS THE FOUND IRON RODS AND SURVEY CAP ON THE NORTHERN BOUNDARY LABELED ON THE FACE OF THIS SURVEY

SURVEYOR'S NOTES:

1.) FORESIGHT TIED THE TOP AND THE TOE OF THE STEEP SLOPE AREA IN AREA 4.

2.) FORESIGHT FOUND AN ERROR IN THE LEGAL DESCRIPTION COMPARED TO THE MONUMENTS IN THE FIELD SET BY SR. LEE, LS 10156. FOR THE PURPOSE OF THIS SURVEY THE PREVIOUS BOUNDARY IS SHOWN HERON, UNTIL A DECISION IS MADE FROM THE STAKEHOLDERS. THE LEGAL DESCRIPTION MAY NEED TO BE UPDATED TO THE AGREED AREA WHERE THE MARKERS ARE LOCATED, OR THE MARKERS SHOULD BE SET AT THE CORRECT LEGALLY DESCRIBED LOCATIONS. EITHER WAY A RECORD OF SURVEY WILL BE NECESSARY TO DOCUMENT THE TRUE LOCATION OF THE BOUNDARY.

JOHN W. GOODMAN
STATE OF WASHINGTON
54051
REGISTERED
PROFESSIONAL LAND SURVEYOR
12/31/24

NOTES:

1. SURVEY CONDUCTED BY FORESIGHT SURVEYING, INC. (12/31/2024 J. GOODMAN) FOR GSI WATER SOLUTIONS (DRAWING NO: 5455 GSI BASE)

LEGEND

LOT LINE	ESTABLISHED SURVEY CONTROL
SITE BOUNDARY	PROPERTY CORNER FOUND
FENCE LINE	CALCULATED POINT ONLY
	TIRE/REFUSE
OVERHEAD UTILITIES	POWER POLE
ELECTRICAL —OE—	UT UTILITY HAND HOLE
	PHONE PEDESTAL
	MONITORING WELL
	EOP EDGE OF ASPHALT

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: NTS
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

SURVEY (EXISTING CONDITIONS)

SHEET:	G3
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	4 OF 24

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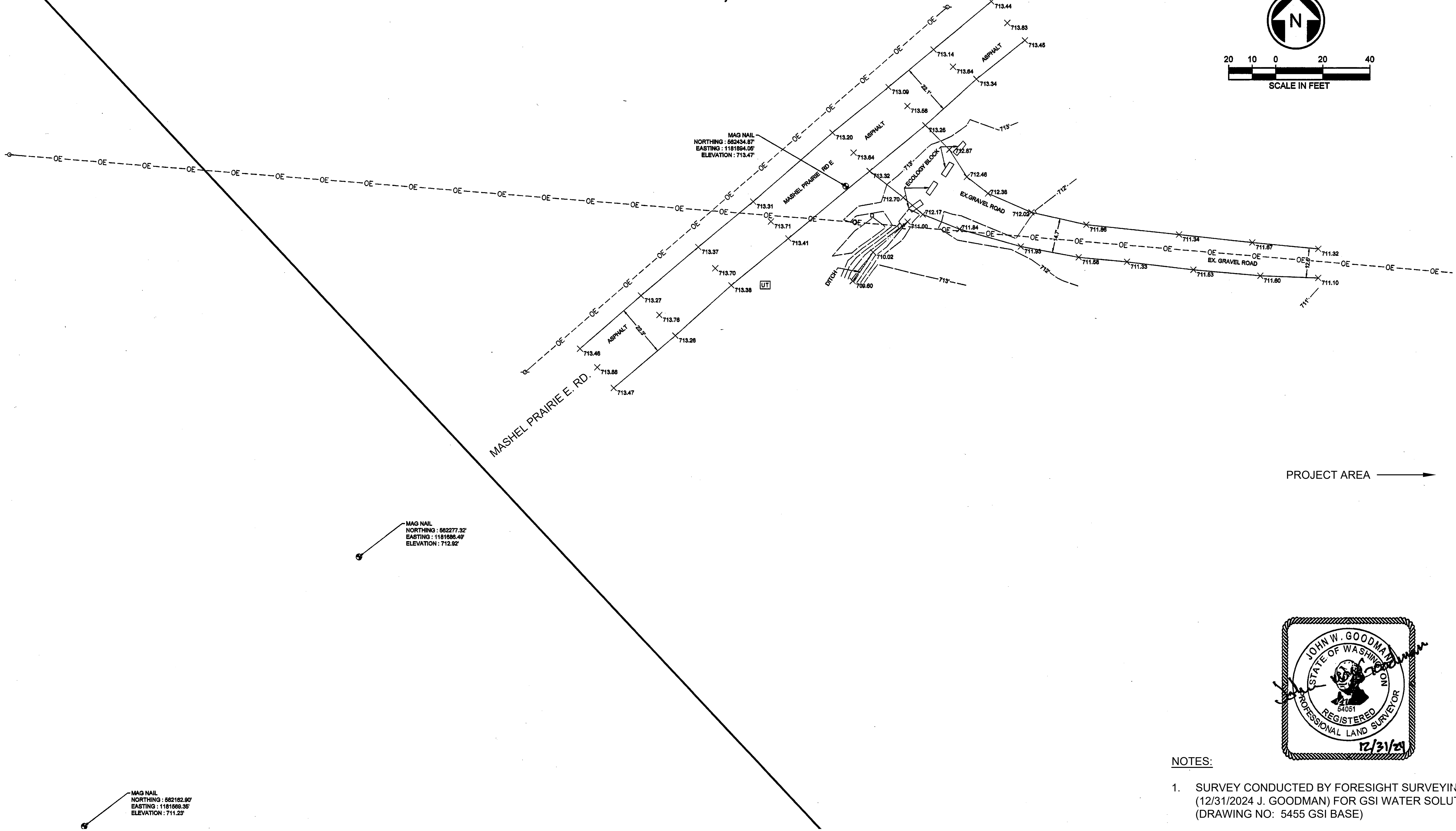
STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

PORTION OF THE NE 1/4 NE 1/4 & SE 1/4 NE 1/4, SEC 20, T 16 N, R 4 E; W.M.

PIERCE COUNTY, WASHINGTON



NOTES:

1. SURVEY CONDUCTED BY FORESIGHT SURVEYING, INC. (12/31/2024 J. GOODMAN) FOR GSI WATER SOLUTIONS (DRAWING NO: 5455 GSI BASE)

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: NTS
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

SURVEY (EXISTING CONDITIONS)

SHEET:	G4
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	5 OF 24

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

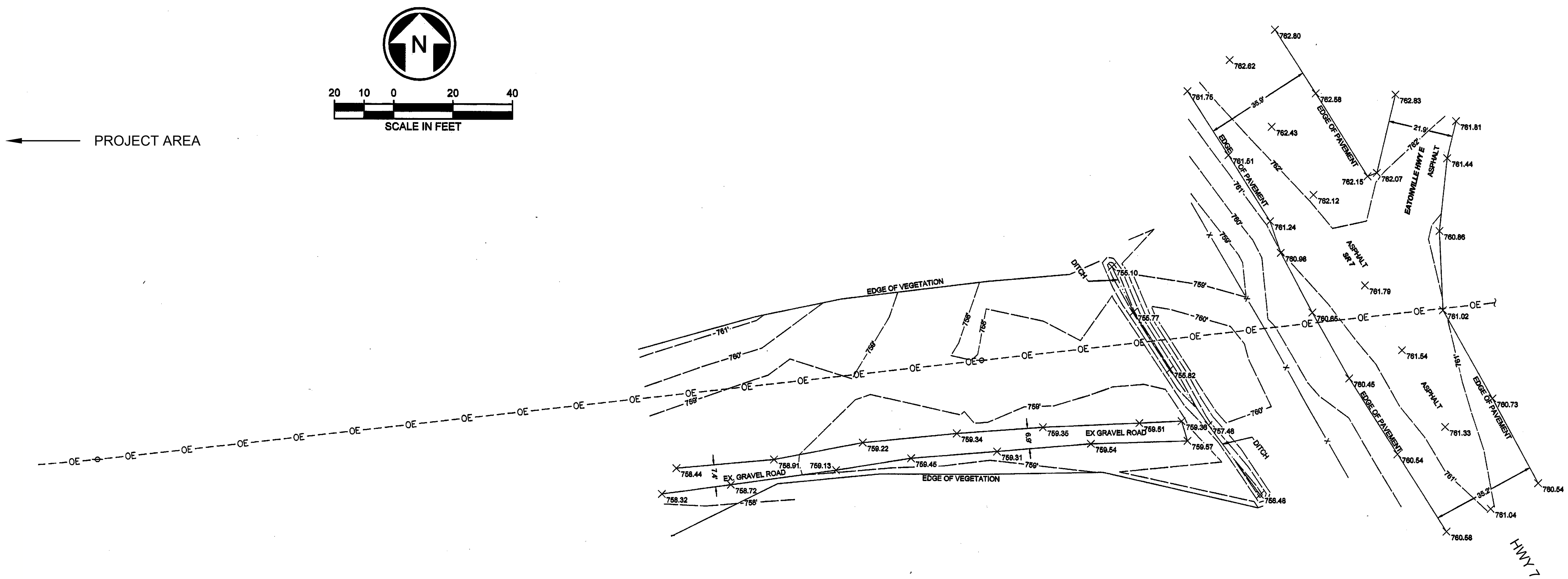
STATE PARK LAND USES FORMER CITY OF EATONVILLE LANDFILL TOPOGRAPHIC SURVEY

PORTION OF THE NE 1/4 NE 1/4 & SE 1/4 NE 1/4, SEC 20, T 16 N, R 4 E; W.M.

PIERCE COUNTY, WASHINGTON

#1119 MAG NAIL W/ FLASHER
AT THE N EDGE
EATONVILLE HWY E AND E EDGE SR7
NORTHING: 562763.92'
EASTING : 1187406.91'
ELEVATION : 764.51'

#1120 MAG NAIL W/ FLASHER
AT THE S AND E EDGE
EATONVILLE HWY E AT WYE INTN
NORTHING: 562715.11'
EASTING : 1187677.66'
ELEVATION : 764.80'



NOTES:

1. SURVEY CONDUCTED BY FORESIGHT SURVEYING, INC. (12/31/2024 J. GOODMAN) FOR GSI WATER SOLUTIONS (DRAWING NO: 5455 GSI BASE)

#1121 MAG NAIL W/ FLASHER
AT E EDGE SR7
NORTHING: 562384.86'
EASTING : 1187647.54'
ELEVATION : 758.50'

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: NTS
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

SURVEY
(EXISTING CONDITIONS)

SHEET:	G5
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	6 OF 24

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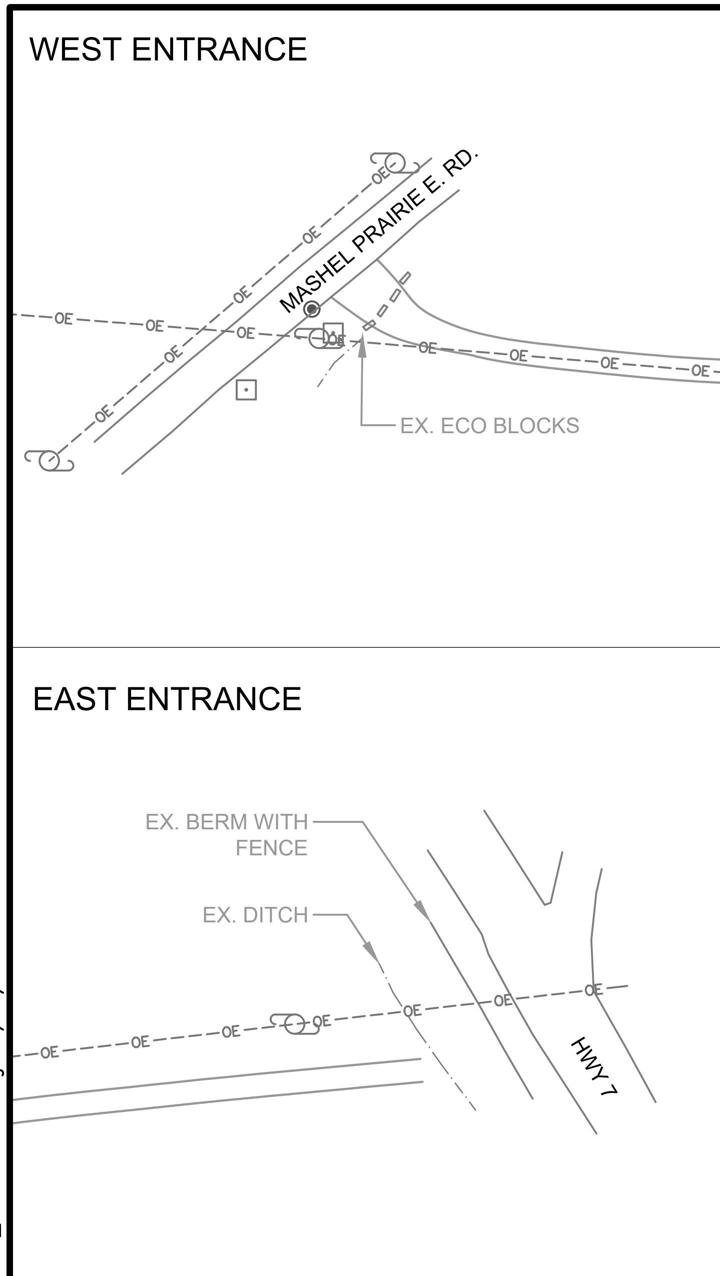
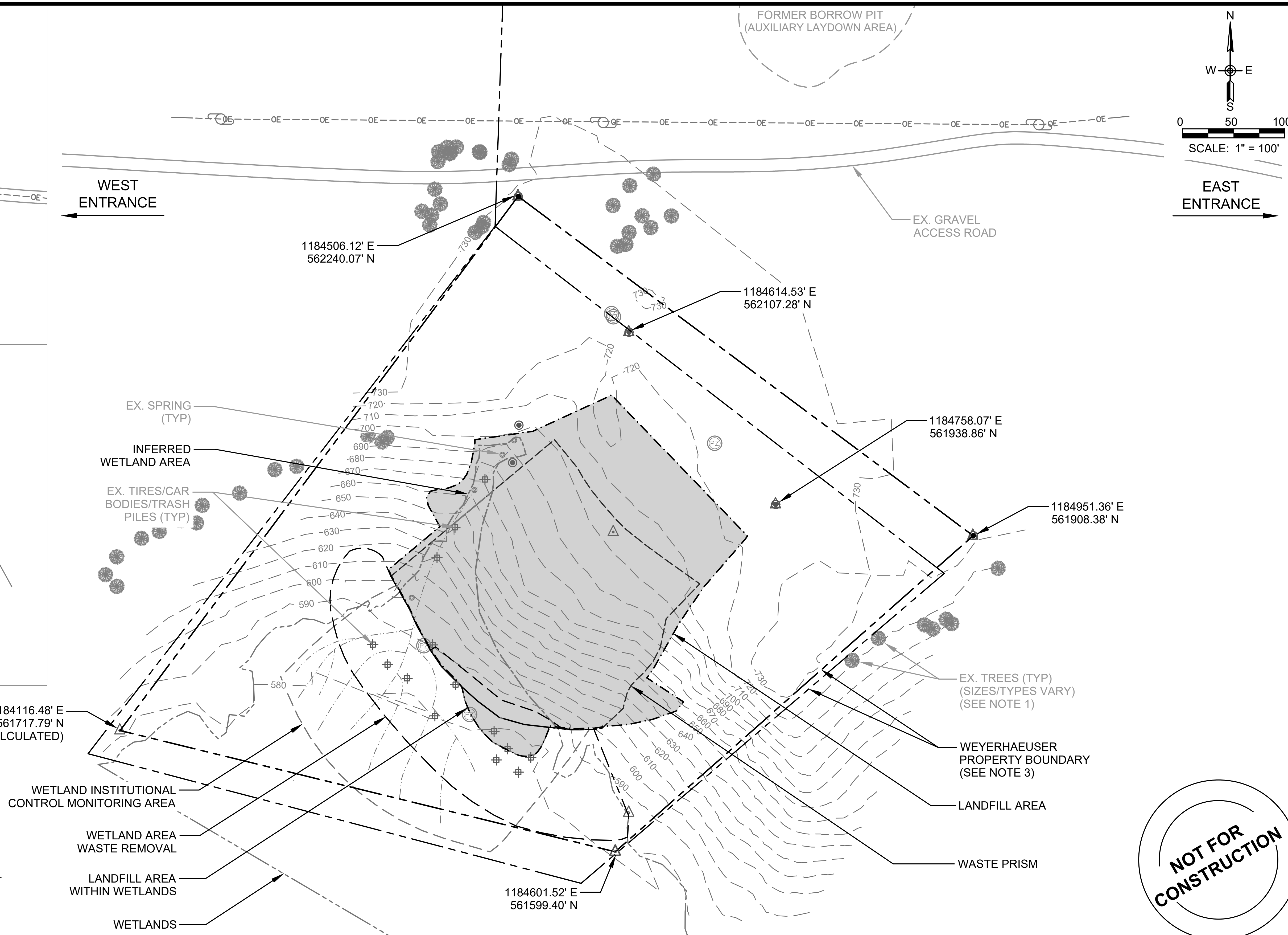




NOTES:

1. EXISTING TREES SHOWN ARE APPROXIMATELY LOCATED, AND DO NO INCLUDE ALL TREES ON NISQUALLY STATE PARK LANDS THAT MAY BE REMOVED FOR THE CLEANUP ACTION. LOCATIONS WERE MANUALLY DIGITIZED USING ROUGHLY GEO-REFERENCED FIGURES FROM OTHERS.
2. TREES ON THE WEYERHAEUSER PROPERTY HAVE NOT BEEN EVALUATED.
3. TWO VARYING PROPERTY BOUNDARIES ARE SHOWN. ONE IS BASED UPON USE OF "FIELD LOCATED" MONUMENTS AND THE OTHER IS BASED UPON THE LEGAL DESCRIPTION (1998 DEED). SEE NOTE 2 ON SHEET G3 FOR MORE INFORMATION.

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: 1" = 100'
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

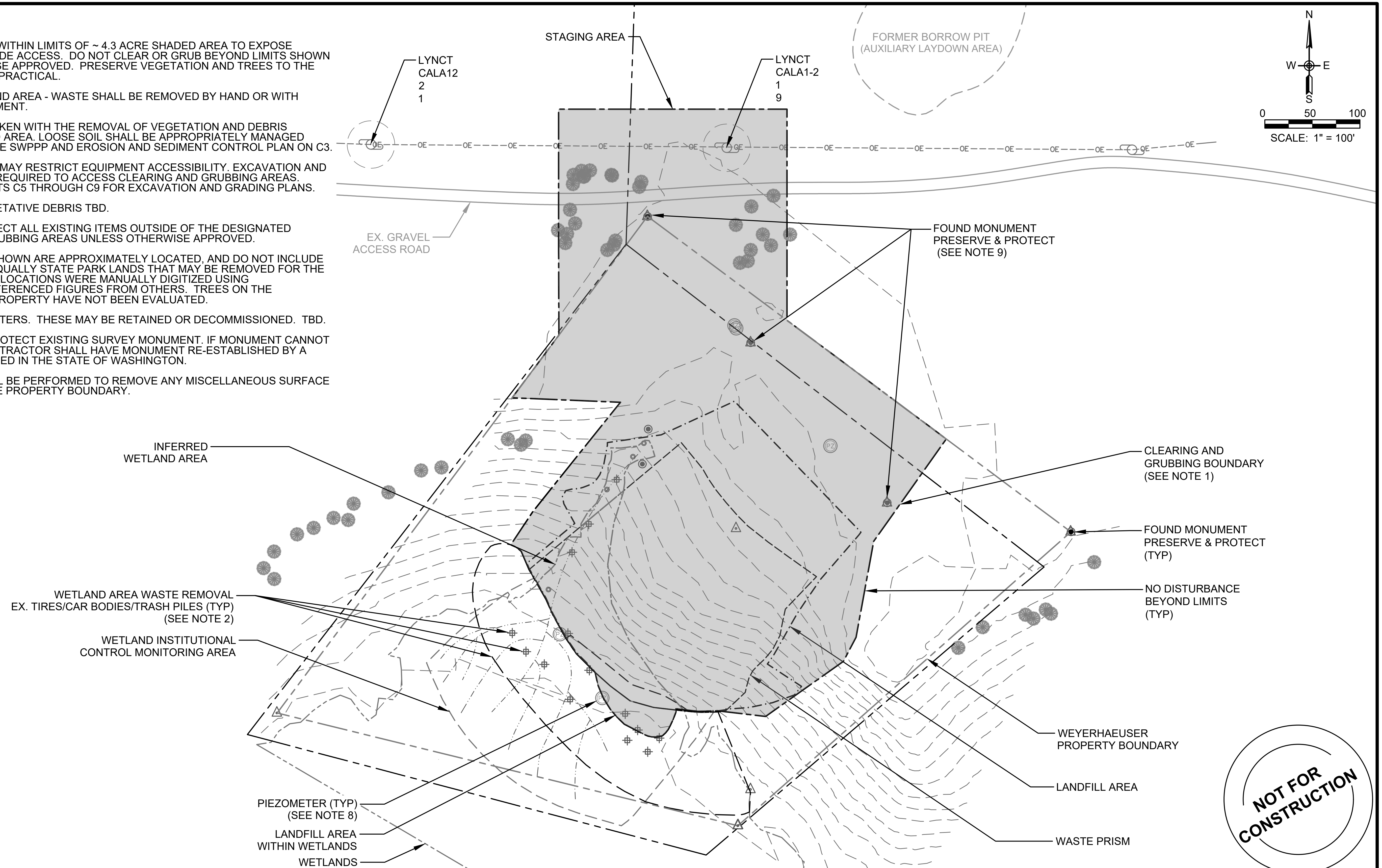
OVERVIEW EXISTING SITE

SHEET:	C1
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	7 OF 24

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

NOTES:

1. CLEAR AND GRUB WITHIN LIMITS OF ~ 4.3 ACRE SHADED AREA TO EXPOSE WASTE AND PROVIDE ACCESS. DO NOT CLEAR OR GRUB BEYOND LIMITS SHOWN UNLESS OTHERWISE APPROVED. PRESERVE VEGETATION AND TREES TO THE MAXIMUM EXTENT PRACTICAL.
2. SENSITIVE WETLAND AREA - WASTE SHALL BE REMOVED BY HAND OR WITH APPROVED EQUIPMENT.
3. CARE SHALL BE TAKEN WITH THE REMOVAL OF VEGETATION AND DEBRIS AROUND WETLAND AREA. LOOSE SOIL SHALL BE APPROPRIATELY MANAGED ACCORDING TO THE SWPPP AND EROSION AND SEDIMENT CONTROL PLAN ON C3.
4. EXISTING GRADES MAY RESTRICT EQUIPMENT ACCESSIBILITY. EXCAVATION AND GRADING MAY BE REQUIRED TO ACCESS CLEARING AND GRUBBING AREAS. REFERENCE SHEETS C5 THROUGH C9 FOR EXCAVATION AND GRADING PLANS.
5. DISPOSAL OF VEGETATIVE DEBRIS TBD.
6. RETAIN AND PROTECT ALL EXISTING ITEMS OUTSIDE OF THE DESIGNATED CLEARING AND GRUBBING AREAS UNLESS OTHERWISE APPROVED.
7. EXISTING TREES SHOWN ARE APPROXIMATELY LOCATED, AND DO NOT INCLUDE ALL TREES ON NISQUALLY STATE PARK LANDS THAT MAY BE REMOVED FOR THE CLEANUP ACTION. LOCATIONS WERE MANUALLY DIGITIZED USING ROUGHLY GEO-REFERENCED FIGURES FROM OTHERS. TREES ON THE WEYERHAEUSER PROPERTY HAVE NOT BEEN EVALUATED.
8. EXISTING PIEZOMETERS. THESE MAY BE RETAINED OR DECOMMISSIONED. TBD.
9. PRESERVE AND PROTECT EXISTING SURVEY MONUMENT. IF MONUMENT CANNOT BE RETAINED, CONTRACTOR SHALL HAVE MONUMENT RE-ESTABLISHED BY A SURVEYOR LICENSED IN THE STATE OF WASHINGTON.
10. A SITE WALK SHALL BE PERFORMED TO REMOVE ANY MISCELLANEOUS SURFACE WASTE WITHIN THE PROPERTY BOUNDARY.



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NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER:	B. ROLLINS	COORDINATE SYSTEM:	GROUND - WSPS 83 US FT
DESIGNER:	C. MACPHERSON	SCALE:	1" = 100'
CHECKED:	D. FORSETH	APPROVED:	D. FORSETH
DATE:	02/13/2025	DATE:	02/13/2025

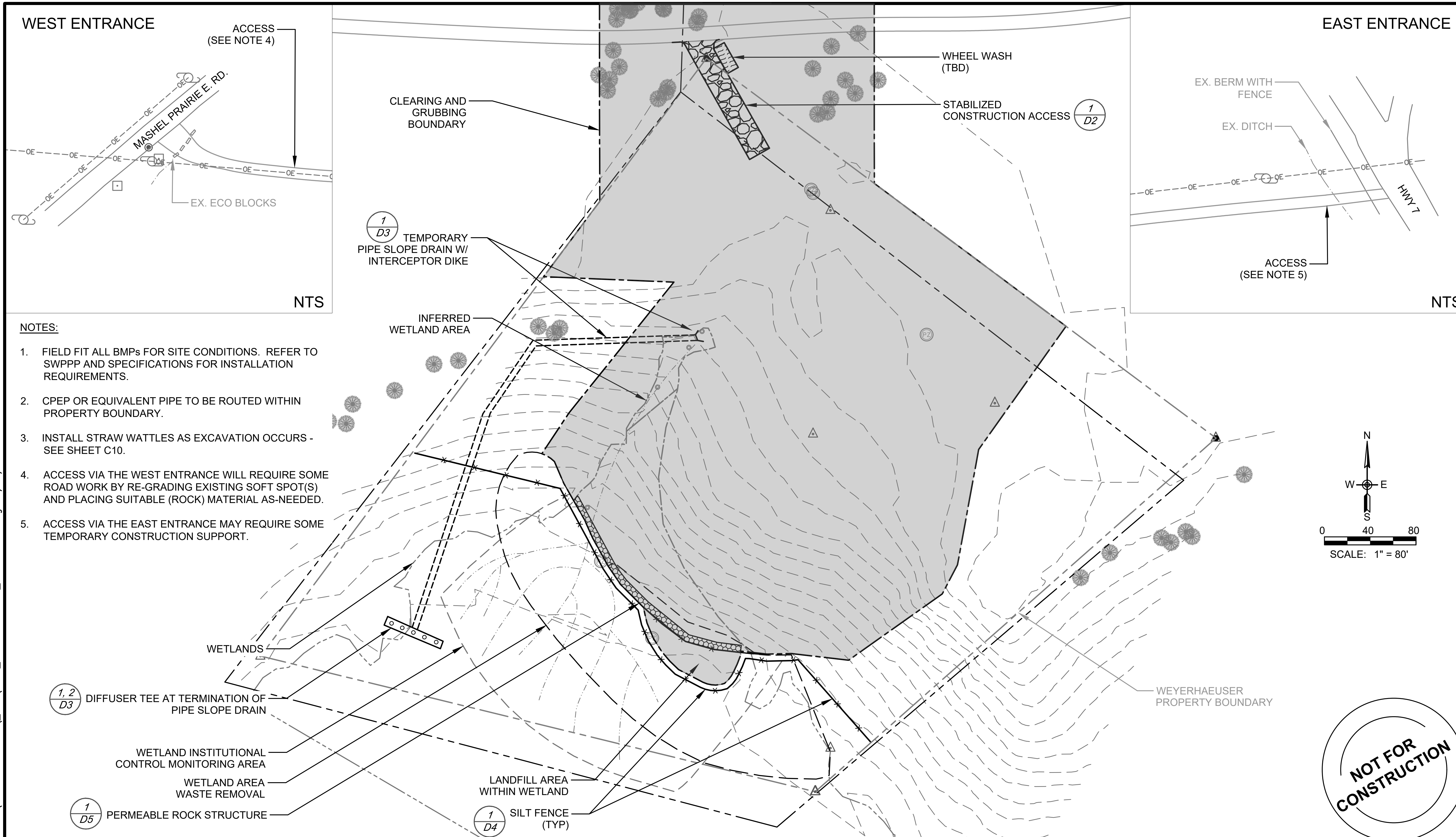
Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

CLEARING AND GRUBBING PLAN

SHEET:	C2
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	8 OF 24



NOTES:

1. FIELD FIT ALL BMPs FOR SITE CONDITIONS. REFER TO SWPPP AND SPECIFICATIONS FOR INSTALLATION REQUIREMENTS.
2. CPEP OR EQUIVALENT PIPE TO BE ROUTED WITHIN PROPERTY BOUNDARY.
3. INSTALL STRAW WATTLES AS EXCAVATION OCCURS - SEE SHEET C10.
4. ACCESS VIA THE WEST ENTRANCE WILL REQUIRE SOME ROAD WORK BY RE-GRADING EXISTING SOFT SPOT(S) AND PLACING SUITABLE (ROCK) MATERIAL AS-NEEDED.
5. ACCESS VIA THE EAST ENTRANCE MAY REQUIRE SOME TEMPORARY CONSTRUCTION SUPPORT.

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NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: 1" = 80'
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

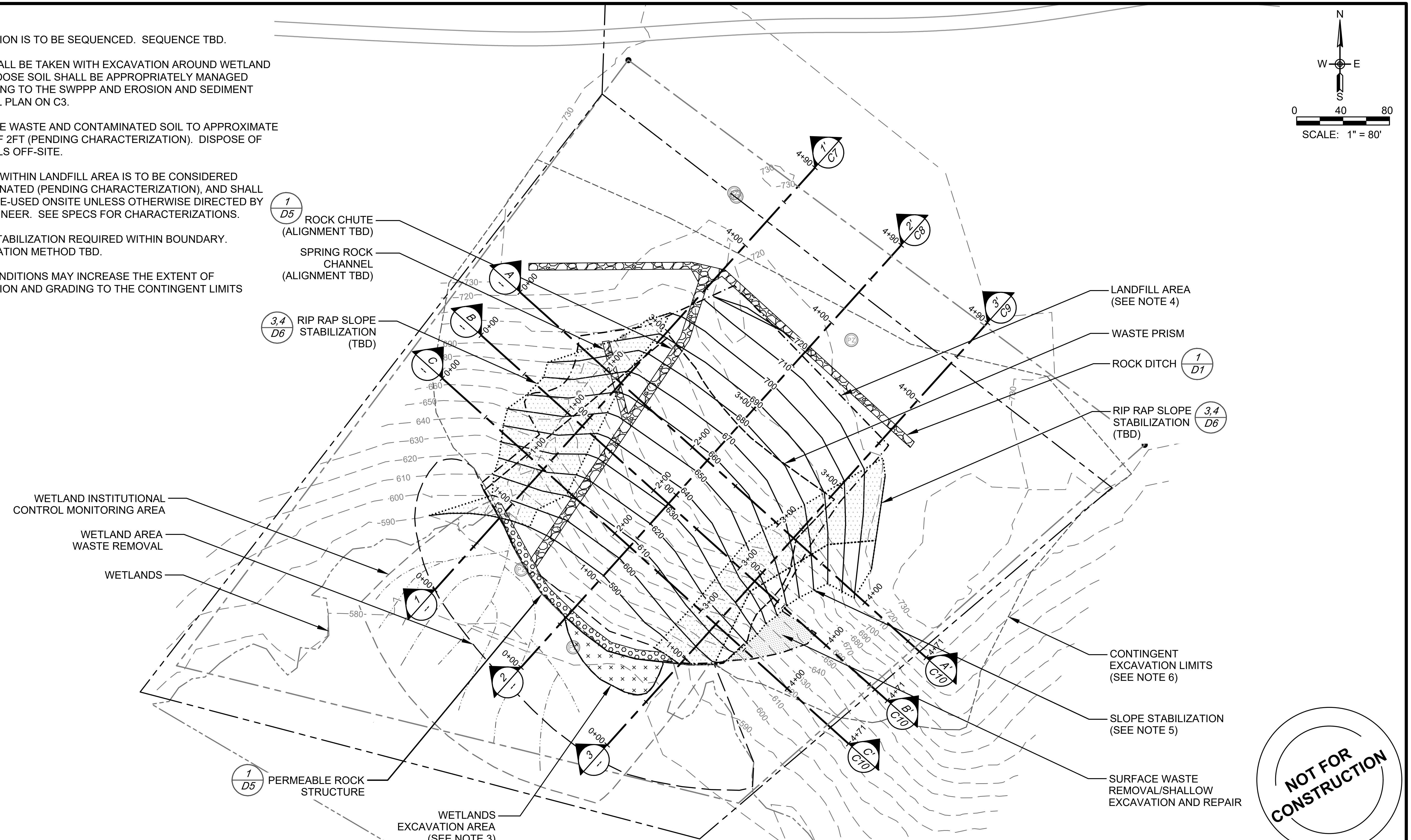
PIERCE COUNTY, WA

TEMPORARY EROSION & SEDIMENT CONTROL PLAN

SHEET: C3
DATE: 2/13/2025
PROJECT NO.: 24069.003
SHEET NO.: 9 OF 24

NOTES:

1. EXCAVATION IS TO BE SEQUENCED. SEQUENCE TBD.
2. CARE SHALL BE TAKEN WITH EXCAVATION AROUND WETLAND AREA. LOOSE SOIL SHALL BE APPROPRIATELY MANAGED ACCORDING TO THE SWPPP AND EROSION AND SEDIMENT CONTROL PLAN ON C3.
3. EXCAVATE WASTE AND CONTAMINATED SOIL TO APPROXIMATE DEPTH OF 2FT (PENDING CHARACTERIZATION). DISPOSE OF MATERIALS OFF-SITE.
4. ALL SOIL WITHIN LANDFILL AREA IS TO BE CONSIDERED CONTAMINATED (PENDING CHARACTERIZATION), AND SHALL NOT BE RE-USED ONSITE UNLESS OTHERWISE DIRECTED BY THE ENGINEER. SEE SPECS FOR CHARACTERIZATIONS.
5. SLOPE STABILIZATION REQUIRED WITHIN BOUNDARY. STABILIZATION METHOD TBD.
6. FIELD CONDITIONS MAY INCREASE THE EXTENT OF EXCAVATION AND GRADING TO THE CONTINGENT LIMITS SHOWN.



NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: 1" = 80'
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

EXCAVATION PLAN (TOPOGRAPHY)

SHEET:	C4
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	10 OF 24

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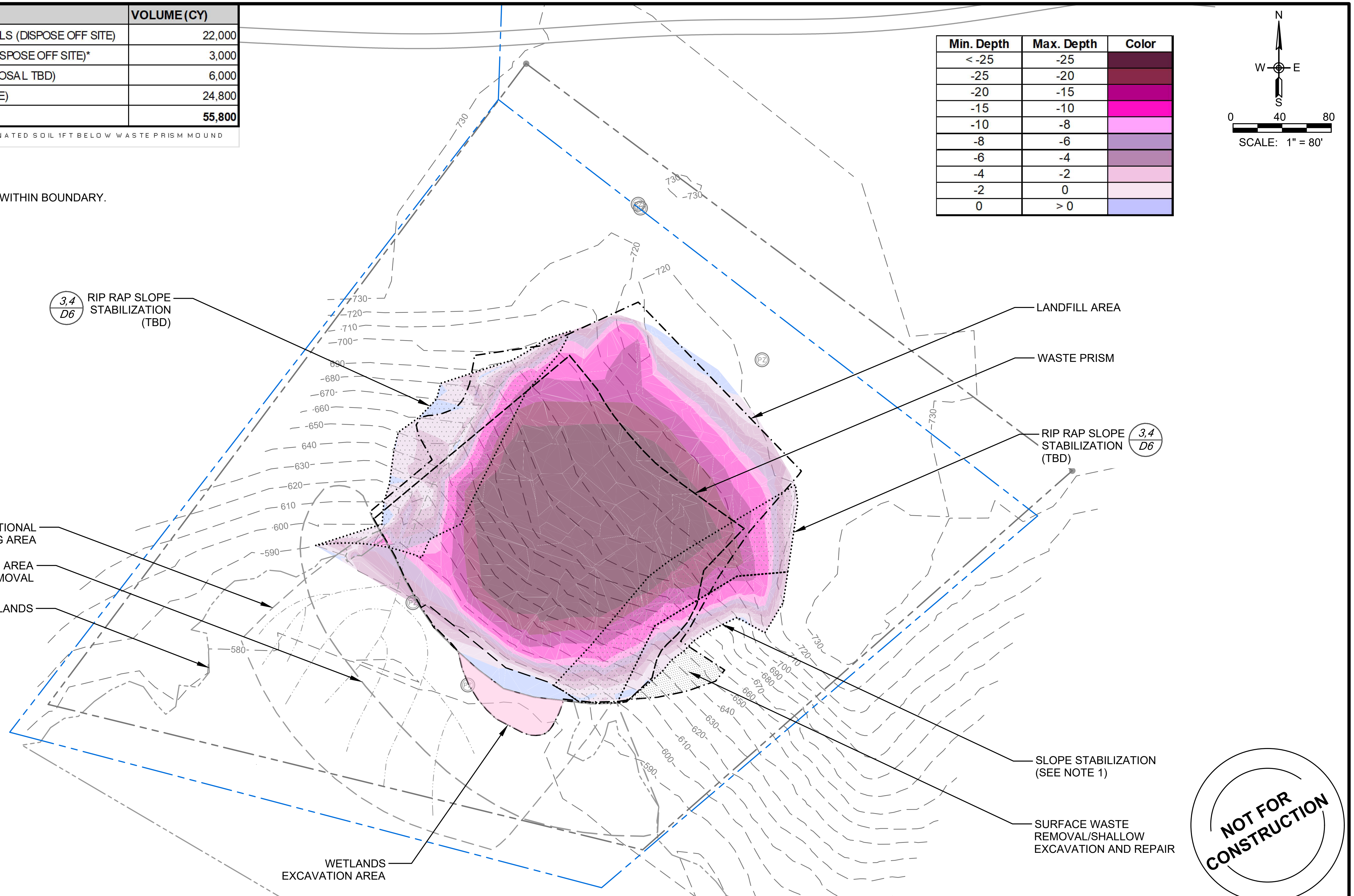
APPROXIMATE TOTAL VOLUME QTYs	VOLUME (CY)
WASTE PRISM WASTE/CONTAMINATED SOILS (DISPOSE OFF SITE)	22,000
LANDFILL WASTE/CONTAMINATED SOIL (DISPOSE OFF SITE)*	3,000
TOTAL UNSTABLE/UNSUITABLE SOIL (DISPOSAL TBD)	6,000
TOTAL NATIVE SOIL (REUSE/PLACE ON SITE)	24,800
TOTAL EXCAVATION	**55,800**

*INCLUDES VOLUME OF ASSUMED CONTAMINATED SOIL 1FT BELOW WASTE PRISM MOUND

NOTES:

1. SLOPE STABILIZATION REQUIRED WITHIN BOUNDARY. STABILIZATION METHOD TBD.

Min. Depth	Max. Depth	Color
< -25	-25	
-25	-20	
-20	-15	
-15	-10	
-10	-8	
-8	-6	
-6	-4	
-4	-2	
-2	0	
0	> 0	



NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS
DESIGNER: C. MACPHERSON
CHECKED: D. FORSETH
DATE: 02/13/2025

COORDINATE SYSTEM: GROUND - WSPS 83 US FT
SCALE: 1" = 80'
APPROVED: D. FORSETH
DATE: 02/13/2025

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EATONVILLE LANDFILL

PIERCE COUNTY, WA

EXCAVATION PLAN (DEPTH)

SHEET: C5
DATE: 2/13/2025
PROJECT NO.: 24069.003
SHEET NO.: 11 OF 24

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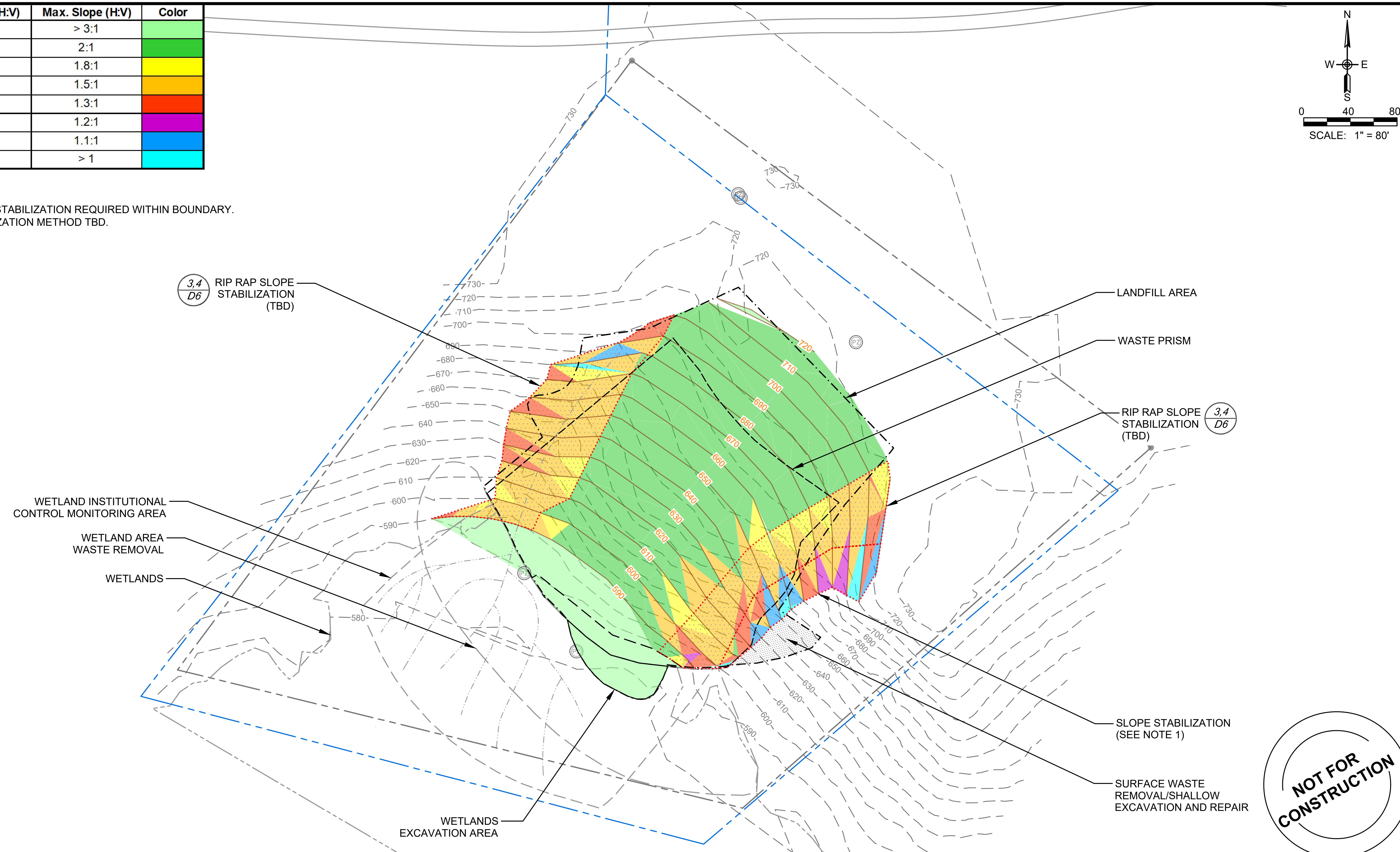
Min. Slope (H:V)	Max. Slope (H:V)	Color
0	> 3:1	
3:1	2:1	
2:1	1.8:1	
1.8:1	1.5:1	
1.5:1	1.3:1	
1.3:1	1.2:1	
1.2:1	1.1:1	
< 1.1:1	> 1	

NOTES:

1. SLOPE STABILIZATION REQUIRED WITHIN BOUNDARY. STABILIZATION METHOD TBD.



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NO.	DATE	REVISIONS	BY	CHK
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C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS
DESIGNER: C. MACPHERSON
CHECKED: D. FORSETH
DATE: 02/13/2025

COORDINATE SYSTEM: GROUND - WSPS 83 US FT
SCALE: 1" = 80'
APPROVED: D. FORSETH
DATE: 02/13/2025

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EATONVILLE LANDFILL
PIERCE COUNTY, WA

EXCAVATION PLAN (SLOPES)

SHEET: C6
DATE: 2/13/2025
PROJECT NO.: 24069.003
SHEET NO.: 12 OF 24

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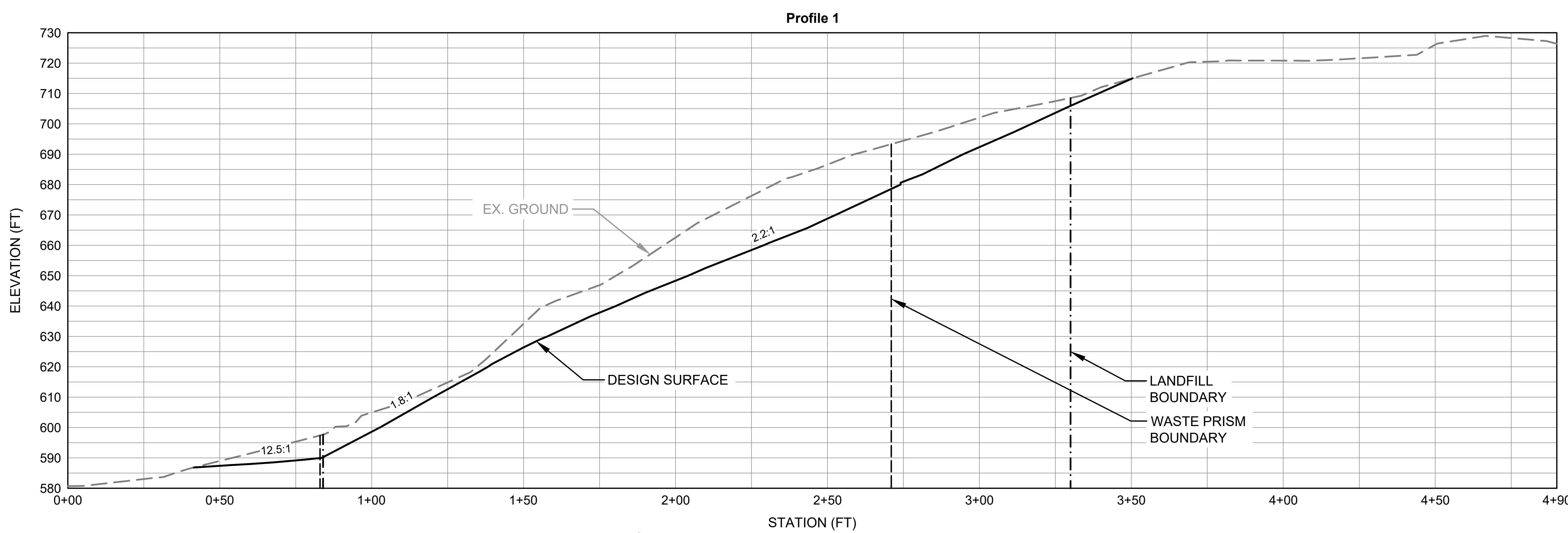
0 20 40
SCALE: 1" = 40'



1
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PROFILE VIEW
HORIZONTAL: 1" = 40'; VERTICAL: 1" = 40'

NOT FOR CONSTRUCTION

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

NO.	DATE	REVISIONS	BY	CHK
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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS
DESIGNER: C. MACPHERSON
CHECKED: D. FORSETH
DATE: 02/13/2025

COORDINATE SYSTEM: GROUND - WSPS 83 US FT
SCALE: 1" = 40'
APPROVED: D. FORSETH
DATE: 02/13/2025

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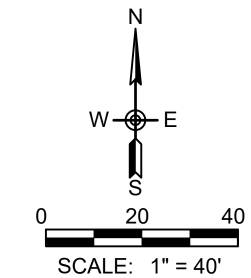
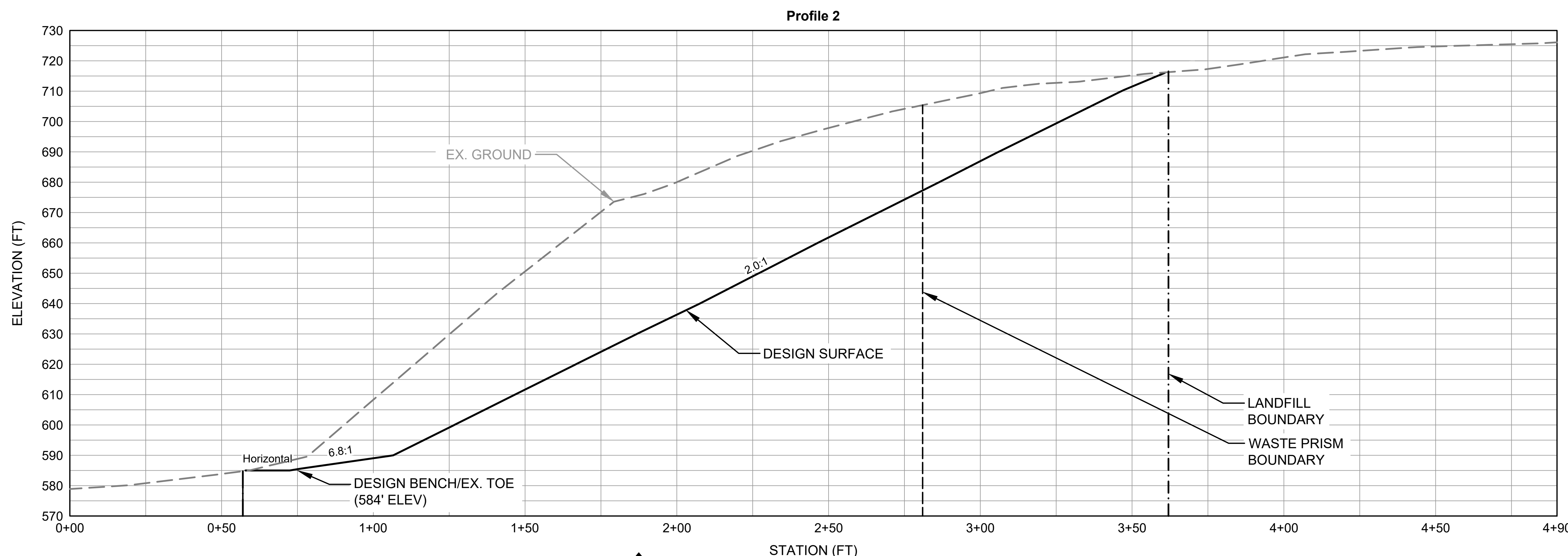
EATONVILLE LANDFILL
PIERCE COUNTY, WA

PROFILE VIEW

SHEET: C7
DATE: 2/13/2025
PROJECT NO.: 24069.003
SHEET NO.: 13 OF 24





2
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PROFILE VIEW

HORIZONTAL: 1" = 40'; VERTICAL: 1" = 40'

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
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C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: 1" = 40'
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

PROFILE VIEW

SHEET: C8

DATE: 2/13/2025

PROJECT NO.: 24069.003

SHEET NO.: 14 OF 24

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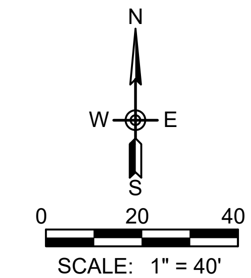

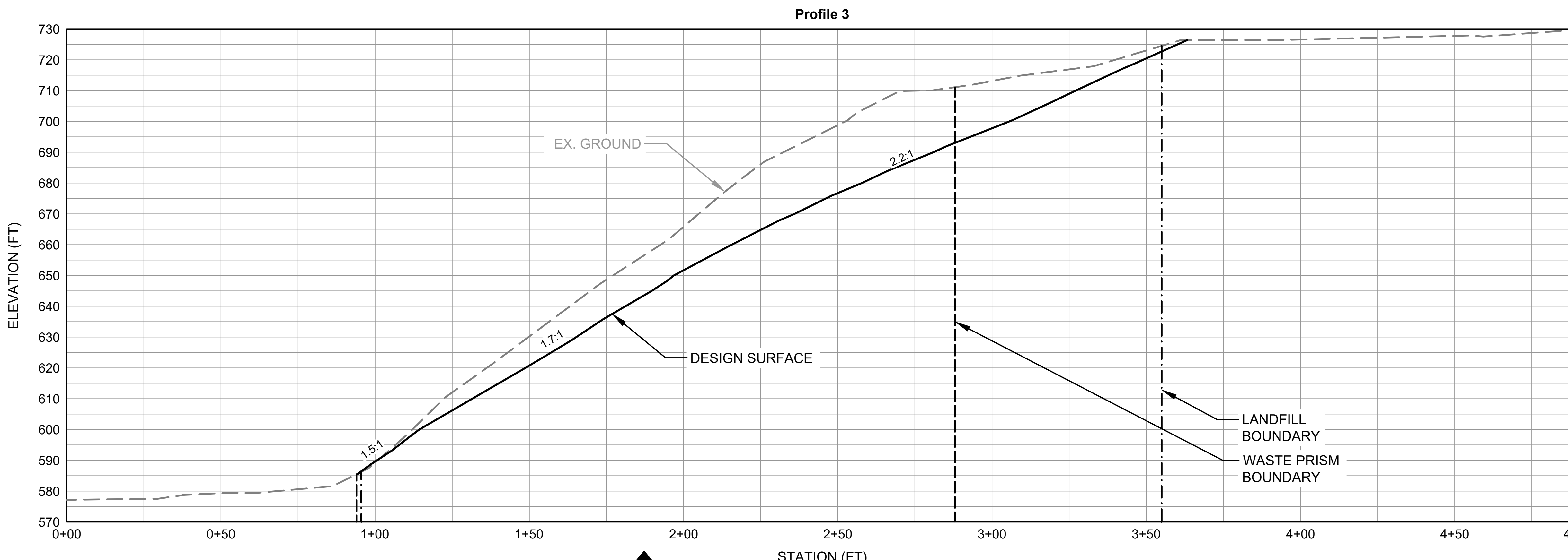

3
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PROFILE VIEW

HORIZONTAL: 1" = 40'; VERTICAL: 1" = 40'

NOT FOR CONSTRUCTION

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: 1" = 40'
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

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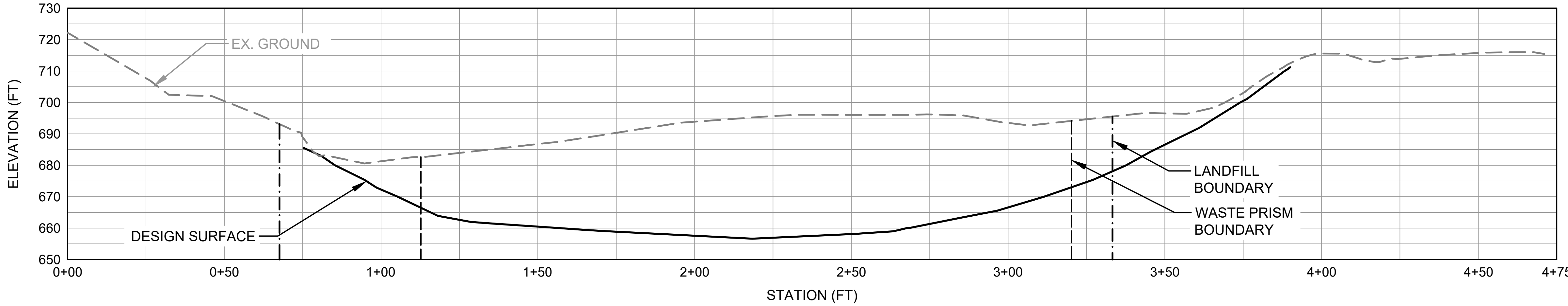
EATONVILLE LANDFILL

PIERCE COUNTY, WA

PROFILE VIEW

SHEET:	C9
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	15 OF 24

Section A



A
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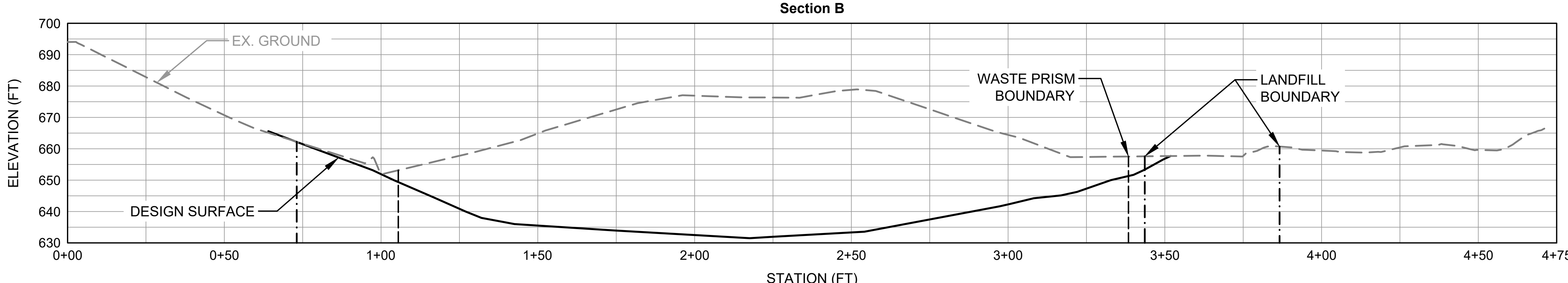
PROFILE VIEW
HORIZONTAL: 1" = 40'; VERTICAL: 1" = 40'

Section B



B
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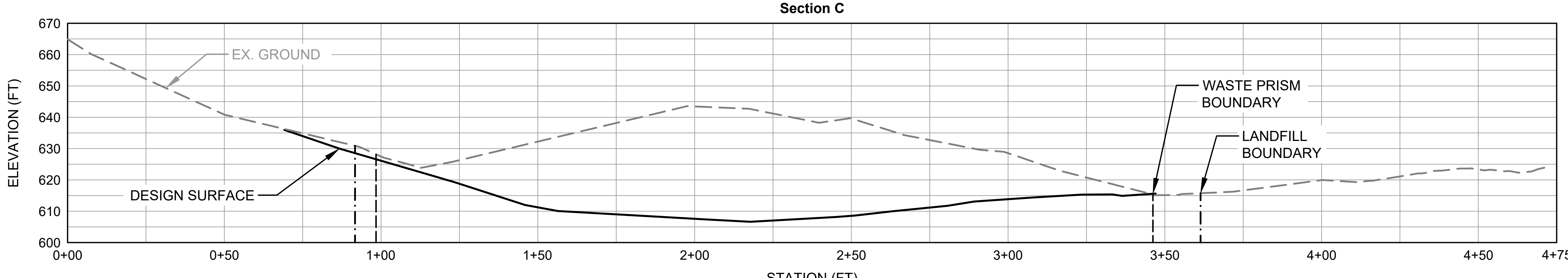
PROFILE VIEW
HORIZONTAL: 1" = 40'; VERTICAL: 1" = 40'

Section C



C
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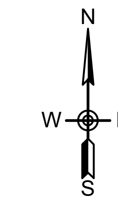
PROFILE VIEW
HORIZONTAL: 1" = 40'; VERTICAL: 1" = 40'



0 20 40
SCALE: 1" = 40'

NOT FOR CONSTRUCTION

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

NO.	DATE	REVISIONS	BY	CHK
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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: 1" = 40'
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

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EATONVILLE LANDFILL

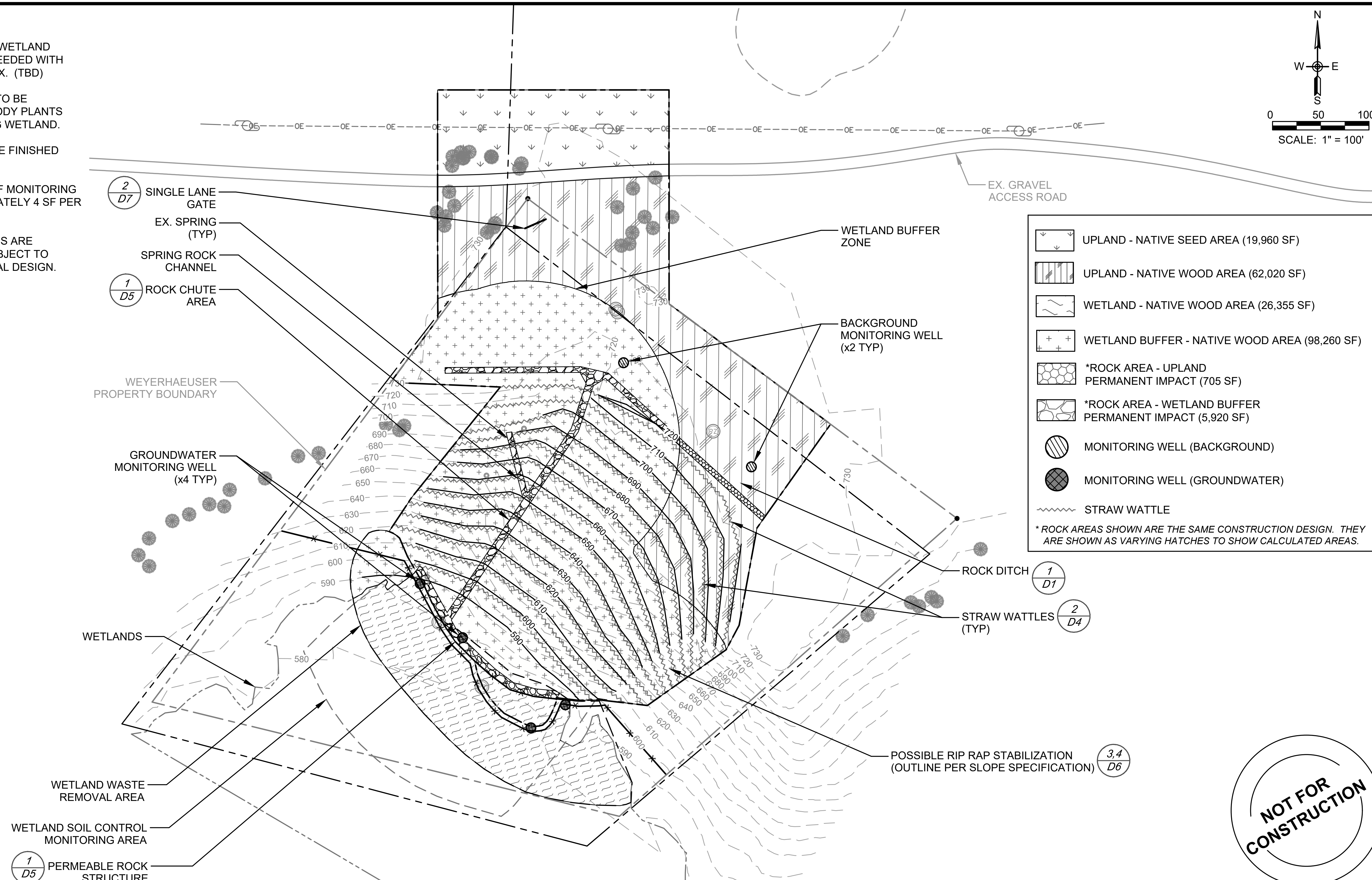
PIERCE COUNTY, WA

SECTION VIEW

SHEET: C10
DATE: 2/13/2025
PROJECT NO.: 24069.003
SHEET NO.: 16 OF 24

NOTES:

1. ACCESS ROAD WITHIN WETLAND BUFFER ZONE TO BE SEEDED WITH NATIVE PLANT SEED MIX. (TBD)
2. DISTURBED WETLAND TO BE RE-PLANTED WITH WOODY PLANTS NATIVE TO THE EXITING WETLAND.
3. CONTOURS SHOWN ARE FINISHED GROUND.
4. PERMANENT IMPACT OF MONITORING WELLS ARE APPROXIMATELY 4 SF PER EACH.
5. LOCATION OF FEATURES ARE APPROXIMATE AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.



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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: 1" = 100'
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

SITE RESTORATION & STABILIZATION PLAN

SHEET:	C11
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	17 OF 24

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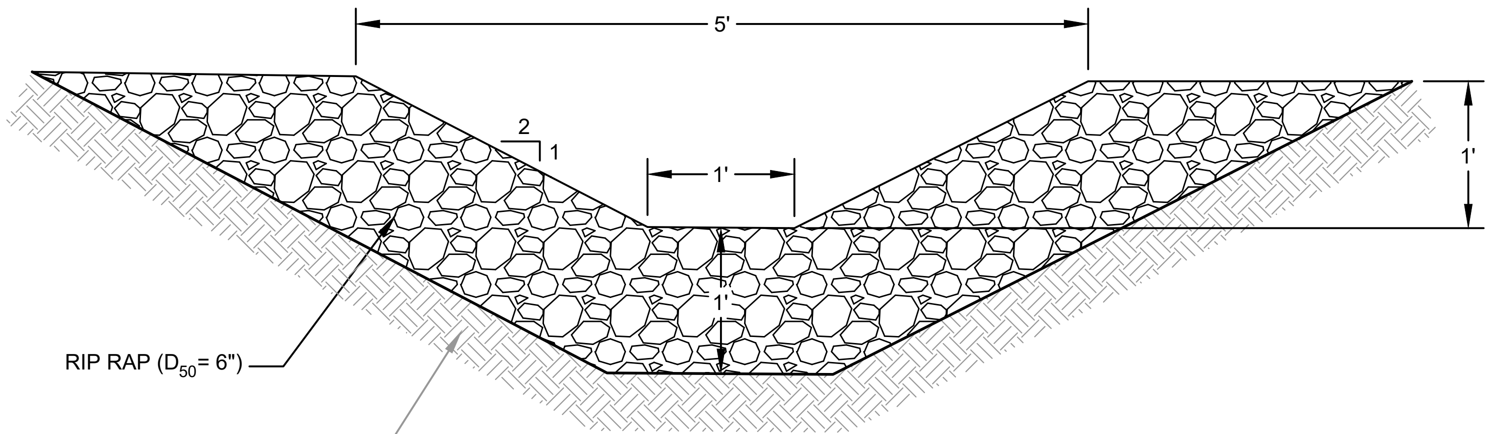


TYPICAL SECTION

1 / - ROCK DITCH SECTION
NTS

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: AS NOTED
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta
Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

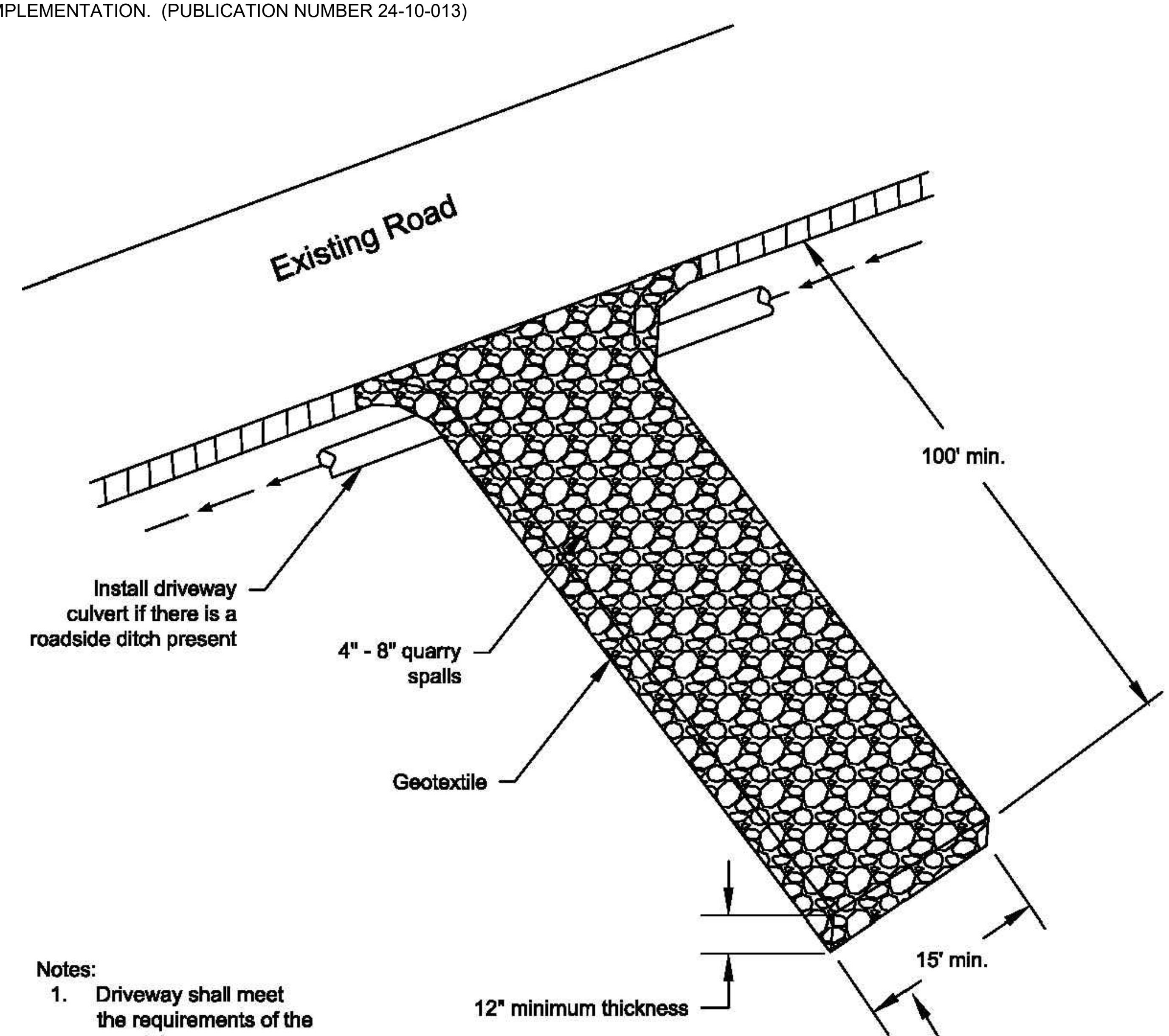
DETAILS

SHEET:	D1
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	18 OF 24

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

DETAIL IS SOURCED FROM THE 2024 STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON (VOLUME II, SECTION 4). THIS MANUAL AND THE ACCOMPANYING SWPPP SHALL BE USED FOR IMPLEMENTATION. (PUBLICATION NUMBER 24-10-013)

NOT TO SCALE



Notes:

1. Driveway shall meet the requirements of the permitting agency.
2. It is recommended that the access be crowned so that runoff drains off the pad.

1 / - STABILIZED CONSTRUCTION ACCESS
NTS

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
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D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS
DESIGNER: C. MACPHERSON
CHECKED: D. FORSETH
DATE: 02/13/2025

COORDINATE SYSTEM: GROUND - WSPS 83 US FT
SCALE: AS NOTED
APPROVED: D. FORSETH
DATE: 02/13/2025

Alta Science & Engineering, Inc.

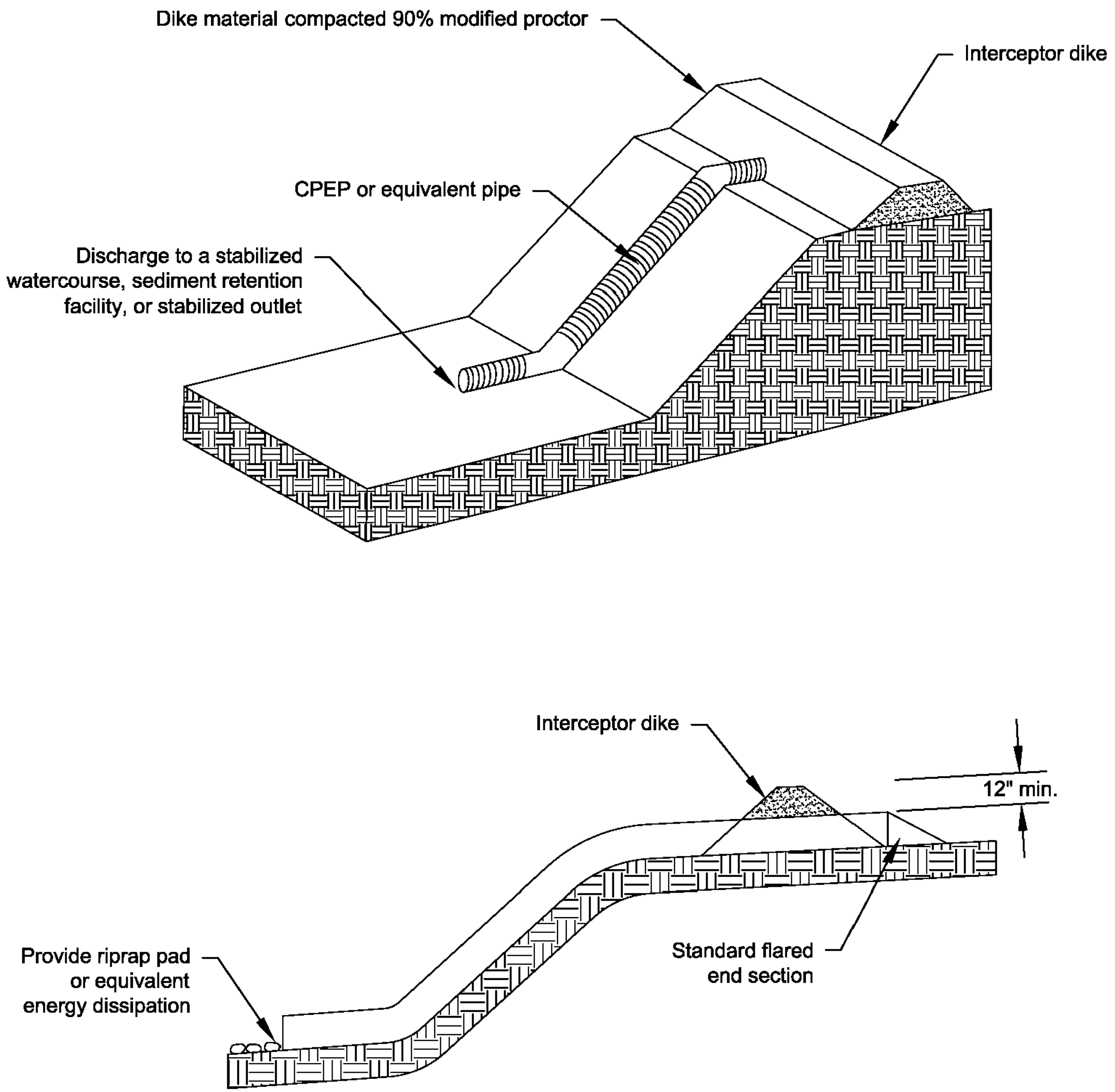
EATONVILLE LANDFILL
PIERCE COUNTY, WA

DETAILS

SHEET: D2
DATE: 2/13/2025
PROJECT NO.: 24069.003
SHEET NO.: 19 OF 24

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

DETAIL IS SOURCED FROM THE 2024 STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON (VOLUME II, SECTION 4). THIS MANUAL AND THE ACCOMPANYING SWPPP SHALL BE USED FOR IMPLEMENTATION. (PUBLICATION NUMBER 24-10-013)

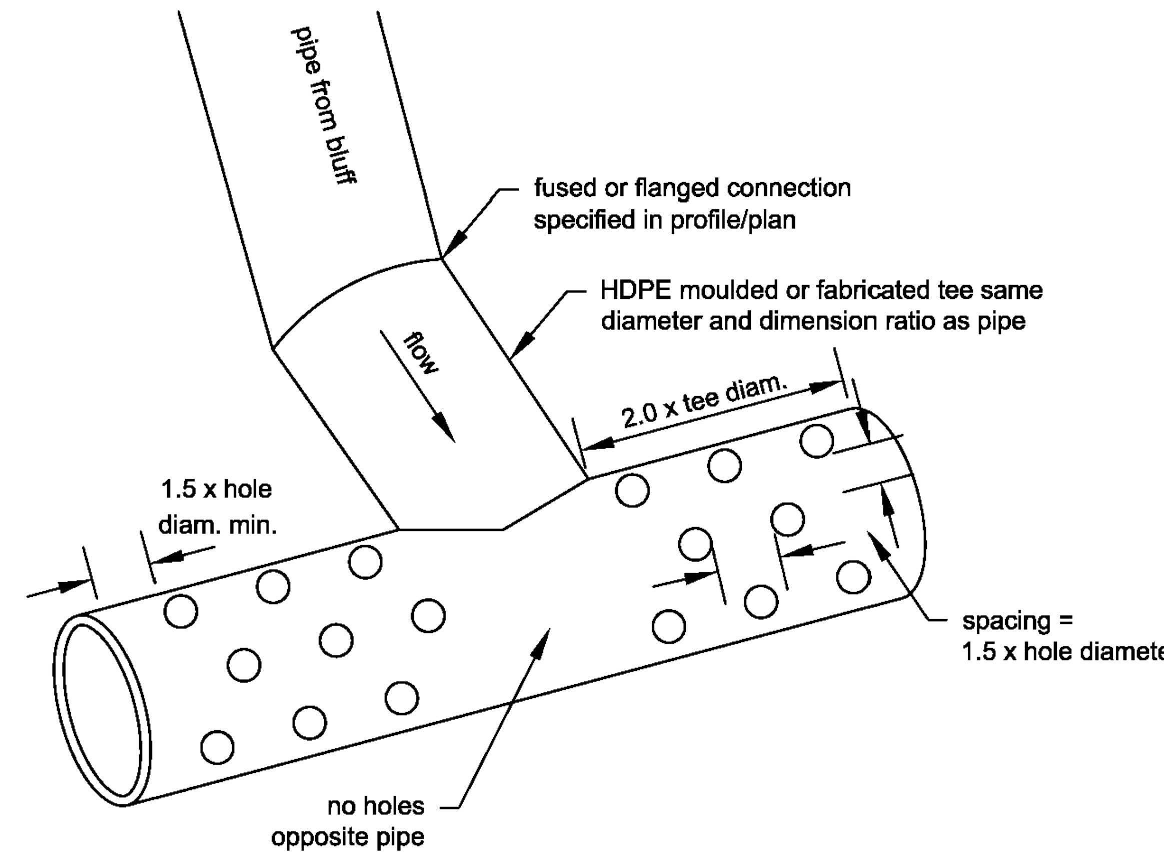


Notes:

1. Inlet and all sections must be securely fastened together with gasketed watertight fittings

1 / - PIPE SLOPE DRAIN
NTS

DETAIL IS SOURCED FROM THE 2024 STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON (VOLUME II, SECTION 4). THIS MANUAL AND THE ACCOMPANYING SWPPP SHALL BE USED FOR IMPLEMENTATION. (PUBLICATION NUMBER 24-10-013)



Drill holes in front half of tee only.
Hole diameter (inches) = tee diameter (inches) divided by 6
(ex. 6 inch tee = 1 inch holes
18 inch tee = 3 inch holes)

2 / - DIFFUSER TEE
NTS

NOT FOR CONSTRUCTION

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: AS NOTED
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

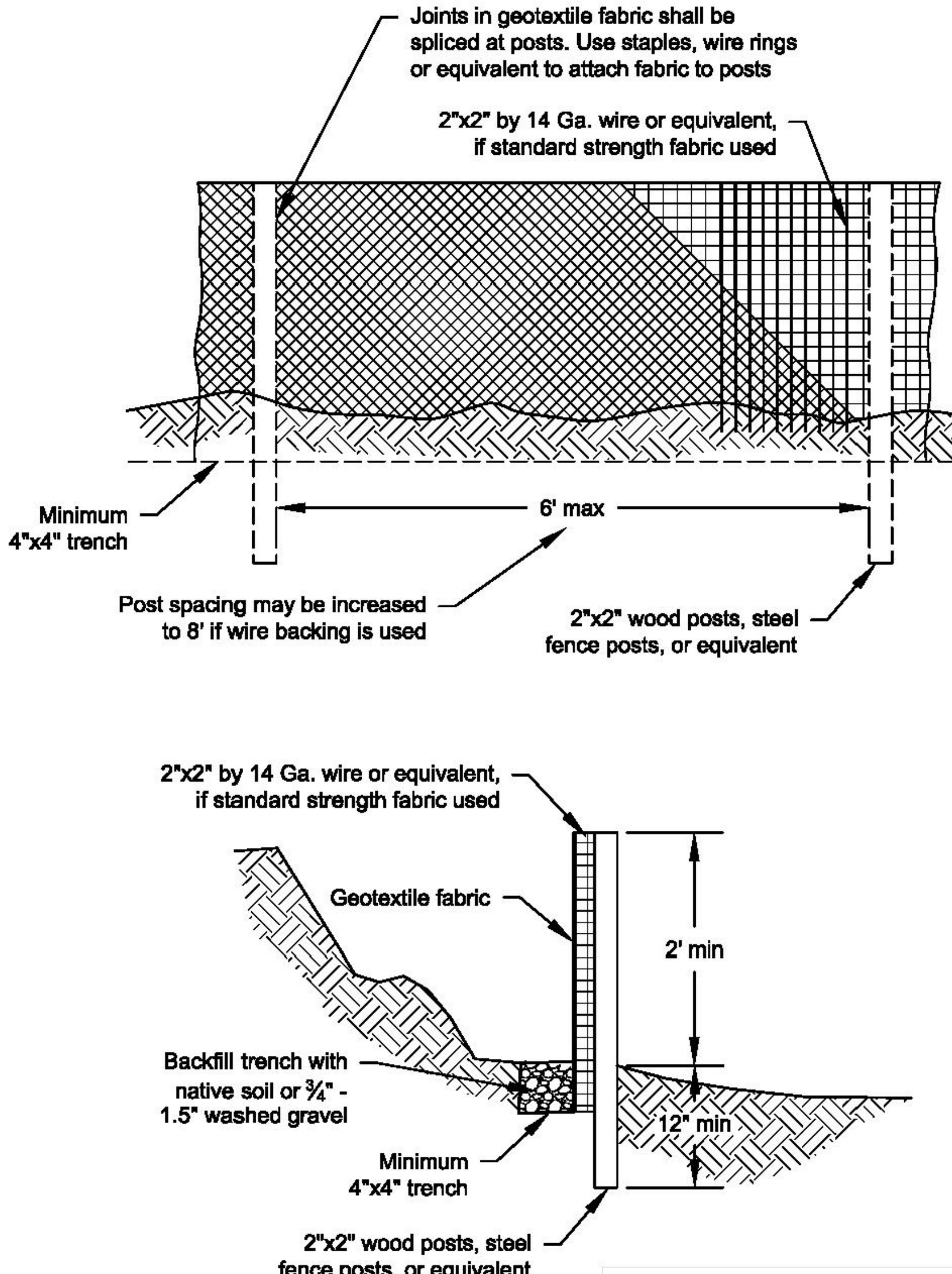
EATONVILLE LANDFILL

PIERCE COUNTY, WA

DETAILS

SHEET:	D3
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	20 OF 24

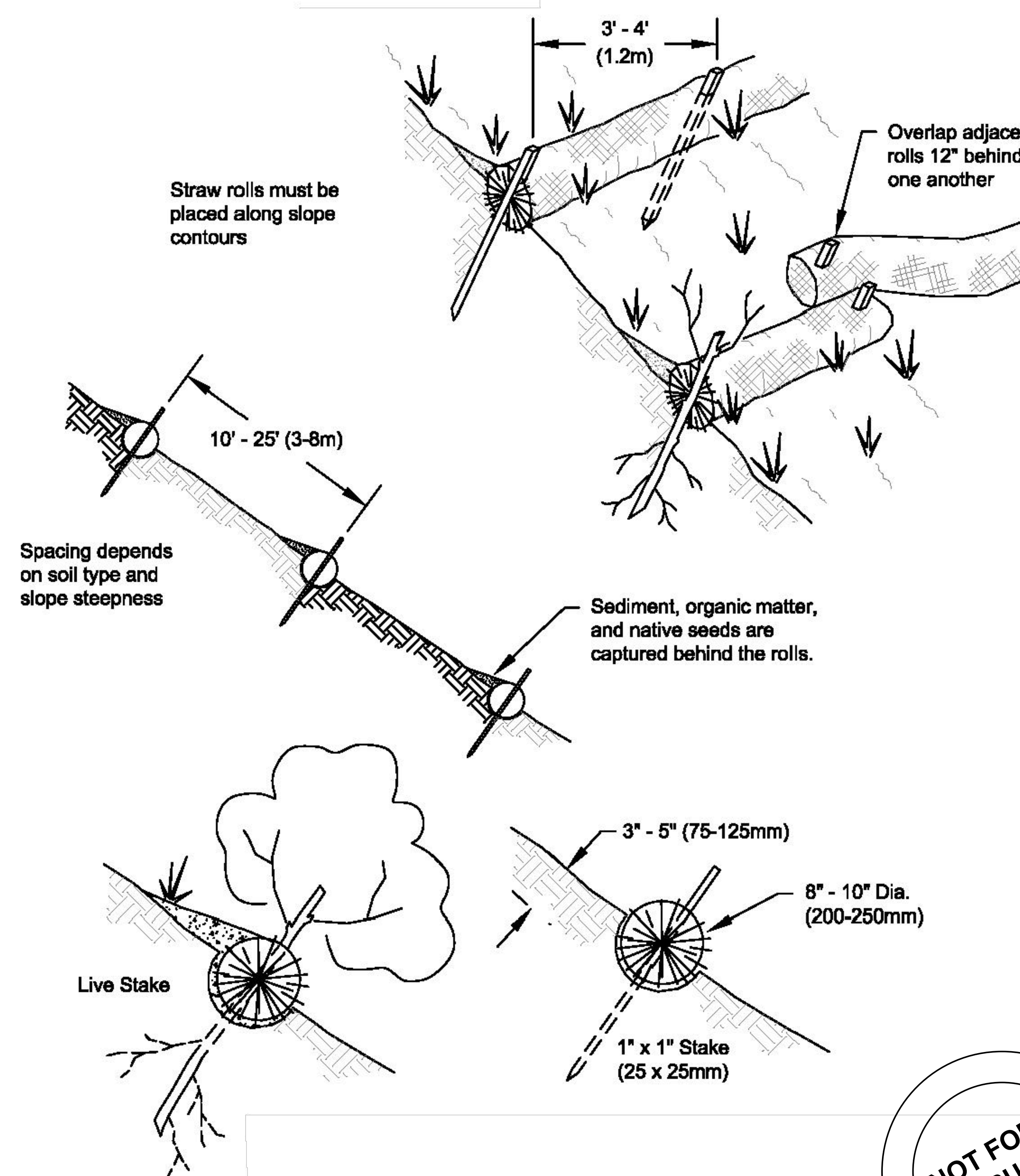
DETAIL IS SOURCED FROM THE 2024 STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON (VOLUME II, SECTION 4). THIS MANUAL AND THE ACCOMPANYING SWPPP SHALL BE USED FOR IMPLEMENTATION. (PUBLICATION NUMBER 24-10-013)



1 / - SILT FENCE
NTS

NOTE:

1. Straw roll installation requires the placement and secure staking of the roll in a trench, 3" - 5" (75-125mm) deep, dug on contour. Runoff must not be allowed to run under or around roll.



DETAIL IS SOURCED FROM THE 2024 STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON (VOLUME II, SECTION 4). THIS MANUAL AND THE ACCOMPANYING SWPPP SHALL BE USED FOR IMPLEMENTATION. (PUBLICATION NUMBER 24-10-013)

2 / - STRAW WATTLE
NTS

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
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DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: AS NOTED
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta
Science & Engineering, Inc.

EATONVILLE LANDFILL

PIERCE COUNTY, WA

DETAILS

SHEET:	D4
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	21 OF 24

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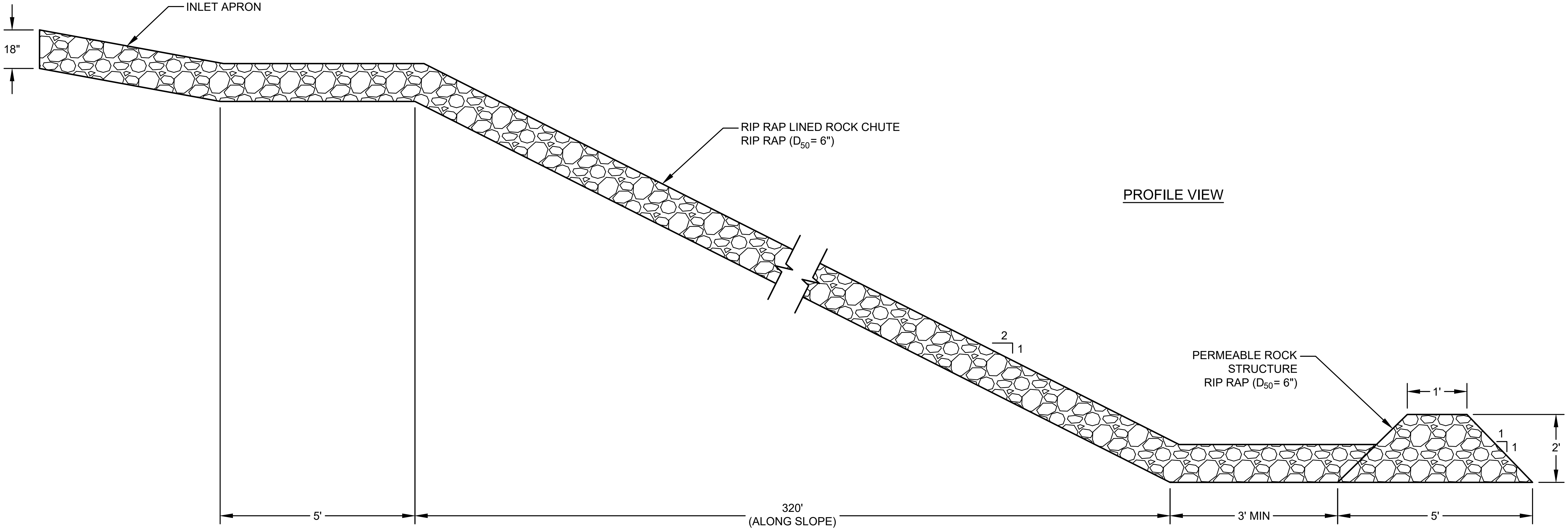
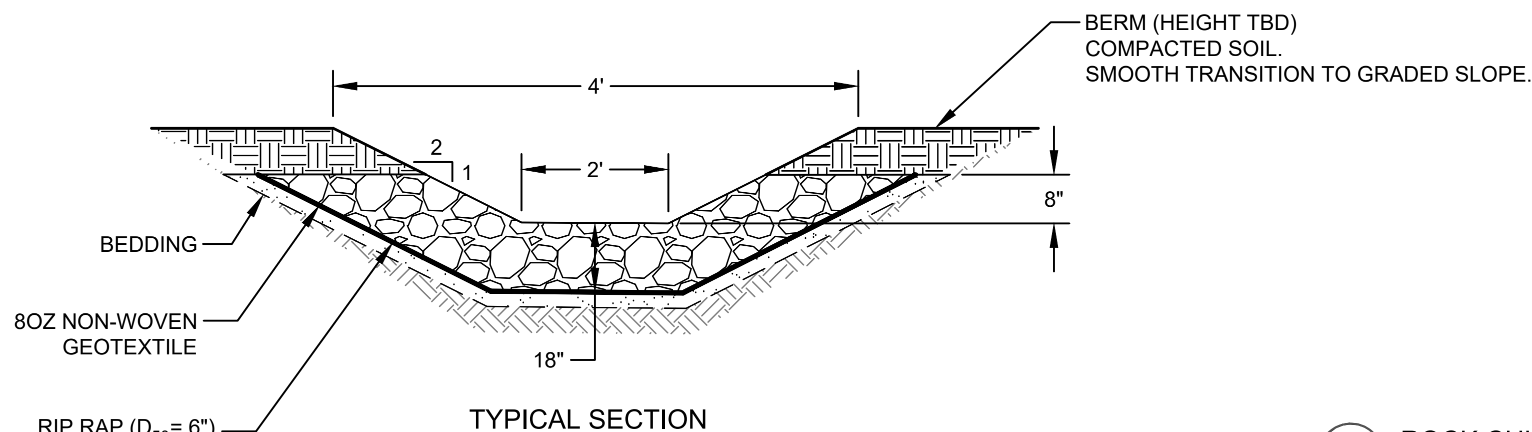


PROFILE VIEW



TYPICAL SECTION

1 / - ROCK CHUTE
NTS

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
B	12/19/24	50% DRAFT - REVISED SET 1	BR	CM
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DRAFTER: B. ROLLINS	COORDINATE SYSTEM: GROUND - WSPS 83 US FT
DESIGNER: C. MACPHERSON	SCALE: AS NOTED
CHECKED: D. FORSETH	APPROVED: D. FORSETH
DATE: 02/13/2025	DATE: 02/13/2025

Alta Science & Engineering, Inc.

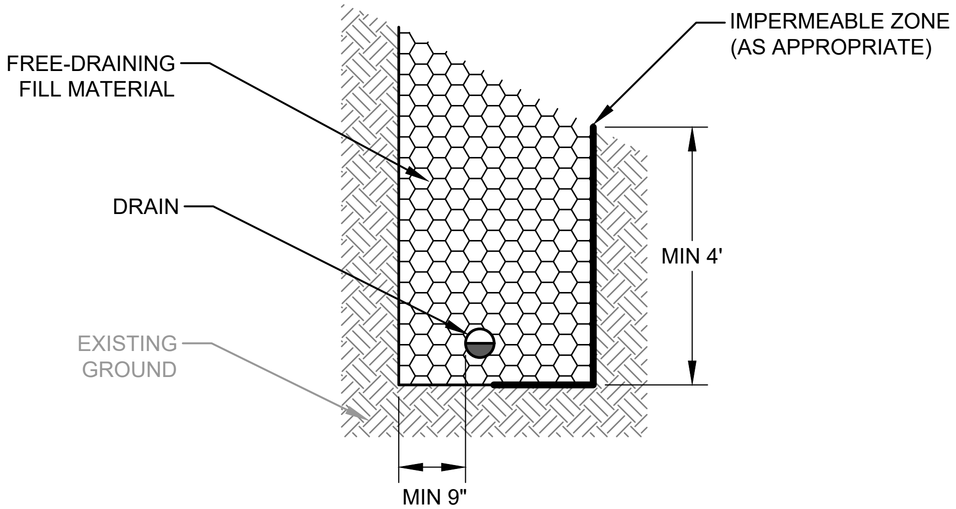
EATONVILLE LANDFILL

PIERCE COUNTY, WA

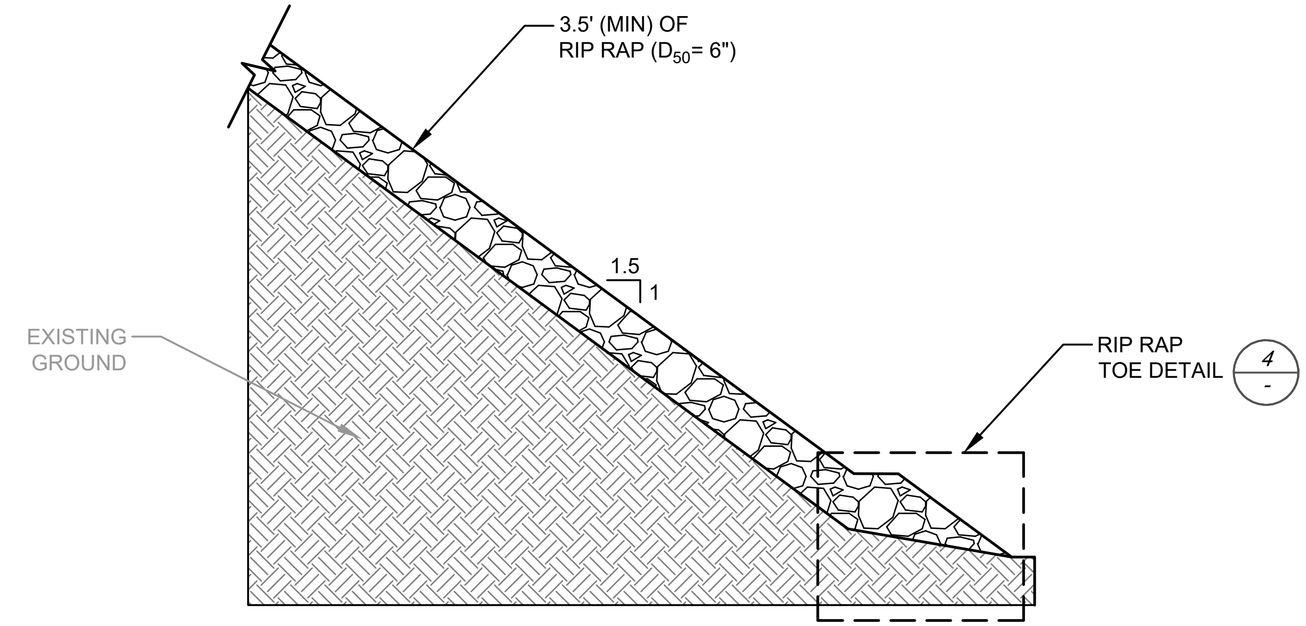
DETAILS

SHEET:	D5
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	22 OF 24

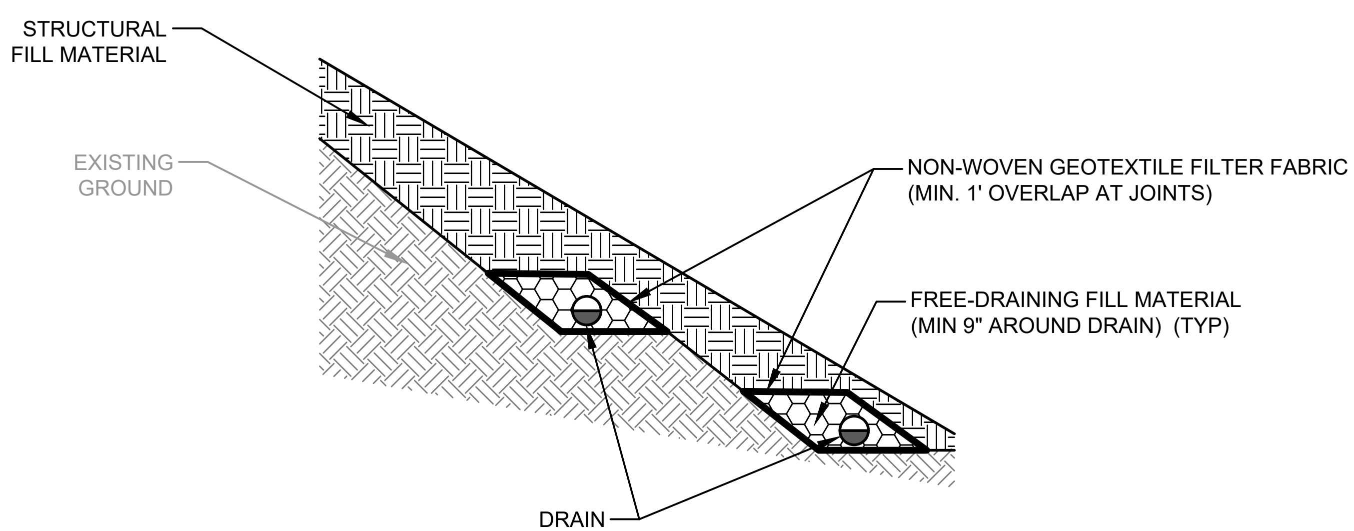
V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025



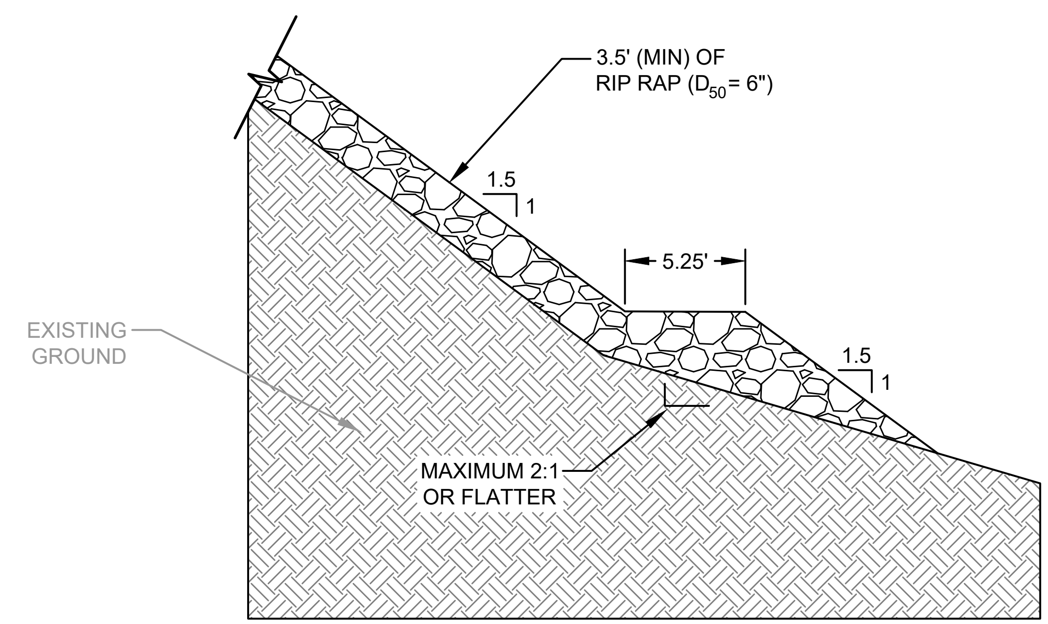
1 / - SLOPE CUTOFF DRAIN
NTS



3 / - RIP RAP SLOPE STABILIZATION FOR 1.5:1 SLOPE
NTS



2 / - SLOPE BACKFILL DRAIN
NTS



4 / - RIP RAP TOE DETAIL
NTS

NOT FOR CONSTRUCTION

V:\GSI Water Solutions\Eatonville Landfill_CAD\REV2_DESIGN 50PERC_2-13-2025.dwg 2/13/2025

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C	01/07/25	UPDATED SURVEY SHEETS	BR	CM
D	2/13/25	50% DRAFT - REVISED SET 2	BR	CM

DRAFTER:	B. ROLLINS	COORDINATE SYSTEM:	GROUND - WSPS 83 US FT
DESIGNER:	C. MACPHERSON	SCALE:	AS NOTED
CHECKED:	D. FORSETH	APPROVED:	D. FORSETH
DATE:	02/13/2025	DATE:	02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL

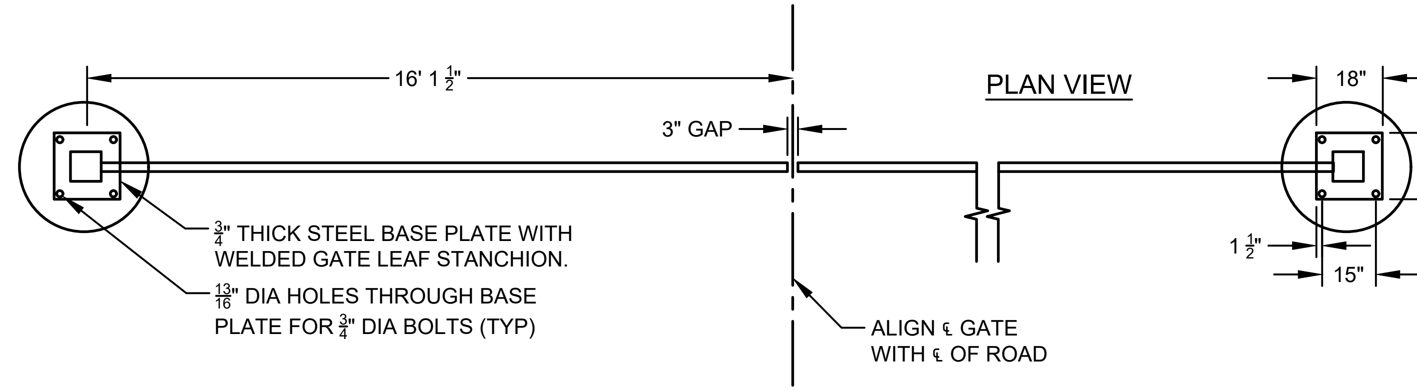
PIERCE COUNTY, WA

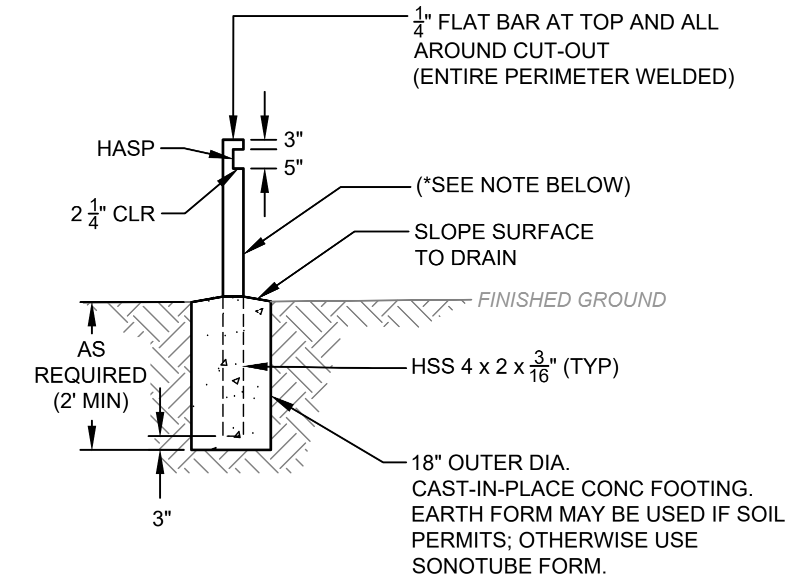
DETAILS

SHEET:	D6
DATE:	2/13/2025
PROJECT NO.:	24069.003
SHEET NO.:	23 OF 24

NOTES:

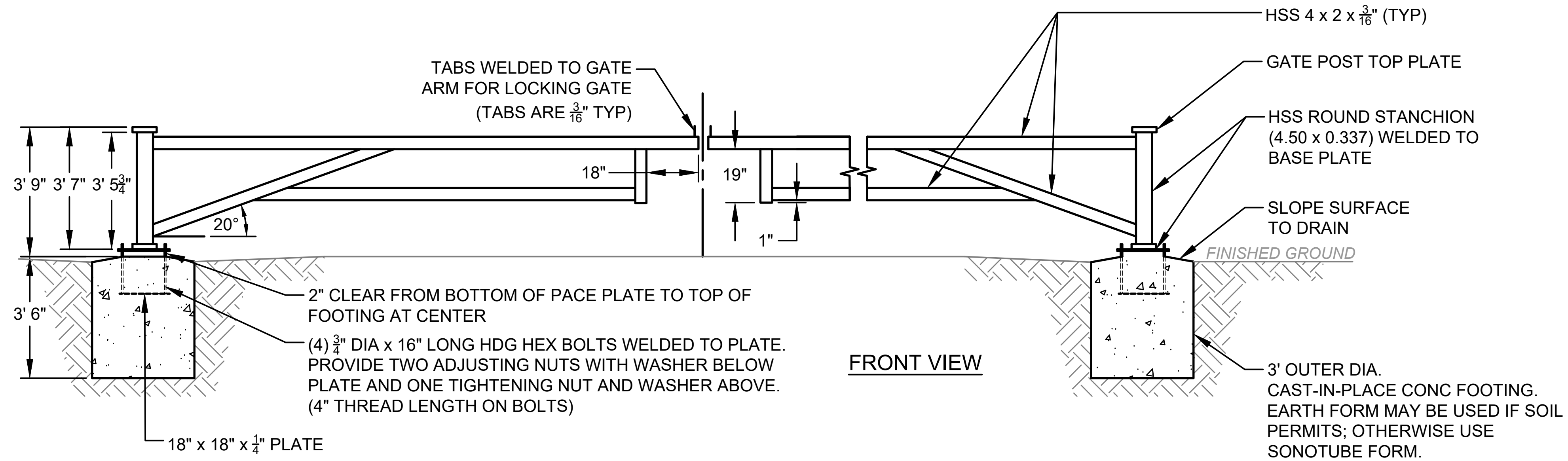
1. PROVIDE (2) GATE ARM HOLDERS.
2. HOT DIP GALVANIZE GATE, ARM HOLDERS, GATE LEAVES, AND BASE PLATE/STANCHION AFTER ALL WELDING HAS BEEN COMPLETED.
3. PROVIDE COMPLETE GATE.
4. FULLY GREASE TOP AND BOTTOM OF STANCHION BEFORE PLACING GATE LEAVES.

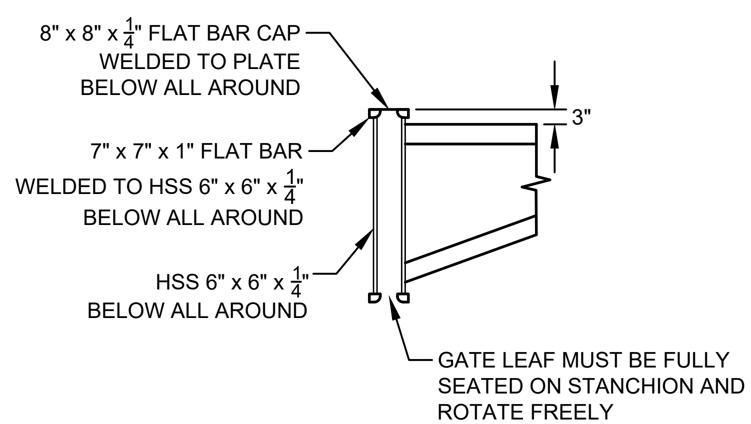




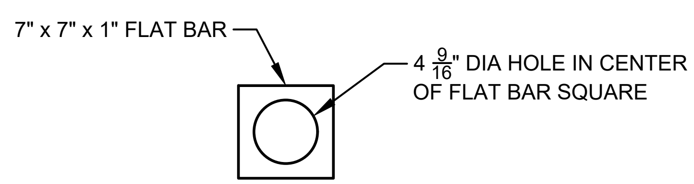
**NOTE:*
ADJUST HEIGHT OF BAR HOLDER TO HOLD GATE ARM HORIZONTAL WHEN GATE IS IN OPEN POSITION. LOCATE 9" FROM END OF GATE BAR.

GATE ARM HOLDER
(SEE NOTE 1)

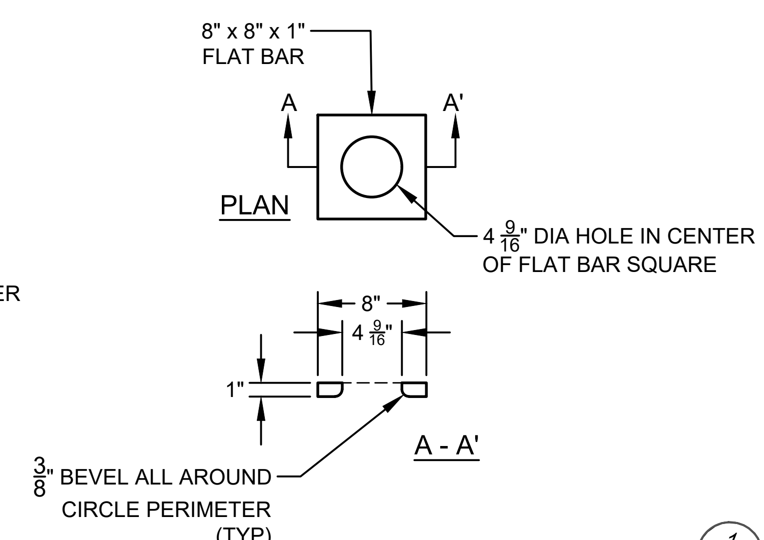




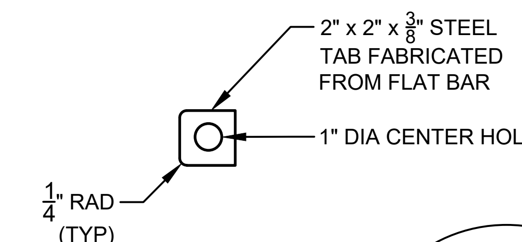
GATE POST DETAIL



GATE POST TOP PLATE



GATE POST BOTTOM PLATE



TAB

1 / - SINGLE LANE ROAD CLOSURE GATE
NTS

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS	BY	CHK
A	11/08/24	50% DRAFT FOR AGENCY REVIEW	BR	CM
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DRAFTER: B. ROLLINS
DESIGNER: C. MACPHERSON
CHECKED: D. FORSETH
DATE: 02/13/2025

COORDINATE SYSTEM: GROUND - WSPS 83 US FT
SCALE: AS NOTED
APPROVED: D. FORSETH
DATE: 02/13/2025

Alta Science & Engineering, Inc.

EATONVILLE LANDFILL
PIERCE COUNTY, WA

DETAILS

SHEET: D7
DATE: 2/13/2025
PROJECT NO.: 24069.003
SHEET NO.: 24 OF 24

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50% DRAFT TECHNICAL SPECIFICATIONS

EATONVILLE LANDFILL PROJECT
PIERCE COUNTY, WASHINGTON

PREPARED FOR:

WEYERHAEUSER COMPANY
220 OCCIDENTAL AVENUE SOUTH
SEATTLE, WA 98104
TELEPHONE: (206) 539-3000

TOWN OF EATONVILLE
201 CENTER STREET WEST
P.O. BOX 309
EATONVILLE, WA 98328
TELEPHONE: (360) 832-3361

ENGINEER:

ALTA SCIENCE AND ENGINEERING, INC
1220 BIG CREEK RD.
KELLOGG, IDAHO 83837
TELEPHONE: (208) 786-1206

GSI WATER SOLUTIONS, INC.
650 NE HOLLADAY STREET, SUITE 900
PORTLAND, OR 97232
TELEPHONE: (503) 239-8799

FEBRUARY 14, 2025

PROJECT TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

DIVISION 31 - EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

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SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 11 00

SUMMARY OF WORK

-- End of Section Table of Contents --

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The Eatonville Landfill is located on a 6.3 acre parcel approximately 2.7 miles west of the Town of Eatonville (Eatonville) in Pierce County, Washington. The property is surrounded by Nisqually State Park land and north of the Marshel River within Nisqually River Watershed. The landfill rests directily on top of a bluff with steep slopes that quickly transition flat wetland area below.

Weyerhaeuser Company (Owner) acquired the property in 1915 for internmittent timber harvesting. Between 1950 and 1980, the property was leased to Eatonville as a municipal landfill. The property has been undeveloped since the unofficial closure of the landfill in 1980.

According to available information, the landfill was not equipped with safeguards such as a liner or leachate collection system. Wastes are primarily characterized as municipal household solid wastes comingled with native soils; large wastes include car bodies, tires, appliences, and concrete blocks. Surface soils, interbedded materials, native soilds, and wetland soils were chemically and characteristically evaluated and do not qualify as federal hazardous wastes according to waste characterization results (REFERNCES TO APPLICABLE DOCUMENTS TO BE ADDED).

The contaminated upland area of the site (Landfill Area) contains dispersed landfill waste and impacted soil. Soil in the Landfill Area is contaminated with several contaminants of concern (COCs) including metals; semivolatile organic compounds; and total petroleum hydrocarbons (TPH), as gasoline-range organics (GRO), diesel-range organics (DRO), and oil-range organics (ORO).

The contaminated wetlands (Wetland Area) at the toe of Landfill Area contain dispersed landfill debris and low concentrations of contaminants of concern (COC), including zinc, TPH-GRO, and TPH-DRO/RRO. Iron and zinc, thought to originate from the landfill, are COCs in shallow groundwater. Zinc and hexavalent chromium are COCs in surface water.

The objective of this project is to successfully remediate the former Eatonville Landfill, providing for adequate protection of human health and the environment based on the current and future uses of the property.

The work required under this contract includes, but is not limited to site control; construction of surface water drainage features and erosion control measures; clearing and grubbing of trees and vegetation, exposed debris, and waste; sorting; excavation and grading; contaminated site construction; capping of the upper bench with a topsoil layer; site restoration involving slope stabilization, revegetation, installation of fencing and an access gate, monitoring well installation, development of access down the graded slope to monitoring wells; and incidental related work. The Contractor shall provide all labor, equipment, materials, supervision, transportation, operating supplies, and incidentals to perform all work specified herein.

1.1.2 Location

The work is located at the former Eatonville Landfill in Pierce County, Washington, approximately as indicated. The exact location will be shown by the Owner's Representative.

1.2 LOCATION OF UNDERGROUND UTILITIES

Obtain digging permits prior to start of excavation, and comply with Installation requirements for locating and marking underground utilities. Verify existing utility locations indicated on contract drawings, within area of work.

1.2.1 Notification Prior to Excavation

Notify the Contracting Officer at least 30 days prior to starting excavation work.

1.3 SALVAGE MATERIAL AND EQUIPMENT

Items designated by the Owner's Representative to be salvaged remain the property of the Owner. Segregate, itemize, deliver and off-load the salvaged property at the Owner designated storage area.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

-- End of Section Table of Contents --

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUBMITTALS

Engineer approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstrction Submittals

Bidding Schedule

1.2 BIDDING SCHEDULE

1.2.1 Data Required

Within 15 calendar days of notice of award, prepare and deliver to the Owner a bidding schedule (construction contract) on the forms furnished by the Owner. Provide a detailed breakdown of the contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices.

1.2.2 Schedule Instructions

Payments will not be made until the Bidding Schedule has been submitted to and accepted by the Owner. Identify the cost for site work, and include all required incidental work.

1.3 PAYMENTS TO CONTRACTOR

1.3.1 Obligation of Owner Payments

The obligation of the Owner to make payments required under the provisions of this contract will be in accordance with the general conditions of the construction contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 33 00

SUBMITTAL PROCEDURES

-- End of Section Table of Contents --

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittal requirements are specified in the technical sections. Examples and descriptions of submittals identified by the Submittal Description (SD) numbers and titles follow:

SD-01 Preconstruction Submittals

Preconstruction Submittals include schedules and a tabular list of locations, features, and other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificates Of Insurance

Surety Bonds

List Of Proposed Subcontractors

List Of Proposed Products

Construction Progress Schedule

Submittal Register

Schedule Of Prices

Health and Safety Plan

Work Plan

Quality Control (QC) plan

Environmental Protection Plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.

Report that includes findings of a test required to be performed on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report that includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily logs and checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods, or personnel qualifications.

Text of posted operating instructions

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Safety Data Sheets(SDS)concerning impedances, hazards and safety precautions.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.$

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.1.2 Approving Authority

Office or designated person authorized to approve the submittal.

1.1.3 Work

As used in this section, on-site and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction. In exception, excludes work to produce SD-01 submittals.

1.2 SUBMITTALS

Engineer approval is required for all submittals.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submittal Register

1.3 PREPARATION

1.3.1 Transmittal Form

1.3.2 Submittal Format

1.3.2.1 Format of SD-01 Preconstruction Submittals

When the submittal includes a document that is to be used in the project, or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.3.2.2 Format for SD-02 Shop Drawings

Provide shop drawings not less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full-size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless another form is required. Ensure drawings are suitable for reproduction and of a quality to produce clear, distinct lines and letters, with dark lines on a white background.

a. Include the nameplate data, size, and capacity on drawings. Also include applicable federal, military, industry, and technical society publication references.

b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

1.3.2.2.1 Drawing Identification

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph IDENTIFYING SUBMITTALS.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location next to the title block. Place the contract number in the margin, immediately below the title block, for each drawing.

1.3.2.3 Format of SD-03 Product Data

Present product data submittals for each section. Include a table of contents, listing the page and catalog item numbers for product data.

Indicate, by prominent notation, each product that is being submitted; indicate the specification section number and paragraph number to which it pertains.

1.3.2.3.1 Product Information

Supplement product data with material prepared for the project to satisfy the submittal requirements where product data does not exist. Identify this material as developed specifically for the project, with information and format as required for submission of SD-07 Certificates.

Provide product data in units used in the Contract documents. Where product data are included in preprinted catalogs with another unit, submit the dimensions in contract document units, on a separate sheet.

1.3.2.3.2 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Engineer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.3.2.3.3 Data Submission

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal that is marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of the construction effort.

Submit the manufacturer's instructions before installation.

1.3.2.4 Format of SD-04 Samples

NOT USED.

1.3.2.5 Format of SD-05 Design Data

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.3.2.6 Format of SD-06 Test Reports

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.3.2.7 Format of SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.3.2.8 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry, and technical-society publication references. If supplemental information is needed to clarify the manufacturer's data, submit it as specified for SD-07 Certificates.

Submit the manufacturer's instructions before installation.

1.3.2.8.1 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Engineer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.3.2.9 Format of SD-11 Closeout Submittals

When the submittal includes a document that is to be used in the project or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.3.3 Source Drawings for Shop Drawings

1.3.3.1 Source Drawings

The entire set of source drawing files (DWG) will not be provided to the

Contractor. Request the specific Drawing Number for the preparation of shop drawings. Only those drawings requested to prepare shop drawings will be provided. These drawings are provided only after award.

1.3.3.2 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Owner or Engineer. The Contractor must make no claim, and waives to the fullest extent permitted by law any claim or cause of action of any nature against the Owner or Engineer, its agents, or its subconsultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Owner and Engineer harmless against all damages, liabilities, or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic source drawing files are not construction documents. Differences may exist between the source drawing files and the corresponding construction documents. The Owner makes no representation regarding the accuracy or completeness of the electronic source drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. The Contractor is re$sponsible for determining if any conflict exists. In the event that a conflict arises between the signed and sealed construction documents prepared by the Owner and the furnished source drawing files, the signed and sealed construction documents govern. Use of these source drawing files does not relieve the Contractor of the duty to fully comply with the contract documents, including and without limitation the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indication of ownership (seals, logos, signatures, initials and dates).

1.4 QUANTITY OF SUBMITTALS

1.4.1 Number of SD-01 Preconstruction Submittal Copies

Unless otherwise specified, submit one set of administrative submittals.

1.4.2 Number of SD-04 Samples

a. Submit samples showing the range of variation, of each required item.

1.5 INFORMATION ONLY SUBMITTALS

Provide information-only submittals to the Engineer a minimum of 14 calendar days prior to the Preparatory Meeting for the associated Definable Feature of Work (DFOW). Approval of the Engineer is not required on information only submittals.

1.6 PROJECT SUBMITTAL REGISTER

A sample Project Submittal Register showing items of equipment and materials for when submittals are required by the specifications is provided as "Attachment A - Submittal Register."

1.6.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. As an attachment, provide a submittal register showing items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional submittals may be required. The Engineer will provide the initial submittal register with the following fields completed, to the extent that will be required by the Engineer during subsequent usage.

Lists specification section in which submittal is required.

Lists each submittal description (SD Number. and type, e.g., SD-02 Shop Drawings) required in each specification section.

Lists one principal paragraph in each specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in as limiting the project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns and all dates on which submittals are received by and returned by the Engineer.

1.6.2 Use of Submittal Register

Submit the submittal register. Include the QC plan and the project schedule. Verify that all submittals required for the project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Activity Number: Activity number from the project schedule.

Contractor Submit Date: Scheduled date for the approving authority to receive submittals.

Contractor Approval Date: Date that Contractor needs approval of submittal.

Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.6.3 Contractor Use of Submittal Register

Update the following fields with each submittal throughout the contract.

Transmittal Number: List of consecutive, Contractor-assigned numbers.

Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

List date submittal transmitted.

List date approval was received.

1.6.4 Approving Authority Use of Submittal Register

Update the following fields in the program utilizaed by Contractor:

Transmittal Number: List of consecutive, Contractor-assigned numbers.

List date submittal was received.

List dates of review actions.

List date of return to Contractor.

1.6.5 Delivery of Copies to the Engineer

Submit an updated electronic copy of the submittal register to the Engineer with each invoice request. Provide an updated Submittal Register monthly regardless of whether an invoice is submitted.

1.7 VARIATIONS

Variations from contract requirements require Owner and Engineer approval pursuant to contract Specifications and Drawings for Construction, and will be considered where advantageous to the Owner.

1.7.1 Considering Variations

Discussion of variations with the Engineer before submission will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. For variations that include design changes or some material or product substitutions, the Engineer may require an evaluation and analysis by a licensed professional engineer hired by the contractor.

Specifically point out variations from contract requirements in a transmittal letter. Failure to point out variations may cause the Owner to require rejection and removal of such work at no additional cost to the Owner.

1.7.2 Proposing Variations

The Engineer will indicate an approval or disapproval of the variation request; and if not approved as submitted, will indicate the Owner's reasons therefore. Any work done before such approval is received is performed at the Contractor's risk.

Specifically point out variations from contract requirements in a transmittal letter. Failure to point out variations may cause the Owner to require rejection and removal of such work at no additional cost to the Owner.

1.7.3 Warranting that Variations are Compatible

When delivering a variation for approval, the Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.7.4 Review Schedule Extension

In addition to the normal submittal review period, a period of 14 days will be allowed for the Owner to consider submittals with variations.

1.8 SCHEDULING

Schedule and submit concurrently product data and shop drawings covering component items forming a system or items that are interrelated. Submit pertinent certifications at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. The Contractor is responsible for additional time required for Owner reviews resulting from required resubmittals. The review period for each resubmittal is the same as for the initial submittal.

b. Submittals required by the contract documents are listed on the submittal register. If a submittal is listed in the submittal register but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Engineer does not relieve the Contractor of supplying submittals required by the contract documents but that have been omitted from the register or marked "N/A."

c. Resubmit the submittal register and annotate it monthly with actual submission and approval dates. When all items on the register have been fully approved, no further resubmittal is required.

1.9 ENGINEER'S APPROVING AUTHORITY

The Engineer will:

a. Note the date on which the submittal was received.

b. Review submittals for approval within the scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with comments and markings appropriate for the action indicated.

Upon completion of review of submittals requiring Engineer approval, stamp and date submittals. 1 copies of the submittal will be retained by the Engineer and 1 copies of the submittal will be returned to the Contractor.

1.9.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize proceeding with the work covered.

b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize proceeding with the work covered provided that the Contractor takes no exception to the corrections.

c. Submittals marked "not approved," "disapproved," or "revise and resubmit" indicate incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for this item until the resubmittal is approved.

d. Submittals marked "not reviewed" indicate that the submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

e. Submittals marked "receipt acknowledged" indicate that submittals have been received by the Engineer. This applies only to "information-only submittals" as previously defined.

1.10 DISAPPROVED SUBMITTALS

Make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, give notice to the Contracting Officer as required under the FAR clause titled CHANGES. The Contractor is responsible for the dimensions and design of connection details and the construction of work. Failure to point out variations may cause the Owner to require rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and resubmit in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.11 APPROVED SUBMITTALS

The Engineer's approval of submittals is not to be construed as a complete check, and indicates only that

Approval or acceptance for a submittal does not relieve the Contractor of the responsibility for meeting the contract requirements or for any error that may exist, because under the Quality Control (QC) requirements of this contract, the Contractor is responsible for ensuring information contained with in each submittal accurately conforms with the requirements of the contract documents.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.12 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, provide assurance that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those that may be damaged in testing, will be returned to the Contractor, at its expense, upon completion of the contract. Unapproved samples will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make as that material. The Engineer reserves the right to disapprove any material or equipment that has previously proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Replace such materials or equipment to meet contract requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component of, each section of the specifications.

1.2 PAYMENT AND MEASUREMENT

There will be no direct measurement for work required within this section to provide temporary construction facilities and controls. Payment will be based on the lump sum amount indicated on the Bidding Schedule for mobilization. Included in this payment will be full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved herein and as required for mobilization and demobilization to/from the site. Total mobilization costs shall not exceed 10% of the original estimated contract cost, less mobilization cost.

1.3 UNIT OF MEASURE

The unit of measure for each pay item will be as follows:
Mobilization/Demobilization: Lump Sum (LS)
Site Controls: Lump Sum(LS)
Traffic Control: Lump Sum (LS)

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan;

Traffic Control Plan;

Haul Road Plan;

1.6 CONSTRUCTION SITE PLAN

Prior to the start of work, submit for Engineer approval a site plan showing the locations and dimensions of temporary facilities, including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

The requirements for the signs, their content, and location are as indicated herein. Erect signs within 15 days after reciept of the notice to proceed.

2.1.1 Warning Signs

Post temporary signs, tags, and labels to give workers and the public adequate warning and caution of construction hazards. Attach signs to the perimeter fencing every 150 feet warning the public of the presence of construction hazards. Signs must require unauthorized persons to keep out of the construction site. Correct the data required by safety signs daily. Post signs at all points of entry designating the construction site as a hard hat area.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Haul Roads

Construct access and haul roads necessary for proper prosecution of the work under this Contract. Construct with suitable grades and widths; avoid sharp curves, blind corners, and dangerous cross traffic. Submit haul road plan for approval. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and haul roads are subject to approval by the Engineer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades are required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.3 FENCING

Provide fencing along the construction site and at all open excavations and tunnels to control access by unauthorized personnel. Safety fencing must be highly visible to be seen by pedestrians and vehicular traffic. Remove the fence upon completion and acceptance of the work.

2.3.1 Polyethylene Mesh Safety Fencing

Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid, a minimum of 48 inches high and maximum mesh size of 2 inches. Fencing must extend from the grade to a minimum of 48 inches above the grade and be tightly secured to T-posts spaced as necessary to maintain a rigid and taut fence. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.2 Chain Link Panel Fencing

Temporary panel fencing must be galvanized steel chain link panels 6 feet high. Multiple fencing panels may be linked together at the bases to form long spans as needed. Each panel base must be weighted down using sand bags or other suitable materials in order for the fencing to withstand anticipated winds while remaining upright. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Construction Contract employees must park privately owned vehicles in an area designated by the Owner's Represetnative. Employee parking must not interfere with existing and established parking requirements near the project site.

3.2 AVAILABILITY AND USE OF UTILITY SERVICES

3.2.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.2.2 Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Owner's Representative and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into a municipal, district, or commercial sanitary sewer system. Penalties or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Owner's Representative and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times. Include provisions for pest control and elimination of odors.

3.2.3 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials weekly to minimize potential hazards. - *(LOCATION OF PROJECT NEAR STATE PARK LAND MAY REQUIRE SPECIAL WILDFIRE PROTECTION PLAN AND SHOULD BE SPECIFIED HERE)*

3.3 TRAFFIC PROVISIONS

3.3.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close a thoroughfare or interfere with traffic on highways except with written permission of the Owner at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan for Engineer approval detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations. . Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Owner's Representative prior to starting any activity that will obstruct traffic.

c. Provide, erect, and maintain, at Contractor's expense, lights, barriers, signals, passageways, detours, Life Safety Signage, overhead protection, and other items that may be required by the authority having jurisdiction.

d. Provide cones, signs, barricades, lights, or other traffic control devices and personnel required to control traffic. Do not use foil-backed material for temporary pavement marking because of its potential to conduct electricity during accidents involving downed power lines.

3.3.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Owner. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Provide self-illuminated (lighted) barricades during hours of darkness. All personnel working in roadways will wear brightly-colored vests or other high visibility apparel in accordance with EM 385-1-1. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of damage to roads caused by construction operations.

3.3.3 Dust Control

Dust control methods and procedures must be approved by the Engineer. Coordinate dust control methods with 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

3.4 CONTRACTOR'S TEMPORARY FACILITIES

Contractor is responsible for security of their property. Provide adequate outside security lighting at the temporary facilities. Trailers must be anchored to resist high winds and meet applicable state or local standards for anchoring mobile trailers.

3.4.1 Storage Area

Contractor shall be responsible for storage of materials, equipment, trailers, and any other components of the required work, including installation of necessary measures to prevent access by the public to these items during non-work hours. Confine equipment and storage of materials to the specified staging area, unless approved otherwise by the Engineer, and maintain cleanliness and orderliness of this area used for the security of any material or equipment storage. Contractor shall not unreasonably encumber the site or public rights-of-way with materials and construction equipment.

3.4.2 Supplemental Storage Area

Upon request, and pending availability, the Owner will designate another or supplemental area for the use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. Maintain the area in a clean and orderly fashion and secured if needed to protect supplies and equipment.

3.4.3 Safety Systems

Protect the integrity of all installed safety systems or personnel safety devices. Obtain prior approval from the Owner if entrance into systems serving safety devices is required. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish Contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Owner.

3.4.4 Weather Protection of Temporary Facilities and Stored Materials

Take immediate actions when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that materials and equipment are protected from from damage.

3.4.4.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby property.

3.5 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. Maintain the safety fencing during the life of the Contract and, upon completion and acceptance of the work, remove from the work site.

3.6 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store all salvageable materials resulting from demolition activities within the fenced area described above or at the supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

3.7 RESTORATION OF STORAGE AREA

Upon completion of the project remove signs, barricades, haul roads, and all other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence. Restore areas used during the performance of the Contract to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including topsoil and seeding as necessary. Gravel access roads and the 'parking area' and staging area shall be bladed smooth and compacted.

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SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.1 WORK DESCRIPTION

The Contractor shall be responsible for implementing temporary environmental controls and measures to protect the site during construction. To address such issues, the Contractor shall provide an Environmental Protection Plan (a.k.a Site Control Plan) for the review and comment of the Engineer that shall be followed and implemented for all construction activities. The Environmental Protection Plan shall contain a written description of water control, dust control, erosion and sediment control, health and safety, and pertinent measures that the Contractor will employ during the completion of work.

This specification also includes information on specific temporary and permanent BMP. The Contractor shall impliment temporary and permant BMPs according to this specification.

1.2 MEASUREMENT

All temporary environmental controls shall be measured in the lump sum (LS) amount, with the exception of Stablized Construction Entrance/Exit. The unit of measure for stabilized construction entrance/exit shall based upon neatline design quantities and the unit prices of required materials (fractured rock, geotextile, earthwork, etc.) within the bidding schedule.

Erosion and sediment contol items to be left in place after construction will be considered permanent erosion and sediment controls and shall be measured seperately by the units specificed in the bidding schedule. Permanent erosion and sediment control items include erosion control blankets and fiber rolls. Measurement for erosion control blanket shall be by the number of square yards of erosion control blanket installed to the nearest square yard as measured by the Engineer. Overlapped and repair areas are not included in the areas for measurement. Payment for erosion control blanket shall be at the unit bid price per square yard shown on the bid form for the contract documents. Measurement for fiber rolls shall be based on the nearest lineal foot of fiber roll installed as measured by the Engineer. Payment shall be made at the corresponding unit price bid shown on the bidding schedule of the contract documents.

1.3 PAYMENT

Payment for environemtnal controls specified above shall constitute full compensation for all labor, equipment, tools, materials and incidentals necessary to accomplish the work.

1.4 UNIT OF MEASURE

The unit of measure for each pay item will be as follows:
Sediment Co: Lump Sum (LS)
Waddles: Square Foot (LF)
Silt Fence: Linear Foot (LF)

1.5 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 279	Standards for the Management of Used Oil
40 CFR 355	Emergency Planning and Notification
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.6 DEFINITIONS

1.6.1 Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act. A list of Class I ODS can be found on the EPA website at the following weblink. https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink. https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

1.6.2 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e., methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.6.3 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.6.4 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.6.5 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.6.6 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.6.7 Hazardous Materials

Hazardous material is any material that: Is defined in 49 CFR 171, listed in 49 CFR 172, regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.1200; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.6.8 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibits a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D, or meets a state, local, or host nation definition of a hazardous waste.

1.6.9 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.6.10 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by municipalities or installations to obtain NPDES permit coverage for their stormwater discharges.

1.6.11 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.6.12 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.6.13 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.6.14 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.6.15 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.6.15.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.6.15.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.6.15.3 Material Not Regulated As Solid Waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.6.15.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 261.

1.6.15.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.6.15.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.6.15.7 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.6.15.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.6.16 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, or creeks meeting the definition of "waters of the United States". Surface discharges from construction sites are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.6.17 Wastewater

Wastewater is the used water and solids that flow through a sanitary sewer to a treatment plant.

1.6.17.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.6.18 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.6.19 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.6.20 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.6.21 Location Specific Universal Waste

Any of the following dangerous waste that are subject to the universal waste requirements of WAC-173-303-573: Batteries as described in WAC-173-303-573(2)); Lamps as described in WAC-173-303-573(5); Mercury-containing equipment as described in WAC-173-303-573(3).

1.7 SUBMITTALS

Engineer approval is required for submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan

Stormwater Pollution Prevention Plan (SWPPP)

Stormwater Notice of Intent

Polution prevention plan and Notice of intent for NPDES coverage under the general permit for construction activities

SD-06 Test Reports

Erosion and Sediment Controls

SD-07 Certificates

Mill Certificate or Affidavit

Certificate attesting that the Contractor has met all specified requirements.

SD-11 Closeout Submittals

Stormwater Pollution Prevention Plan Compliance Notebook

Stormwater Notice of Termination (for NPDES coverage under the general permit for construction activities)

As-Built Topographic Survey

Waste Determination Documentation

Hazardous Waste/Debris Management

Disposal Documentation for Hazardous and Regulated Waste

1.8 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.9 QUALITY ASSURANCE

1.9.1 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Engineer. Submit copies of regulatory notifications to the Engineer at least 5 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.9.2 Non-Compliance Notifications

The Engineer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Engineer of the proposed corrective action and take such action when approved by the Engineer. The Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. FAR 52.242-14 Suspension of Work provides that a suspension, delay, or interruption of work due to the fault or negligence of the Contractor allows for no adjustments to the contract for time extensions or equitable adjustments. In addition to a suspension of work, the Engineer may use additional authorities under the contract or law.

1.10 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, submit an Environmental Protection Plan for review and approval by the Engineer. The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Issues of concern must be defined within the Environmental Protection Plan as outlined in this section. Address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but are considered necessary, must be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, meet with the Engineer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. This meeting may be fulfilled during the preconstruction conference. The Environmental Protection Plan must be current and maintained onsite by the Contractor.

Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.10.1 General Overview and Purpose

1.10.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention plan, spill control plan, solid waste management plan, wastewater management plan, contaminant prevention plan, a historical, archaeological, cultural resources, biological resources and wetlands plan, traffic control plan Hazardous, Toxic and Radioactive Waste (HTRW) Plan Non-Hazardous Solid Waste Disposal Plan borrowing material plan.

1.10.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.10.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.10.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.10.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.10.2 General Site Information

1.10.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.10.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

Show where any fuels, hazardous substances, solvents, or lubricants will be stored. Provide a spill plan to address any releases of those materials.

1.10.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.10.3 Management of Natural Resources

a. Land resources

b. Tree protection

c. Replacement of damaged landscape features

d. Temporary construction

e. Stream crossings

f. Fish and wildlife resources

g. Wetland areas

1.10.4 Protection of Historical and Archaeological Resources

a. Objectives

b. Methods

1.10.5 Stormwater Management and Control

a. Ground cover

b. Erodible soils

c. Temporary measures

(1) Structural Practices

(2) Temporary and permanent stabilization

d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

e. Stormwater Pollution Prevention Plan (SWPPP).

1.10.6 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste.

Control and disposal of hazardous waste.

This item consist of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan when within an installation. The Engineer will provide a copy of the Installation Hazardous Waste Management Plan as applicable.

As a minimum, include the following:

a. List of the types of hazardous wastes expected to be generated

b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated

c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications

d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)

e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)

f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)

g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar

h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures

i. Plans for the disposal of hazardous waste by permitted facilities; and

Procedures to be employed to ensure required employee training records are maintained.

1.10.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.10.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

PART 2 PRODUCTS

2.1 ENVIRONMENTALLY PREFEREBLE PRODUCTS

Consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and disposal of products, and provide products and materials with the least effect on the environment.

The use of the following materials is prohibited:

a. Products containing asbestos.

b. Products containing urea formaldehyde.

c. Products containing polychlorinated biphenyls.

d. Products containing chlorinated fluorocarbons.

2.2 EROSION AND SEDIMENT CONTROLS (*ADDITIONAL BMPS TO BE ADDED*)

2.2.1 Components for Silt Fences

2.2.1.1 Filter Fabric

Provide geotextile that complies with the requirements of ASTM D 4439, and consists of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and contains stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. Provide synthetic filter fabric that contains ultraviolet ray inhibitors and stabilizers to assure a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. Identify, store and handle filter fabric in accordance with ASTM D 4873. The filter fabric shall meet the following requirements, unless otherwise approved by the Engineer:

FILTER FABRIC FOR SILT SCREEN FENCE		
PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile	ASTM D 4632	100 lbs. min.
Elongation (%)		30% max.
Trapezoid Tear	ASTM D 4533	55 lbs. min
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.2.1.2 Silt fence Stakes and Posts

Use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 by 2 inches when oak is used and 4 by 4 inches when pine is used, and have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds/linear foot and a minimum length of 3 feet.

2.2.1.3 Wire Fence

If used, wire fencing should be a minimum 14 gage with a maximum 2 inch mesh opening, or as approved.

2.2.1.4 Prefabricated Units

Prefabricated silt fence units, Envirofence or approved equal, may be used in lieu of the materials described above providing the unit is installed per the manufacturer's instructions.

2.2.1.5 Mill Certificate or Affidavit

Provide a mill certificate or affidavit attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. Specify in the mill certificate or affidavit the actual Minimum Average Roll Values and identify the fabric supplied by roll identification numbers. Submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.2.2 Components for Straw Bales

The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. Straw bales shall be certified weed free. Provide bales with a standard cross section of 14 by 18 inches. Wire-bound or string-tie all bales. Use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have a minimum dimensions of 2 by 2 inches in cross section and have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds/linear foot and a minimum length of 3 feet.

2.2.3 Components for Erosion Control Blanket

The erosion control mat shall be composed a straw fiber matrix with 1.5 pound photodegradable polypropylene top and bottom nets, intended to have at least a 12 month longevity, rated for slopes up to 2:1 (H:V). Supply the following or approved equal: North American Green Erosion Control Blanket, Product S150.

Contractor shall use staples or stakes to anchor the erosion control mat to the sloped ground surface following manufacturer's recommendations and installation specifications. Staples/stakes shall have a minimum of 8-inch legs/lengths.

2.2.4 Components for Fiber Rolls

Contractor shall furnish 9-inch minimum diameter fiber rolls consisting of straw, flax, or other similar materials bound into a biodegradable tubular plastic or similar encasing material. Provide wood stakes with a nominal classification of 0.75 x 0.75 inches and a minimum length of 24 inches.

2.2.5 Components for Stabilized Construction Entrance/Exit

The stabilized construction entrance/exit shall be constructed of fractured aggregate 2 to 8 inches in diameter for the base layer and 2-inches in diameter for the surface/top layer. Provide geotextile as barrier between the existing ground surface and rock meeting the specifications in Section 31 05 19.13 GEOTEXTILES FOR EARTHWORK.

PART 3 EXECUTION

3.1 ENVIRONMENTAL CONTROLS

3.1.1 Protection of Natural Resources

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office as applicable, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility.

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

3.1.2 Environmental Permits and Commitments

Obtaining and complying with all environmental permits and commitments required by Federal, State, Regional, and local environmental laws and regulations is the Contractor's responsibility.

3.1.3 Land Resources

Confine all activities to areas defined by the drawings and specifications. Identify any land resources to be preserved within the work area prior to the beginning of any construction. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval, except in areas indicated on the drawings or specified to be cleared. Ropes, cables, or guys will not be fastened to or attached to any trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times, as defined in the following subparagraphs. Remove stone, soil, or other materials displaced into uncleared areas.

3.1.3.1 Work Area Limits

Mark the areas that need not be disturbed under this contract prior to commencing construction activities. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. The Contractor's personnel must be knowledgeable of the purpose for marking and/or protecting particular objects.

3.1.3.2 Landscape and Vegetation

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved must be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Engineer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Engineer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Engineer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.1.3.3 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designeated on the drawings or as directed by the Engineer. Temporary movement or relocations of Contractor facilities will be made only when approved. Temporary excavation and embankments for plant and/or work areas must be controlled to protect adjacent areas.

3.1.4 WATER RESOURCES

Monitor all water areas affected by construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated. For construction activities immediately adjacent to impaired surface waters, the Contractor must be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued

Clean Water Act permits.

3.1.4.1 Wetlands

Do not enter, distrub, destroy, or allow discharge of contaminants into any wetlands. The protection of wetlands is the Contractor's responsibility.

3.1.4.2 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

3.1.4.3 Streams

Stream crossings must allow movement of materials or equipment without violating water pollution control standards of the federal, state, and local governments. Construction of stream crossing structures must be in compliance with all required permits including, but not limited to, Clean Water Act Section 404, and Section 401 Water Quality.

The Engineer's approval and appropriate permits are required before any equipment will be permitted to ford live streams. In areas where frequent crossings are required, install temporary culverts or bridges. Obtain Engineer's approval prior to installation. Remove temporary culverts or bridges upon completion of work, and repair the area to its original condition unless otherwise required by the Engineer.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.2.1 Construction General Permit

Provide a Construction General Permit as required by the State of Washington. Under the terms and conditions of the permit, install, inspect, maintain BMPs, prepare stormwater erosion and sediment control inspection reports, and submit SWPPP inspection reports. Maintain construction operations and management in compliance with the terms and conditions of the general permit for stormwater discharges from construction activities.

3.2.1.1 Stormwater Pollution Prevention Plan

Submit a project-specific Stormwater Pollution Prevention Plan (SWPPP) to the Engineer for approval, within 30 days of Contract Award and prior to the commencement of work. The SWPPP must meet the requirements of Washington State General Permit for stormwater discharges from construction sites.

Include the following:

a. Comply with terms of the state general permit for stormwater discharges from construction activities. Prepare SWPPP in accordance with state requirements. Use state

b. Select applicable BMPs from EPA Fact Sheets located at https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#constr or in accordance with applicable state or local requirements.

c. Include a completed copy of the Notice of Intent, BMP Inspection Report Template, and Stormwater Notice of Termination, except for the effective date.

3.2.1.2 Stormwater Notice of Intent for Construction Activities

Prepare and submit the Notice of Intent for NPDES coverage under the general permit for construction activities to the Engineer for review.

Submit the approved NOI and appropriate permit fees onto the appropriate federal or state agency for approval. No land disturbing activities may commence without permit coverage. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.

3.2.1.3 Inspection Reports

Submit "Inspection Reports" to the Contracting Officer in accordance with the State of Washington Construction General Permit.

3.2.1.4 Stormwater Pollution Prevention Plan Compliance Notebook

Create and maintain a three ring binder of documents that demonstrate compliance with the Construction General Permit. Include a copy of the permit Notice of Intent, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports and related corrective action records, copies of correspondence with the the WashingtonState Permitting Agency, and a copy of the permit Notice of Termination in the binder. At project completion, the notebook becomes property of the Government. Provide the compliance notebook to the Engineer.

3.2.1.5 Stormwater Notice of Termination for Construction Activities

Submit a Notice of Termination to the Engineer for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the permittee is responsible. Once approved, submit the Notice of Termination to the appropriate state or federal agency. Prepare as-built topographic survey information required by the permitting agency for certification of the stormwater management system, and provide to the Engineer.

3.2.2 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, all markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.2.3 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Engineer. Move or relocate the Contractor facilities only when approved by the Engineer. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.2.4 Municipal Separate Storm Sewer System (MS4) Management

Comply with the Installation's MS4 permit requirements.

3.3 EROSION AND SEDIMENT CONTROL MEASURES

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

3.3.1 Silt Fence

3.3.1.1 Installation

Construct the silt fence in accordance with the Stormwater Management Manual for Western Washington (2024), the SWPPP, the Project Drawings, and as specified herein.

Extend silt fences a minimum of 16 inches above the ground surface without exceeding 34 inches above the ground surface. Provide filter fabric from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, splice together filter fabric at a support post, with a minimum 6 inch overlap, and securely sealed. Excavate trench approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4 by 4 inch trench shall be backfilled and the soil compacted over the filter fabric. Posts should be spaced a maximum of 10 feet apart when wire mesh support fence is used and no more than 6.5 feet apart when using extra-strength filter fabric (without a wire fence). The posts should extend at least 16 inches into the ground.

If standard strength filter fabric is to be used, fasten the optional wire mesh fence support to the upslope side of the posts using heavy duty wire stales, tie wires, or hog rings. Extend the wire mesh support to the bottom of the trench. The filter fabric should then be stapled or wired to the fence. Extra strength filter fabric does not require a wire mesh support fence. In this case, staple or wire the filter fabric directly to the posts. Silt fence shall be left by the Contractor upon completion of the project work. Owner will be responsible for future maintenance and/or removal of the silt fence.

3.3.1.2 Maintenance

Inspect the silt fences in accordance with paragraph, titled "Inspections," of this section. Any required repairs shall be made promptly. Pay close attention to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, replace the fabric promptly. Remove sediment deposits when deposits reach one-third of the height of the barrier.

3.3.2 Straw Bales

3.3.2.1 Installation

Construct in accordance with the Stormwater Management Manual for Western Washington (2024), SWPPP, the Project Drawings and as specified herein.

Place the straw bales in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Install straw bales so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. Entrench and backfill the barrier. Excavate a trench the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), backfill the excavated soil against the barrier. Conform the backfill soil with the ground level on the downhill side and build up to 4 inches against the uphill side of the barrier. Scatter loose straw over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Securely anchor each bale by at least two stakes driven through the bale. Drive the first stake or steel post in each bale toward the previously laid bale to force the bales together. Drive stakes or steel pickets a minimum 18 inches deep into the ground to securely anchor the bales.

3.3.2.2 Maintenance

Inspect straw bale barriers in accordance with paragraph, titled "Inspections". Pay close attention to the repair of damaged bales, end runs and undercutting beneath bales. Accomplish necessary repairs to barriers or replacement of bales in a promptly manner. Remove sediment deposits when deposits reach one-half of the height of the barrier. At the each end of each row turn bales uphill when used to retain sediment. Remove a straw bale barrier when it is no longer required, as approved by Engineer. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. Seed the areas disturbed by this shaping in accordance with Section 32 92 19 SEEDING AND PLANTING.

3.3.3 Erosion Control Blanket

3.3.3.1 Installation

Construct in accordance with the Stormwater Management Manual for Western Washington (2024), the SWPPP, the Project Drawings, and as specified herein.

After approval of the seeding operation (Section 32 92 19 SEEDING AND PLANTING), the rolls of erosion control blanket shall be rolled onto the surface from the top of the slope to the bottom of the slope in the locations identified on the drawings. Rolls should not be constructed in a horizontal direction across the slope face. At the top of the area, bury the end of each roll in a trench at least 6 inches deep. The trench should then be backfilled and tamped. Overlap the sides of rolls at least 4 inches and make sure that there is a least a 3 foot overlap when an uphill roll joins to a downhill roll. Extend the matting beyond the edge of the mulched or seeded area at least 1 foot at the sides and 3 feet at the top and bottom of the area. Staples/stakes should be driven perpendicularly into the slope face. Place them approximately 3 feet apart down the sides and center of the roll, and not more than 1 foot apart at the upper end of a roll or at the end overlap of two rolls. Be sure the blanket makes uniform contact with the slope face underneath with no bridging of rills or gullies allowed.

3.3.3.2 Maintenance

Inspect the erosion control blankets in accordance with paragraph, titled "Inspections". Make repairs as necessary to restore complete coverage and full effectiveness of the matting. Contractor shall repair erosion control blanket in accordance with manufacturer's specifications at no additional cost to the Owner.

3.3.4 Fiber Rolls

3.3.4.1 Installation

Construct in accordance with the Stormwater Management Manual for Western Washington (2024), the SWPPP, the Project Drawings, and as specified herein.

Contractor shall construct/obtain and install fiber rolls at the locations and manner as shown on the drawings and described herein. Locate fiber rolls on level contours and turn the ends of the fiber roll up slope to prevent runoff from going around the roll. Stake fiber rolls into a 2 to 4-inch deep trench with a width equal to the diameter of the fiber roll. Backfill and foot tamp the upgradient side of the fiber roll such that water flowing down the slope will not run under the fiber roll. Drive wood stakes at the end of each fiber roll and spaced 4 foot maximum on center into the ground. If more than one fiber roll is placed in a row, the rolls should be overlapped at least 2 feet, not abutted.

3.3.4.2 Maintenance

Inspect the fiber rolls in accordance with paragraph, titled "Inspections". Repair or replace split, torn, unraveling, or slumping fiber rolls. Sediment that accumulated behind the fiber roll shall be removed when sediment accumulation reaches one-half the distance between the top of the fiber roll and the adjacent ground surface.

3.3.5 Stabilized Construction Entrance/Exit

3.3.5.1 Installation

Construct in accordance with the Stormwater Management Manual for Western Washington (2024), the SWPPP, the Project Drawings, and as specified herein.

Construct the stabilized construction entrance/exit to the specified dimensions at the location identified on the drawings. Clear all vegetation, roots, and all other obstructions and make sure that the entrance is properly graded and compacted prior to placing geotextile in accordance with Section 31 05 19.13 GEOTEXTILES FOR EARTHWORK. Place a 1-foot layer of fractured rock (2 to 8 inches in diameter) over the entire width and length of the entrance as shown on the drawings, followed by a 4 inch layer of 2-inch aggregate. Contract shall slightly crown the entrance so that runoff drains off the pad.

3.3.5.2 Maintenance

Inspect the stabilized construction entrance/exit in accordance with paragraph, titled "Inspections". If the entrance is not preventing sediment or mud from being tracked onto pavement or public rights-of-way, then alternate measures to keep the streets free of sediment shall be used. All materials spilled, dropped, washed, or tracked from vehicles onto roadways should be removed immediately. When necessary, vehicle wheels shall be cleaned to remove sediment prior to entrance onto public right-of-ways. Any sediment that is tracked onto pavement shall be removed immediately with sweeping. The sediment collected by sweeping shall be removed or stabilized onsite. The stabilized construction entrance shall be removed after the final site stabilization is achieved and the temporary BMP is no longer needed.

3.4 SURFACE AND GROUNDWATER

3.4.1 Dewatering

If the construction dewatering is noted or suspected of being contaminated, follow the procedures outlined in the SWPPP. Obtain authorization for any contaminated groundwater release in advance from the Engineer and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.4.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States except as authorized herein. The protection of waters of the United States shown on the drawings in accordance with paragraph LICENSES AND PERMITS is the Contractor's responsibility. Authorization to enter specific waters of the United States identified does not relieve the Contractor from any obligation to protect other waters of the United States within, adjacent to, or in the vicinity of the construction site and associated boundaries.

3.5 PROTECTION OF CULTURAL RESOURCES

3.5.1 Archaeological Resources

If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be suspended. Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Engineer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources. The Government retains ownership and control over archaeological resources.

3.6 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with all Federal and State air emission and performance laws and standards.

3.6.1 Burning

Onsite burning permissions and procedures to be established after 50% Design.

3.6.2 Dust Control

Keep dust down at all times, including during nonworking periods.[Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations.] Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster. Since these products contain Crystalline Silica, comply with the applicable OSHA standard, 29 CFR 1910.1053 or 29 CFR 1926.1153 for controlling exposure to Crystalline Silica Dust.

3.6.2.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed Federal, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.6.3 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.6.4 Sound Intrusions

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with State and Local Government regulations.

3.7 WASTE MINIMIZATION

Participate in State and Local Government sponsered recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

3.7.1 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to the Engineer monthly. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	[_____] [cubic yards][tons],[cubic meters] as appropriate
C&D Debris Recycled	[_____] [cubic yards][tons],[cubic meters] as appropriate
C&D Debris Composted	[_____] [cubic yards][tons],[cubic meters] as appropriate
Total C&D Debris Generated	[_____] [cubic yards][tons],[cubic meters] as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	[_____] [cubic yards][tons],[cubic meters] as appropriate

3.8 WASTE MANAGEMENT AND DISPOSAL

3.8.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g., scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of Federal, state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not exhaustive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.8.2 Solid Waste Management

3.8.2.1 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off the property and dispose of it in compliance with Federal, state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements.

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with Federal, State and local requirements.

3.8.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on the property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on the property without written approval of the Engineer and Installation Hazardous Waste Manager.

3.8.3.1 Hazardous Waste/Debris Management

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with federal, state, and local regulations, including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Prior to removal of any hazardous waste from the property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. Do not bring hazardous waste onto the property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.8.3.2 Hazardous Waste Disposal

3.8.3.2.1 Responsibilities for Contractor's Disposal

Provide hazardous waste manifest to the Installations Environmental Office for review, approval, and signature prior to shipping waste off the property.

3.8.3.2.1.1 Services

Provide service necessary for the final treatment or disposal of the hazardous material or waste in accordance with 40 CFR 260 - 40 CFR 279, local, and state, laws and regulations, and the terms and conditions of the Contract within 60 days after the materials have been generated. These services include necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal or transportation, include manifesting or complete waste profile sheets, equipment, and compile documentation).

3.8.3.2.1.2 Labeling

During waste accumulation label all containers in accordance with 40 CFR 262. Prior to offering a waste for off-site transport, determine the Department of Transportation's (DOT's) proper shipping names for waste in accordance with 49 CFR 172 (each container requiring disposal) and demonstrate to the Contracting Officer how this determination is developed and supported by the sampling and analysis requirements contained herein. Label all containers of hazardous waste with the words "Hazardous Waste" or other words to describe the contents of the container in accordance with 40 CFR 262 and applicable state or local regulations.

3.8.3.3 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

a. Batteries as described in 40 CFR 273.2

b. Lamps as described in 40 CFR 273.5

c. Mercury-containing equipment as described in 40 CFR 273.4

d. Aerosol cans as described in 40 CFR 273.6

e. Pesticides as described in 40 CFR 273.3

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.8.3.4 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.8.3.5 Disposal Documentation for Hazardous and Regulated Waste

Contact the Engineer or designated representative for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or state permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifests must be reviewed, signed, and approved by the Engineer before the Contractor may ship waste. To obtain specific disposal instructions, coordinate with the Installation Environmental Office. Refer to location special requirements for the Installation Point of Contact information.

3.8.4 Releases/Spills of Oil and Hazardous Substances

3.8.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, the Engineer.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Owner

3.8.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Owner for costs incurred including sample analysis materials, clothing, equipment, and labor if the Owner will initiate its own spill cleanup procedures, for Contractor- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Engineer judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.8.5 Mercury Materials

Immediately report to the Environmental Office and the Engineer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Engineer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.8.6 Wastewater

3.8.6.1 Disposal of Wastewater

Disposal of wastewater must be as specified below.

3.8.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related waste water off-Owner property in accordance with Federal, state, regional, and local laws and regulations.

3.8.6.1.2 Surface Discharge

For discharge of ground water, Surface discharge in accordance with federal, state, and local laws and regulations.

3.9 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto the property that does not directly relate to requirements for the performance of this contract. Submit an SDS and estimated quantities to be used for each hazardous material to the Engineer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261 and state and installation requirements.

3.10 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.11 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, stormwater ditches or canals, or navigable waters of the United States.

3.11.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.11.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a Spill Prevention Control and Countermeasure (SPCC) plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Engineer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.12 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Engineer. Do not disturb this material until authorized by the Engineer.

3.13 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Engineer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

-- End of Section --

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 78 00

CLOSEOUT SUBMITTALS

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SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 As-Built Drawings

As-built drawings are the marked-up drawings, maintained by the Contractor on-site, that depict actual conditions and deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to submitted Requests for Information (RFI's); direction from the Contracting Officer; design that is the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as[red-lined hard copies on site]. These files serve as the basis for the creation of the record drawings.

1.1.2 Record Drawings

The record drawings are the final compilation of actual conditions reflected in the as-built drawings.

1.2 SOURCE DRAWING FILES

Request the full set of electronic drawings, in the source format, for Record Drawing preparation, after award and at least 30 days prior to required use.

1.2.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction [drawings and]data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CAD drawing files are not construction documents. Differences may exist between the CAD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CAD files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing files does not relieve the

Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction [drawings and]data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranties

SD-08 Manufacturer's Instructions

Posted Instructions

SD-11 Closeout Submittals

Record Drawings

Warranted Equipment and Materials

1.4 Payment

No separate payment will be made for record drawings required under this contract, and all costs accrued in connection with such drawings are considered a subsidiary obligation of the Contractor.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 RECORD DRAWINGS

Drawings showing final as-built conditions of the project. This paragraph covers record drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working record drawings" and "final record drawings" refer to contract drawings which are revised to be used for final record drawings showing as-built conditions. The final CAD record drawings must consist of one set of electronic CAD drawing files in the specified format, 2 sets of prints, and one set of the approved working Record drawings.

3.1.1 Markup Guidelines

Make comments and markup the drawings complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where item(s) were relocated and change related details. These working as-built markup prints must be neat, legible and accurate as follows:

a. Use base colors of red, green, and blue. Color code for changes as follows:

(1) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

(2) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.

(3) Additions (Green) - Added items, lettering in notes and leaders.

b. Provide a legend if colors other than the "base" colors of red, green, and blue are used.

c. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.

d. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.

e. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.

f. Wherever a revision is made, also make changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.

g. For deletions, cross out all features, data and captions that relate to that revision.

h. For changes on small-scale drawings and in restricted areas, provide large-scale inserts, with leaders to the applicable location.

i. Indicate one of the following when attaching a print or sketch to a markup print:

1) Add an entire drawing to contract drawings

2) Change the contract drawing to show changes on the drawing.

3) Provided for reference only to further detail the initial design.

j. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 Working Record and Final Drawings

Revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings as listed in the Contractor Quality Control Plan (as appropriate for the project). The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Engineer and the Contractor prior to submission of pay estimates. If the Contractor fails to maintain the working and final record drawings as specified herein, the Owner will deduct from payments an amount representing the estimated cost of maintaining the record drawings. This deduction will continue until an agreement can be reached between the Owner and the Contractor regarding the accuracy and completeness of updated drawings.

Show on the as-built drawings, but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface items. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the alignment from a reference point. Also record the average depth below the surface of each run.

b. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

c. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, and foundations.

d. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

e. Changes or Revisions which result from the final inspection.

f. Where contract drawings or specifications present options, show only the option selected for construction on the working as-built markup drawings.

g. If borrow material for this project is from sources on Owner property, or if Owner property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.

j. Systems designed or enhanced by the Contractor.

k. Changes in location of structures and site features.

l. Modifications.

m. Actual location of anchors, construction and control joints, etc., in concrete.

n. Unusual or uncharted obstructions that are encountered in the contract work area during construction.

o. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

3.1.3 Drawing Preparation

Modify the record drawings as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project and must be returned to the Owner after approval by the Engineer. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Owner.

3.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only employ personnel proficient in the preparation of CADD drawings to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CADD files. The Contractor will be furnished "as-designed" drawings in AutoCad Civil 3D 2011 format compatible with a Windows operating system. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). Provide all program files and hardware necessary to prepare final record drawings. Engineer will review final record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

a. Provide CADD "base" colors of red, green, and blue. Color code for changes as follows:

   (1) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.

   (2) Additions (Green) - Added items, lettering in notes and leaders.

   (3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

b. Rename the Contract Drawing files in a manner related to the contract number as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. All changes shall be made on the layer/level as the original item.

c. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Mark all other contract drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date original contract drawings in the revision block.

d. Within 10 days after Engineer approval of all of the working record drawings for the project work, prepare the final CADD record drawings and submit two sets of blue-lined prints of these drawings for Engineer review and approval. The Engineer will promptly return one set of prints annotated with any necessary corrections. Within 7 days, revise the CADD files accordingly at no additional cost and submit the final record drawing package for the project. Submit one set of electronic files on compact disc, read-only memory (CD-ROM), two sets of blue-line prints and one set of the approved working record drawings. They must be complete in all details and identical in form and function to the contract drawing files supplied by theEngineer. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Engineer reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Owner upon final approval. Failure to submit final record drawing files and marked prints as specified will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made to the Contractor.

3.2 CLEANUP

SPECIFIC CLEANUP TO BE ADDED AFTER 50% DESIGN

-- End of Section --

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EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

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SECTION 02 61 13

EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

All excavation and removal of waste materials (municipal landfill materials and contaminated soil) shall be in accordance with these specifications and in accordance with the lines, grades, and elevations shown on the Drawings or as established by the Engineer.

Work related to excavation and removal of waste materials shall consist of performing all operations necessary to excavate (or remove as specified), grade and satisfactorily dispose of all materials encountered during excavation of the Eatonvile Landfill slope and other areas as indicated on the Drawings.

The Contractor is responsible for coordinating and completing all hazardous material testing needed for disposal at an authorized facility. The Contractor shall submit test results to Engineer.

1.2 MEASUREMENT AND PAYMENT

1.2.1 Measurement

Base measurement for excavation and onsite transportation on the actual number of cubic yards of contaminated material in-place prior to excavation. Base determination of the volume of contaminated material excavated on cross-sectional volume determination reflecting the differential between the original elevations of the top of the contaminated material and the final elevations after removal of the contaminated material. Base measurement for backfilling of excavated areas on in-place cubic yards of compacted fill. Base measurement for construction of stockpile areas on the number of square yards of stockpile liner constructed.

1.2.2 Payment

1.2.2.1 Excavation and Transportation

Compensation for excavation and onsite transportation of contaminated material will be paid as a unit cost. Include sampling and any other items incidental to excavation and handling not defined as having a specific unit cost.

1.2.2.2 Backfilling

Compensation for backfill soil, transportation of backfill, backfill soil conditioning, backfilling, compaction, and geotechnical testing will be paid as a single unit cost.

1.2.2.3 Stockpiling

Compensation for construction of stockpile areas will be paid for as a unit cost. Include all aspects of grading, preparation, handling, placement, maintenance, removal, treatment, and disposal of stockpile cover materials and liner materials and all other items incidental to construction of stockpiles in the unit cost.

1.2.3 Unit of Measure

Upland Waste Removal: CY
Wetland Waste Removal: CY

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D698	(2012; E 2014; E 2015) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2167	(2015) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2487	(2017; E 2020) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D5434	(2012) Field Logging of Subsurface Explorations of Soil and Rock
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D7928	(2017) Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 302	Designation, Reportable Quantities, and Notification

1.4 SUBMITTALS

Engineer approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Work Plan

SD-02 Shop Drawings

Surveys

SD-06 Test Reports

Compaction

Closure Report

1.5 REGULATORY REQUIREMENTS

1.5.1 Permits and Licenses

Obtain required federal, state, and local permits for excavation and storage of contaminated material. Obtain permits at no additional cost to the Government.

1.5.2 Air Emissions

Monitor and control air emissions in accordance with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

PART 2 PRODUCTS

2.1 SPILL RESPONSE MATERIALS

Provide appropriate spill response materials including, but not limited to the following: containers, adsorbents, shovels, and personal protective equipment. Make spill response materials available at all times when contaminated materials/wastes are being handled or transported. Provide spill response materials that are compatible with the type of materials and contaminants being handled.

2.2 BACKFILL

Obtain backfill material from [the location indicated on the drawings] offsite sources approved by the Engineer. Classify backfill in accordance with ASTM D2487 as GW, GP, GM, GC, SW, SP, SM, SC, ML, MH, CL, or CH. Provide backfill that is free from roots and other organic matter, trash, debris, snow, ice or frozen materials. Test backfill material for the parameters listed below at a frequency of once per [3000] [_____] cubic yards. Perform a minimum of one set of classification tests per borrow source. Also collect and test [one] [_____] backfill sample per borrow source for the chemical parameters listed below.

Physical Parameter	Criteria	Test Method
Grain Size	[_____]	ASTM D7928
Compaction	[_____]	ASTM D698
[_____]	[_____]	[_____]

Chemical Parameter	Test Frequency	Criteria
[_____]	[_____]	[_____]

Do not use material for backfill until borrow source chemical and physical test results have been submitted and approved.

PART 3 EXECUTION

3.1 SURVEYS

Perform surveys immediately prior to and after excavation of contaminated material to determine the volume of contaminated material removed. Also, perform surveys immediately after backfill of each excavation. Provide cross-sections on [25] [_____] foot intervals and at break points for all excavated areas. Survey and show locations of confirmation samples on the drawings. Perform surveys in accordance with Section: [_____].

3.2 EXISTING STRUCTURES AND UTILITIES

Do not perform e excavation until site utilities have been field located. Take the necessary precautions to ensure no damage occurs to existing structures and utilities. Repair damage to existing structures and utilities resulting from the Contractor's operations at no additional cost to the Government. Do not disturb utilities encountered that were not previously shown or otherwise located without approval from the Contracting Officer.

3.3 CLEARING

Perform clearing to the limits shown on the drawings in accordance with Section 31 11 00 CLEARING AND GRUBBING.

3.4 CONTAMINATED MATERIAL REMOVAL

3.4.1 Excavation

Excavate areas of contamination to the depth and extent shown on the drawings and not more than [0.2] [_____] ft beyond the depth and extent shown on the drawings unless directed by the Contracting Officer. Perform excavation in a manner that will limit spills and the potential for contaminated material to be mixed with uncontaminated material. Maintain an excavation log describing visible signs of contamination encountered for each area of excavation. Prepare excavation logs in accordance with ASTM D5434.

3.4.2 Shoring

If workers must enter the excavation, evaluate, shore, slope or brace it as required by EM 385-1-1 and 29 CFR 1926 section 650.

3.4.3 Dewatering

Divert surface water to prevent entry into the excavation. Limit dewatering to that necessary to assure adequate access, a safe excavation, prevent the spread of contamination, and to ensure that compaction requirements can be met. Do not perform dewatering without prior approval of the Contracting Officer.

3.5 CONFIRMATION SAMPLING AND ANALYSIS

The Contracting Officer will be present to inspect the removal of contaminated material from each site. After all material suspected of being contaminated has been removed, examine the excavation for evidence of contamination. If the excavation appears to be free of contamination, use field analysis to determine the presence of [_____] contamination using [a real time vapor monitoring instrument] [immunoassay field kits] [_____]. Excavate additional material as directed by the Contracting Officer. After all suspected contaminated material is removed, collect confirmation samples and analyze for the following contaminants:

Chemical Parameter	Action Level
[_____]	[_____]

Collect samples at a frequency of one per [_____] square yards from the bottom [and each of the side walls] or as directed by the Contracting Officer. Collect a minimum of one sample from the bottom [and each side wall] of the excavation. Based on test results, propose any additional excavation which may be required to remove material which is contaminated above action levels. Additional excavation is subject to approval by the Contracting Officer. Mark locations of samples in the field and document on the as-built drawings.

3.6 CONTAMINATED MATERIAL STORAGE

Place material in temporary storage [immediately after excavation] [after treatment while awaiting test results]. The following paragraphs describe acceptable methods of material storage. Provide storage units that are in good condition and constructed of materials that are compatible with the material or liquid to be stored. If multiple storage units are required, clearly label each unit with an identification number and keep a written log to track the source of contaminated material in each temporary storage unit.

3.6.1 Stockpiles

Construct stockpiles to isolate stored contaminated material from the environment. Stockpile size greater than [_____] cubic yards is prohibited. Construct stockpiles to include:

a. [A chemically resistant geomembrane liner free of holes and other damage. Provide non-reinforced geomembrane liners that have a minimum thickness of [20] [_____] mils. Provide scrim reinforced geomembrane liners that have a minimum weight of 40 lbs/1000 square feet. Place the geomembrane on a ground surface that is free of rocks greater than 0.5 inches in diameter and any other object which could damage the membrane.] [Use pavement as the liner system. Construct pavement in accordance with Section [_____]].

b. Geomembrane cover free of holes or other damage to prevent precipitation from entering the stockpile. Provide non-reinforced geomembrane covers that have a minimum thickness of 10 mils. Provide scrim reinforced geomembrane covers that have a minimum weight of 26 lbs/1000 square feet. Extend the cover material over the berms and anchor or ballast to prevent it from being removed or damaged by wind.

c. Berms surrounding the stockpile, a minimum of 12 inches in height. Berm vehicle access points.

d. Slope the liner system to allow collection of leachate. Storage and removal of liquid which collects in the stockpile, in accordance with paragraph Liquid Storage.

3.6.2 Roll-Off Units

Use water-tight roll-off units used to temporarily store contaminated material. Place a cover over the units to prevent precipitation from contacting the stored material. Locate the units [as shown on the drawings] [_____]. Remove liquid which collects inside the units and store in accordance with paragraph Liquid Storage.

3.6.3 Liquid Storage

Temporarily store liquid collected from excavations and stockpiles in [55 gallon barrels] [[500] [_____] gallon tanks]. Provide water-tight liquid storage containers and locate [as indicated] [_____].

3.7 SAMPLING

3.7.1 Sampling of Stored Material

Collect samples of stored material at a frequency of once per [_____] cubic yards. Test samples for the following:

Chemical Parameter	Action Level
[_____]	[_____]

Treat stored material with contaminant levels that exceed the action levels [offsite. Analyses for contaminated material to be taken to an offsite treatment facility must conform to local, state, and federal criteria as well as to the requirements of the treatment facility. Furnish documentation of all analyses performed to the Contracting Officer. Additional sampling and analyses to the extent required by the approved offsite treatment, storage or disposal (TSD) facility is the responsibility of the Contractor and must be [performed at no additional cost to the Government] [subject to approval by the Contracting Officer].] [onsite. Perform treatment in accordance with Section [_____].]

3.7.2 Sampling Liquid

Sample liquid collected from [excavations] [storage areas] [decontamination facilities] a frequency of once for every [500] [_____] gal of liquid collected. Test samples for the following:

Chemical Parameter	Action Level
[_____]	[_____]

Treat liquid with contaminant levels that exceed action levels [offsite. Analyses for contaminated liquid to be taken to an offsite treatment facility must conform to local, state, and federal criteria as well as to the requirements of the treatment facility. Furnish documentation of all analyses performed to the Contracting Officer. Additional sampling and analysis to the extent required by the approved offsite treatment, storage or disposal (TSD) facility receiving the material is the responsibility of the Contractor and must be [performed at no additional cost to the Government] [subject to approval by the Contracting Officer].] [onsite. Perform treatment accordance with Section [_____].]

3.7.3 Sampling Beneath Storage Units

Collect samples from beneath each storage unit prior to construction of and after removal of the storage unit. Collect samples at a frequency of one per each [_____] square yards from a depth interval of [0 to 0.5] [_____] feet and test for the following:

Chemical Parameter	Action Level
[_____]	[_____]

Based on test results, remove soil which has become contaminated above action levels at no additional cost to the Government. Handle contaminated material which is removed from beneath the storage unit in accordance with paragraph Sampling of Stored Material. As directed by the Contracting Officer and at no additional cost to the Government, perform additional sampling and testing to verify areas of contamination found beneath stockpiles have been cleaned up to below action levels.

3.8 SPILLS

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), pollutant, contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), notify the Contracting Officer immediately. If the spill exceeds the reporting threshold, follow the pre-established procedures as described in the [RCRA Contingency Plan] [Base Wide Contingency Plan] [_____] for immediate reporting and containment. Take immediate containment actions to minimize the effect of any spill or leak. Perform cleanup in accordance with applicable federal, state, and local regulations. As directed by the Contracting Officer, perform additional sampling and testing to verify spills have been cleaned up. Perform spill cleanup and testing at no additional cost to the Government.

3.9 BACKFILLING

3.9.1 Confirmation Test Results

Backfill excavations immediately after all contaminated materials have been removed and confirmation test results have been approved. Place and compact backfill to the lines and grades shown on the drawings.

3.9.2 Compaction

Place approved backfill in lifts with a maximum loose thickness of [8] [_____] inches. Compact soil to [90] [_____] percent of [ASTM D698] [ASTM D1557] maximum dry density. Perform density tests at a frequency of once per [10,000] [_____] square feet per lift. conduct a minimum of [one density test] [[_____] density tests] on each lift of backfill placed. Determine field in-place dry density in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938. If ASTM D6938 is used, check a minimum of one in ten tests using ASTM D1556/D1556M or ASTM D2167. Test results from ASTM D1556/D1556M or ASTM D2167 will govern if there is a discrepancy with the ASTM D6938 test results.

3.10 DISPOSAL REQUIREMENTS

SPECIFIC DISPOSAL REQUIREMENTS TO BE ADDED

Perform offsite disposal of contaminated material in accordance with Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

3.11 CLOSURE REPORT

Submit [_____] copies of a Closure Report within [14] [_____] calendar days of completing work at the site. Label the report with the contract number, project name, location, date, name of general Contractor, and the Corps of Engineers District contracting for the work. As a minimum, include the following information:

a. A cover letter signed by a [responsible company official] [Professional Engineer registered in the State of [_____] who is a responsible company official] certifying that all services involved have been performed in accordance with the terms and conditions of the contract documents and regulatory requirements.

b. A narrative report including, but not limited to, the following:

   (1) site conditions, ground water elevation, and cleanup criteria;

   (2) excavation logs;

   (3) field screening readings;

   (4) quantity of materials removed from each area of contamination;

   (5) quantity of water/product removed during dewatering;

   (6) sampling locations and sampling methods;

   (7) sample collection data such as time of collection and method of preservation;

(8) sample chain-of-custody forms; and

(9) source of backfill.

c. Copies of all chemical and physical test results.

d. Copies of all manifests and land disposal restriction notifications.

e. Copies of all certifications of final disposal signed by the responsible disposal facility official.

f. Waste profile sheets.

g. Scale drawings showing limits of each excavation, limits of contamination, known underground utilities within 50 feet of excavation, sample locations, and sample identification numbers. Show on-site stockpile, storage, treatment, loading, and disposal areas on the drawings.

h. Progress Photographs. Use color photographs to document progress of the work. Take a minimum of four views of the site showing the location of the area of contamination, entrance/exit road, and any other notable site conditions before work begins. After work has been started, photographically record [daily] [weekly] activities at each work location. Provide photographs that are a minimum of 3 by 5 inches and include:

(1) Soil removal and sampling.

(2) Dewatering operations.

(3) Unanticipated events such as spills and the discovery of additional contaminated material.

(4) Contaminated material/water storage, handling, treatment, and transport.

(5) Site or task-specific employee respiratory and personal protection.

(6) Fill placement and grading.

(7) Post-construction photographs. After completion of work at each site, take a minimum of four views of each excavation site.

Include a digital version of all photos shown in the report with the Closure Report. Provide photographs that are a minimum of 3 inches by 5 inches and mount back-to-back in double face plastic sleeves punched to fit standard three ring binders. Attach an information box to each print. Arrange the typewritten box as follows:

Project Name:	Direction of View:
Location:	Date/Time:
Photograph No.:	Description of View:

-- End of Section --

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DIVISION 02 - EXISTING CONDITIONS

SECTION 02 66 13

SELECT FILL AND TOPSOIL FOR LANDFILL COVER

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SECTION 02 66 13

SELECT FILL AND TOPSOIL FOR LANDFILL COVER

PART 1 GENERAL

1.1 UNIT PRICES

Base measurement and payment for "select fill" and "topsoil" on the respective unit prices for each cubic yard of "select fill" and "topsoil" in place. Include the cost for development of borrow sources, cost of materials, excavation, hauling, equipment, placement, testing, and other work required to construct the "select fill" or "topsoil" layers in the unit cost.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D698	(2012; E 2014; E 2015) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D2167	(2015) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2216	(2019) Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2487	(2017; E 2020) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2974	(2020; E 2020) Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4972	(2018) Standard Test Methods for pH of Soils
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and

	Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D7928	(2017) Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

1.3 SUBMITTALS

Engineer approval is required for all submittals.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials Handling Plan

SD-04 Samples

Select Fill

Topsoil

SD-06 Test Reports

Borrow Source Assessment Report

Select Fill and Topsoil Material Tests

Moisture Content and Density Tests of In-Place Select Fill

PART 2 PRODUCTS

2.1 Select Fill

Provide select fill in compliance with the criteria listed in Table 1 and free of debris, frozen materials, angular rocks, roots, and organics. Submit a minimum of 50 pounds of select fill from each proposed borrow source to the Government's designated laboratory at least [15] [_____] days prior to placement.

2.2 TOPSOIL

Provide topsoil consisting of natural, friable soil that is representative of soils in the vicinity which produce heavy growths of crops, grass, or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plant growth or be a hindrance to grading, planting, or maintenance operations. Submit a minimum of 5 pounds of topsoil from each proposed borrow source to the Government's designated laboratory at least [15] [_____] days prior to placement. Also, provide topsoil complying with the criteria listed in Table 1.

3 way mix weed free topsoil
All site soil chemicals of concern below CUL's.
Placed 6 to 12 thick.
Secured on steep slopes.

TABLE 1
REQUIRED PHYSICAL PROPERTIES OF SELECT FILL AND TOPSOIL

Property	Test Value	Test Method
Select Fill		
Soil classification	Lean clay (CL) Clayey sand (SC) Clayey gravel (GC) [_____]	ASTM D2487
Max. particle size (inches)	1.0 [_____]	ASTM D7928
Max. particle size (inches)	1	ASTM D7928
pH	5-7	ASTM D4972
Organic content (percent)	5-20	ASTM D2974

2.3 EQUIPMENT

Use equipment to place the select fill and topsoil layers as described in the approved Materials Handling Plan, including ground pressures. Do not use equipment that accelerates or brakes suddenly, turns sharply, or operates at speeds exceeding 5.0 miles per hour.

PART 3 EXECUTION

3.1 BORROW SOURCE ASSESSMENT REPORT

Submit a Borrow Source Assessment Report at least [15] [_____] days prior to select fill and topsoil placement. No select fill or topsoil may be placed until the Borrow Source Assessment Report is approved. Include the following in the report: location of each borrow source; estimated quantity of borrow available; logs of subsurface explorations; and laboratory test results.

3.1.1 Select Fill

3.1.1.1 Classification Testing

Perform borrow source assessment tests on each principal type or combination of materials proposed for use in the select fill layer to ensure compliance with specified requirements. Perform at least one set of borrow assessment tests on each borrow source proposed for use. A set of borrow source assessment tests consists of Atterberg limits (ASTM D4318), particle size analysis (ASTM D7928), and moisture content (ASTM D2216). Based on borrow source assessment testing, classify soils in accordance with ASTM D2487.

3.1.1.2 Moisture-Density (Compaction) Testing

Test a representative sample from each principal type or combination of borrow materials to establish compaction curves using ASTM D698. Perfrom at least one compaction test on each borrow source proposed. Use a minimum of [5] [_____] points to develop each compaction curve. During construction, conform to the following requirements for placement of select fill:

a. Minimum allowable dry density less than [90] [_____] percent of maximum dry density is not acceptable.

b. The allowable moisture content range must be [+/- 3] [_____] percent of optimum.

3.1.2 Topsoil

Perform testing representative samples of each principal type or combination of topsoil materials. Perform at least one set of tests on each borrow source proposed. Perform testing consisting of the determination of maximum particle size in accordance with ASTM D7928, pH in accordance with ASTM D4972, and organic content in accordance with ASTM D2974.

3.1.3 Chemical Contamination Testing

Use borrow for the select fill and topsoil layers that is free of contamination. Sample and analyze each proposed borrow source for chemical contamination in accordance with [_____].

3.2 INSTALLATION

3.2.1 Select Fill Placement

On slopes, place select fill from the bottom of the slope upward.

3.2.1.1 Subsequent Lifts of Select Fill

Loose lift thickness of each subsequent lift greater than [8][12] inches is unacceptable.

3.2.2 Topsoil Placement

Do not place topsoil when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading. Place topsoil in one lift and evenly spread to a final compacted thickness of [6] [_____] inches. Traffic compact topsoil using approved placement equipment. On slopes, place topsoil from the bottom of the slope upward.

3.3 CONSTRUCTION TOLERANCES

Provide finished surfaces that are uniformly graded and free from depressions, mounds, or windrows. Top surfaces of the select fill layer and topsoil layer greater than [3] [_____] inches above the lines and grades shown on the drawings are prohibited. No minus tolerance will be permitted. Do not drive rigid grade stakes into the select fill layer to control placement.

3.4 CONSTRUCTION TESTS

3.4.1 Select Fill and Topsoil Material Tests

Do not place select fill or topsoil until the Borrow Source Assessment

Report is approved. During construction of the select fill layer, take representative samples for testing at the frequencies listed in Table 2 from the borrow source prior to placement. Test results must comply with the requirements listed in Part 2 Products or the material will be rejected for use. Submit test results as specified.

TABLE 2
SELECT FILL AND TOPSOIL MATERIAL TESTING FREQUENCIES

Property	Frequency	Test Method
Select Fill		
Grain size analysis	2,000 cubic yards	ASTM D7928
Atterberg limits	2,000 cubic yards	ASTM D4318
Compaction (Note 1)	5,200 cubic yards	ASTM D698
Topsoil		
Grain size analysis for maximum particle size	2,000 cubic yards	ASTM D7928
pH	2,000 cubic yards	ASTM D4972
Organic content	2,000 cubic yards	ASTM D2974
Note 1: Compare compaction test results with the results obtained during the borrow source assessment. When there are significant differences, adjustments to the acceptable moisture content or density ranges must be proposed by the Contractor for approval.		

3.4.2 Moisture Content and Density Tests of In-Place Select Fill

Perform moisture content and density tests in accordance with Table 3. Density requirements will not be enforced for the first lift of the select fill layer. Submit test results as specified.

TABLE 3
MOISTURE CONTENT AND DENSITY TESTS OF IN-PLACE SELECT FILL

Property	Frequency per Lift	Test Method
Nuclear moisture content	10,000 square feet	ASTM D6938
Standard moisture content	1 for every 20 nuclear tests	ASTM D2216

TABLE 3 MOISTURE CONTENT AND DENSITY TESTS OF IN-PLACE SELECT FILL		
Nuclear density	10,000 square feet	ASTM D6938
Standard density	1 for every 20 nuclear tests	ASTM D1556/D1556M or ASTM D2167

3.4.2.1 Test Frequencies and Locations

Each day that select fill is placed, perform a minimum of one set of standard moisture content and density tests. Check nuclear density and moisture content tests at the frequencies shown in Table 3. Perform standard tests at locations which are as close as possible to the locations of the nuclear tests being checked.

3.4.2.2 Nuclear Density and Moisture Content Tests

Take nuclear density readings in the direct transmission mode. When ASTM D6938 is used, check and adjust the calibration curves using only the sand cone method as described in ASTM D1556/D1556M. ASTM D6938 results in a wet unit weight of soil and when using this method, use ASTM D6938 to determine the moisture content of the soil. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938; make the calibration checks of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer.

3.4.2.3 Test Results

Compare field moisture content and density test results to the compaction curve for the appropriate material type being tested. If test results are not within the acceptable range for moisture content or density, as described in subparagraph Moisture-Density (Compaction) Testing, perform [3] [_____] additional tests near the location of the failed parameter. If all retests pass, take no additional action. If any of the retests fail, repair the lift of soil out to the limits defined by passing tests for that parameter. Retest the area as directed.

3.5 PROTECTION

3.5.1 Damage

Repair erosion rills or other damage that occurs and re-establish grades. Document repairs to the select fill layer or topsoil layer including location and volume of soil affected, corrective action taken, and results of retests.

3.5.2 Stockpiles

Storage or stockpiling of material on the completed surface of the select fill or topsoil layers will not be permitted.

-- End of Section --

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DIVISION 31 - EARTHWORK

SECTION 31 00 00

EARTHWORK

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SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 WORK DESCRIPTION

All earthwork, including excavation, embankment, and grading shall be in accordance with these sepcifications and in accordance with the lines, grades, and elevations shown on the drawings or as established by the Engineer.

Excavation work shall consist of performing all operations necessary to excavate, grade, and satisfactory dispose of all unsuitable materials encountered during excavation of the site as indicated on the Drawings. The work shall include excavation of clean soil (not considered landfill waste material or contaminated soil), appropriate disposal or placment of unsuitable soils, borrow excavation, construction access road excavation, borrow source excavation, and all other excavation not covered under other sections of these specifications.

Embankment work required under this contract shall consist of performing all operations necessary to prepare, backfill, compact, and grade all areas requiring embankment or fill as shown in the drawings. This work includes slope embankment, roadway embankment, and all other backfilling or embankment not covered under other sections of these specifications.

1.2 MEASUREMENT PROCEDURES

1.2.1 Excavation

The unit of measurement for excavation and borrow will be the cubic yard, computed by the average end area method from cross sections taken before and after the excavation and borrow operations, including the excavation for ditches, when the material is acceptably utilized or disposed of as herein specified. The measurements will include authorized excavation of rock (except for piping trenches that is covered below), authorized excavation of unsatisfactory subgrade soil, and the volume of loose, scattered rocks and boulders collected within the limits of the work; allowance will be made on the same basis for selected backfill ordered as replacement. The measurement will not include the volume of subgrade material or other material that is scarified or plowed and reused in-place, and will not include the volume excavated without authorization or the volume of any material used for purposes other than directed. The volume of overburden and the volume of excavation for ditches to drain borrow pits, unless used as borrow material, will not be measured for payment. The measurement will not include the volume of any excavation performed prior to the taking of elevations and measurements of the undisturbed grade.

1.2.2 Topsoil Requirements

Separate excavation, hauling, and spreading or piling of topsoil and related miscellaneous operations will be considered subsidiary obligations of the Contractor, covered under the contract unit price for excavation.

1.2.3 Select Granular Material

Measure select granular material in place as the actual cubic yards replacing wet or unstable material in trench bottoms within the limits shown. Provide unit prices which include furnishing and placing the granular material, excavation and disposal of unsatisfactory material, and additional requirements for sheeting and bracing, pumping, bailing, cleaning, and other incidentals necessary to complete the work.

1.3 PAYMENT PROCEDURES

Payment will constitute full compensation for all labor, equipment, tools, supplies, and incidentals necessary to complete the work.

1.4 UNIT OF MEASURE

The unit of measure for each pay item will be as follows:
Clean Soil (Cut and Grading): Cubic Yard (CY)
Clean Soil (Fill and Grading): Cubic Yard (CY)
Aggregate (3/4 inch): Ton
Rock Chute Riprap (D50 = 10): Cubic Yard (CY)

1.5 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM INTERNATIONAL (ASTM)

ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D698	(2012; E 2014; E 2015) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2216	(2019) Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846.3-3	(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.6 DEFINITIONS

1.6.1 Structural Fill

Soil material placed to support buildings, walls, pads, and other similar facilities.

1.6.2 Embankment Fill

Soil material placed to construct embankment.

1.6.3 Porous Fill

Free-draining material placed for subsurface drainage, as a capillary break, or another specific purpose.

1.6.4 Topsoil

Surface layer of primarily organic soil capable of supporting vegetation growth.

1.6.5 Utility Bedding Material

Fill placed to directly support pipes, conduits, cables, and appurtenant structures. Bedding may also be used to provide a cushion between utilities and bedrock, obstacles, obstructions and other unyielding materials.

1.6.6 Satisfactory Materials

Material generated on-site from excavation that have been screened to remove waste material and organics and tested for contamination by the Engineer shall be considered satisfactory. Satisfactory materials may contain stones less than 8 inches.

1.6.7 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; roots and other organic matter or frozen material. Notify the Engineer when encountering any contaminated materials.

1.6.8 Unstable Material

Unstable materials are too weak to adequately support the utility pipe, conduit, equipment, or appurtenant structure. Satisfactory material may become unstable due to ineffective drainage, dewatering, becoming frozen, excessive loading.

1.6.9 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.6.10 Capillary Water Barrier

A layer of clean, poorly graded crushed rock, stone, or natural sand or gravel having a high porosity which is placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below a slab.

1.6.11 Degree of Compaction (Proctor)

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557 or ASTM D698 abbreviated as a percent of laboratory maximum density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180-21 paragraph 1.5, Note 1.

1.6.12 Degree of Compaction (Relative Density)

Degree of compaction required for soils with less than 5 percent passing the No. 200 sieve, is expressed as a relative percentage of the maximum index density/dry unit weight and minimum index density/dry unit weight, obtained by the test procedures in accordance with ASTM D4253 and ASTM D4254, respectively, abbreviated as a percent of laboratory relative density.

1.6.13 Borrow

Soil brought to the project site from an external location for the purposes of project construction.

1.6.14 Subgrade

Earth materials directly below foundations and directly below granular base materials in building slab and pavement areas including shoulders.

1.7 SUBMITTALS

Engineer approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Excavation and Trenching Plan

Borrow Plan

SD-06 Test Reports

Material Test Report

Borrow Site Testing

1.8 QUALITY CONTROL

1.8.1 Geotechnical Engineer

Provide a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer is responsible for preparing and updating the Excavation and Trenching Plan and Dewatering Work Plan as construction progresses to reflect changing conditions and submit an updated plan if necessary. Submit a monthly Geotechnical Evaluation report, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Contractor is responsible for arranging meetings with the Geotechnical Engineer and Contracting Officer throughout the contract duration.

1.8.2 Qualified Technician

Provide a Qualified Technician to inspect, monitor, sample, and performing field testing. The technician qualifications need to be one of the following: a current National Institute for Certification in Engineering Technologies (NICET) Level II minimum certification in Construction Materials Testing Soils; a Geologist-in-Training with minimum one-year experience; an Engineer-in-Training with minimum one-year experience; a Registered Geologist; or a Professional Engineer.

1.8.3 Lab Validation

Perform testing by a Corps validated commercial testing laboratory or Contractor established testing laboratory meeting the requirements of Section 01 45 00 (or similar number) entitled QUALITY CONTROL and approved by the Contracting Officer. Submit testing laboratory validation for the testing to be performed. Do not permit work requiring testing until testing facilities have been inspected, Corps validated and approved by the Contracting Officer.

1.8.4 Preconstruction Meeting

Conduct a preconstruction meeting at the jobsite at least five business days prior to the start of earthwork operations on the project. The preconstruction meeting is to be arranged by the Contractor and is to follow the written agenda submitted prior to the meeting. The purpose of this meeting is to review the requirements of this specification and the associated plans. The following individuals must be in attendance at this meeting: Contractor's Project Manager and Project Superintendent, earthwork subcontractor's Project Manager and Site Foreman, Contractor's Geotechnical Engineer and Testing Agency, Government Geotechnical Engineer and Civil Engineer, and Government Construction Manager and Engineering Technician.

The minutes of this meeting are to be recorded by the Contractor and published via email within 48 hours to all attendees. The minutes must be re-published within 48 hours via email pending any subsequent comments from the attendees.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Embankment Fill

Materials classified as [GW], [GP], [GM], [GC], [GW-GM], [GW-GC], [GP-GM], [GP-GC], [GC-GM], [SW], [SP], [SM], [SW-SM], [SC], [SW-SC], [SP-SM], [SP-SC], [CL], or [CH] in accordance with ASTM D2487. Select material type appropriate for the intended purpose.

2.1.2 Porous Fill

Materials containing less than 5 percent passing the No. 200 sieve. Provide the gradation as appropriate for the intended purpose.

2.1.3 Topsoil

Material suitable for topsoil obtained from [offsite areas] [excavations] [areas indicated on the drawings] is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth.[Amend topsoil pH range to obtain a pH of [5.5 to 7] [_____].][Topsoil material will be in accordance with ASTM D5268.]

2.1.4 Capillary Water Barrier

Conform to ASTM C33/C33M for fine aggregate grading with a maximum of 3 percent by weight passing ASTM D1140, No. 200 sieve,[or][1-1/2 inch and no more than 2 percent by weight passing the No. 4 size sieve][or coarse aggregate Size 57, 67, or 77].

2.1.5 Utility Bedding Material

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with [AWWA C600] [ASTM D2321]. Install bedding for plastic piping to spring line of pipe.[Provide geotextile fabric below bedding layer where indicated.] Utility bedding material may include the following:

2.1.5.1 Class I

Angular, 0.25 to 1.5 inch, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

2.1.5.2 Class II

Coarse sands and gravels with maximum particle size of 1.5 inch, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D2487.

2.1.5.3 Sand

Clean, coarse-grained sand classified as [_____], [gradation [_____] of the [DOT] [State Standard] or [SW] [or] [SP] by ASTM D2487 for [bedding] [and] [backfill] [as indicated]].

2.1.5.4 Gravel and Crushed Stone

Clean, coarsely graded natural gravel, crushed stone or a combination thereof identified as [_____], [gradation [_____] of the [DOT] [State Standard]] or having a classification of [GW] [GP] in accordance with ASTM D2487 for [bedding] [and] [backfill] [as indicated].[Do not exceed maximum particle size of [3] [_____] inches.]

2.2 FLOWABLE FILL

Design and submit flowable fill mix design to consist of Portland cement, fly ash, and/or slag cement and fine aggregate. Include the dry weights of cementitious material(s); quality and gradation of aggregates in the saturated surface-dry weights along with gradation tests; quantities, types, and names of admixtures; and quantity of water per cubic yard. The [minimum] [maximum] unconfined compressive strength to be [_____] [psi] [psf] at [_____] days in accordance with ASTM D4832. The aggregates in accordance with ASTM C33/C33M Fine Aggregates. Air-entrain fill in accordance with ASTM C260/C260M. The air content to be between [8 and 15 percent] in accordance with ASTM D6023. The flow to be between [8 and 12 inches] [_____] in accordance with ASTM D6103/D6103M. Portland cement to be Type I or II in accordance with ASTM C150/C150M. Fly ash to be Class C in accordance with ASTM C618. Provide slag cement in Grade 100 or 120 in accordance with ASTM C989/C989M.

2.3 MATERIAL FOR RIP-RAP

Provide [bedding material][filter fabric] and rock conforming to these requirements for construction indicated.

2.3.1 Bedding Material

Provide bedding material consisting of sand, gravel, or crushed rock, well graded, or poorly graded with a maximum particle size of 2 inches. Compose material of tough, durable particles. Allow fines passing the No. 200 standard sieve with a plasticity index less than [6] [_____].

2.3.2 Rock

Provide rock fragments which ensure permanence in the structure and the environment in which it is to be used. Use rock fragments free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. Provide fragments sized such that no individual fragment exceeds a weight of [150] [_____] pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Provide rock with a minimum specific gravity of [2.50] [_____]. Do not permit the inclusion of more than trace [1 percent] [_____] quantities of dirt, sand, clay and rock fines.

2.4 BORROW

Provide borrow materials from sources located within and/or outside of Ownerproperty meeting the requirements of paragraph [EMBANKMENT FILL] [TOPSOIL].

PART 3 EXECUTION

3.1 PROTECTION

Perform all work specified in accordance with applicable requirements of the Corps of Engineers publication EM 385-1-1 Safety and Health Requirements Manual.[Provide a Geotechnical Engineer to monitor construction activities and to prepare necessary work plans and reports; see paragraph QUALITY CONTROL.]

Use equipment of type and size appropriate for the site conditions (soil character and moisture content). Maintenance of exposed subgrades and fills is the responsibility of the Contractor. The Contractor is required to prevent damage by ineffective drainage, dewatering, and heavy loads and equipment by implementing precautionary measures. Repair or replace any defects or damage.

3.1.1 Underground Utilities

Location of the existing utilities indicated is approximate. Physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor is responsible for protecting utilities from damage during construction.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity [and][or] provide temporary ditches, swales, and other drainage features and equipment as required to keep soils from becoming unstable, prevent erosion, or undermining of foundations. Remove unstable material from working platforms for equipment operation and soil support for subsequent construction features and provide new material as specified herein. It is the responsibility of the Contractor to assess the site conditions to employ necessary measures to permit construction to proceed.

3.1.2.2 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches are not allowed within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Perform control measures by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, maintain the water level continuously, at least [_____] feet below the working level.[Submit a Dewatering Work Plan outlining procedures for accomplishing dewatering work.][Operate dewatering system continuously until construction work below existing water levels is complete. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system. Submit dewatering performance records weekly.]

3.1.3 Shoring and Sheeting

Submit an Excavation and Trenching Plan to stabilize features, prevent undermining or unintended horizontal and vertical movement of adjacent structures, and prevent slippage or movement in banks or slopes adjacent to the excavation. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Drawings to include material sizes and types, arrangement of members, and the sequence and method of installation and removal. Calculations are to include data and references used.

3.1.4 Protection of Graded Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.2 BORROW

Select borrow material to meet the requirements and conditions of the fill or embankment for which it is to be used. Obtain borrow material from [the borrow areas shown] [within the limits of the project site, selected by the Contractor] [from approved private sources].[Submit a Borrow Plan that includes materials to be excavated, stockpile locations, proposed slopes, drainage, and closure.] Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval.

3.2.1 Owner Furnished Borrow Area(s)

Obtain approved borrow materials from [_____]. The rights-of-way and earth materials for constructing the work have been furnished, without cost, to the Contractor at locations as [specified] [shown]. Submit a Borrow Plan to the Government of intention to use the specified Government-furnished borrow areas.

3.2.1.1 Stripping and Stockpiling Operations in Borrow Area

Strip in accordance with paragraph STRIPPING. Strip at least 5 feet beyond the limits of the borrow excavation and any stockpiles of fill and embankment materials.

Stockpile materials within the borrow area work limits such that the stockpiles does not interfere with borrow operations. Stockpile borrow material awaiting transport in approved segregated piles. Maintain a minimum of 30 feet between all stockpile toes and the top of the borrow cut.

3.2.1.2 Drainage of Borrow Excavations

Provide adequate drainage of borrow area. Ensure that borrow operations result in minimum detrimental effects on natural environmental conditions.

3.2.1.3 Borrow Area Closure

Complete borrow areas final grading, so that slopes are not steeper than [_____] vertical on [_____] horizontal, except as otherwise indicated. Avoid abrupt changes in grade. Distribute stripped material and stockpiles of unstable materials over the disturbed borrow area, as directed. Final grade the borrow area to drain.

3.2.2 Contractor Furnished Borrow Area(s)

Obtain approved borrow materials from approved offsite sources. If a borrow source is selected that is not a commercial entity from which soil material is directly purchased, submit a Borrow Plan that includes the borrow source location, geotechnical test results showing the fill material meets the Contract requirements, environmental test results in accordance with paragraph ENVIRONMENTAL REQUIREMENTS FOR OFF-SITE SOIL, and any Federal, State, and local permits required for excavation and reclamation of the borrow area.

3.2.3 Environmental Requirements for Off-Site Soil

Test offsite soils brought in for use as backfill for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and full Toxicity Characteristic Leaching Procedure (TCLP) including ignitability, corrosivity and reactivity. Backfill may not contain concentrations above [appropriate State and EPA criteria, and for hazardous waste characteristics] [10] [_____] parts per million (ppm) of total petroleum hydrocarbons (TPH) and [10] [_____] ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and pass the TCLP test. Determine TPH concentrations by using [EPA Method 8015][applicable State TPH Testing Requirements]. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5030/8020/8260B. Perform TCLP in accordance with EPA SW-846.3-3 Method 1311. Perform hazardous waste characteristic tests for ignitability, corrosivity, and reactivity in accordance with accepted standard methods. Perform PCB testing in accordance with accepted standard methods for sampling and analysis of bulk solid samples. Provide borrow site testing for petroleum hydrocarbons and BTEX from a grab sample of material from the area most likely to be contaminated at the borrow site (as indicated by visual or olfactory evidence), with at least one test from each borrow site. Provide borrow site testing for hazardous waste characteristics (TPH, BTEX and TCLP) from a composite sample of material, collected in accordance with standard soil sampling techniques. Do not bring borrow material to project site until Borrow Plan containing environmental test results has been received and approved by the Contracting Officer.

3.3 SURFACE PREPARATION

3.3.1 Clearing and Grubbing

Clear and grub as specified in Section 31 11 00 CLEARING AND GRUBBING.

Remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations. Remove stumps entirely. Grub out matted roots and roots over 3 inches in diameter to at least 18 inches below existing surface.

3.3.2 Stripping

Strip site where indicated on the plans. Strip existing surface materials to a depth of [4] [_____] inches below the existing ground surface in areas designated as Clear and Grub on the plans. Strip existing surficial soils to a depth of [_____] inches in all other areas. Strip in all areas within the planned limits of disturbance. All stripped materials not suitable for reuse as topsoil will be wasted in specified disposal area. Screen all stripped soils to remove roots and organic materials prior disposal.

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Protect topsoil and keep in segregated piles until needed.

3.3.3 Proof Rolling

Perform proof rolling on exposed subgrade that is unfrozen and free of surface water (wet conditions resulting from rainfall).[Notify the Contracting Officer a minimum of three days prior to proof rolling.][Perform proof rolling in the presence of the Contracting Officer.]

[After stripping, excavating, and rough grading to the planned elevation,]proof roll the existing subgrade of all building, pavement and embankment locations with six passes of a [loaded tandem axle dump truck] [15 ton, pneumatic-tired or smooth drum roller]. Operate the [roller] [truck] in a systematic manner to ensure the number of passes over all areas, and at speeds between 2.5 to 3.5 miles per hour. Subgrade materials that exhibit excessive deflection and/or rutting during proof rolling need to be scarified, aerated, and re-compacted to specified density at [plus or minus] [2][_____] percent of optimum moisture content prior to being considered for remedial action by the Contracting Officer. When proof rolling under buildings, the building subgrade is considered to extend 5 feet beyond the building lines, and make one-half of the passes with the roller in a direction perpendicular to the other passes.

3.3.4 Stockpiling Operations

Place and grade stockpiles of satisfactory [and unsatisfactory] [and wasted materials] as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. Do not create stockpiles that could obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.4 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Excavate soil disturbed or weakened by Contractor's operations, and soils softened or made unstable for subsequent construction due to exposure to weather. Use material removed from excavations meeting the specified requirements in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes to minimize surplus material and to minimize additional material to brought on site. Do not excavate below indicated depths except to remove unstable material as determined by the [Government] [Geotechnical Engineer] and confirmed by the Contracting Officer. Remove and replace excavations below the grades shown with appropriate materials as directed by the Contracting Officer.

If at any time during excavation, including excavation from borrow areas, the Contractor encounters material that may be classified as rock or as hard/unyielding material, uncover such material, and notify the Contracting Officer. Do not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow sufficient time for classification and delineation of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

3.4.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown. Do not excavate below grades shown. Backfill excessive excavation as directed by the Contracting Officer, with satisfactory, compacted, material or with suitable stone or cobble to grades shown. Dispose excavated material as shown or as directed. Do not allow material to be deposited within 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.4.2 Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Slope trench walls below the top of the pipe, or make vertical, and of such width as recommended by the manufacturer. Provide vertical trench walls where no manufacturer installation instructions are available. Do not exceed the trench width of 24 inches below the top pipe plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for pipe sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the Government.

3.4.2.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of [_____] inch or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.4.2.2 Removal of Unyielding Material

Where [overdepth is not indicated and]unyielding material is encountered in the bottom of the trench, notify the Engineer. Following approval, remove such material [_____] inch below the required grade and replaced with suitable materials as provided in paragraph FILLING AND COMPACTION.

3.4.2.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with suitable material as provided in paragraph FILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Government.

3.4.2.4 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures [sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members.] [of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown.]

3.4.3 Rock Excavation and Blasting

Excavate rock encountered in the cut section to a depth of 6 inches below finished grade and replace with [satisfactory material] [_____].[Submit a Rock Excavation Plan, prepared and sealed by a registered professional engineer.][Perform blasting in accordance with EM 385-1-1 and in conformance with Federal, State, and local safety regulations. Submit notice 15 days prior to starting work. Submit a Blasting Plan, prepared and sealed by a registered professional engineer that includes calculations for overpressure and debris hazard. Provide blasting mats and use the non-electric blasting caps. Obtain written approval prior to performing any blasting and notify the Contracting Officer 24 hours prior to blasting. Include provisions for storing, handling and transporting explosives as well as for the blasting operations in the plan. The Contractor is responsible for damage caused by blasting operations.][Blasting will not be permitted.]

3.5 SUBGRADE PREPARATION

3.5.1 General Requirements

Shape subgrade to line, grade, and cross section as indicated. Remove unsatisfactory and unstable material in surfaces to receive fill or in excavated areas, [as determined by proof rolling,]and replaced with [satisfactory materials] [structural fill] [_____]. Do not place material on surfaces that are muddy, frozen, contain frost, or otherwise containing unstable material. Scarify the surface to a depth of 4 inches prior to placing fill. Step or bench sloped surfaces steeper than 1 vertical to 4 horizontal prior to scarifying. Place 4 inches of loose fill and blend with scarified material. When subgrade is part fill and part excavation or natural ground, scarify to a depth of 8 inches.

3.5.2 Subgrade Filter Fabric

Place filter fabric as indicated directly on prepared subgrade free of vegetation, stumps, rocks larger than 2 inch diameter and other debris which may puncture or otherwise damage the fabric. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of 3 feet overlap in all directions. Overlap fabric at joints a minimum of 3 feet. Obtain approval of filter fabric installation before placing fill or backfill. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein. Follow manufacturer's recommended installation procedures.

3.6 FILLING AND COMPACTION

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs for SUBGRADE PREPARATION. Do not place material on surfaces that are muddy, frozen, or contain frost. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary [to plus or minus [_____] percent of optimum moisture] [to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used]. Fill and backfill to contours, elevations, and dimensions indicated. Compact and test each lift before placing overlaying lift.

3.6.1 Trench Backfill

Backfill trenches to the grade shown. [Backfill the trench to [_____] feet above the top of pipe prior to performing the required pressure tests. Leave the joints and couplings uncovered during the pressure test.] [Do not backfill the trench until all specified tests are performed.]

3.6.1.1 Replacement of Unyielding Material

Replace unyielding material removed from the bottom of the trench with satisfactory material or initial backfill material.

3.6.1.2 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with satisfactory material placed in layers not exceeding 6 inches loose thickness.

3.6.1.3 Bedding and Initial Backfill

[Provide bedding of the type and thickness shown.]Place initial backfill material and compact it with approved tampers to a height of at least one foot above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except where shown or when specified otherwise in the individual piping section, provide bedding for buried piping in accordance with PART 2 paragraph UTILITY BEDDING MATERIAL. Compact backfill to top of pipe to [95 percent of ASTM D698 maximum density] [85 percent of ASTM D1557]. Provide plastic piping with bedding to spring line of pipe.

3.6.1.4 Final Backfill

Do not begin backfill until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Bring backfill to indicated finish grade. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and one foot above other utility lines need to be free from stones larger than one inch in any dimension. Heavy equipment for spreading and compacting backfill are not to be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; compact remaining area in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Place backfill carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Do not place backfill against foundation walls prior to 7 days after completion of the walls. As far as practicable, bring backfill up evenly on each side of the wall and sloped to drain away from the wall.

3.6.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed[and the concrete has been allowed to cure for [7][_____] days], place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.6.3 Compaction

3.6.3.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to [85] [90] percent of [ASTM D698] [ASTM D1557].

3.6.3.2 Adjacent Areas

Compact areas within 5 feet of structures to 95 percent of [ASTM D698] [ASTM D1557].

3.7 EMBANKMENTS

3.7.1 Earth Embankments

Construct earth embankments from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. Place the material in successive horizontal layers of loose material not more than 8 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise break up each layer; moisten or aerate as necessary; thoroughly mix; and compact to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Backfill and fill material are to be [within the range of minus 2 to plus 2 percent of optimum moisture] [to a moisture content that will readily facilitate obtaining the specified compaction].

Compaction requirements for the upper portion of earth embankments forming subgrade for pavements are identical with those requirements specified in paragraph SUBGRADE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7.2 Rock Embankments

Construct rock embankments from material classified as rock excavation, as defined above, placed in successive horizontal layers of loose material not more than [_____] inch in depth. Do not use pieces of rock larger than [_____] inch in the greatest dimension. Spread each layer of material uniformly, completely saturate, and compact to a minimum density of [_____] pounds per cubic foot. Adequately bond each successive layer of material to the material on which it is placed. Finish compaction with vibratory compactors weighing at least [_____] tons, heavy rubber-tired rollers weighing at least [_____] tons, or steel-wheeled rollers weighing at least [_____] tons.[Do not use rock excavation as fill material for the construction of pavements.][In embankments on which pavements are to be constructed, do not use rock above a point [_____] inch below the surface of the pavement.]

3.8 RIP-RAP CONSTRUCTION

Construct rip-rap [on bedding material] [on filter fabric] [with grout] [in accordance with [DOT] [_____] State Standard, paragraph [_____]] in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.8.1 Bedding Placement

Spread [filter fabric and] bedding material uniformly to a thickness of at least [3] [_____] inches on prepared subgrade as indicated.[Compaction of bedding is not required. Finish bedding to present even surface free from mounds and windrows.]

3.8.2 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.[For grouted rip-rap, hand-place surface rock with open joints to facilitate grouting and do not fill smaller spaces between surface rock with finer material. Provide at least one "weep hole" through grouted rip-rap for every 50 square feet of finished surface. Provide weep holes with columns of bedding material, 4 inches in diameter, extending up to the rip-rap surface without grout.]

3.9 FINISHING/FINISH OPERATIONS

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, frozen or otherwise unstable subgrade.

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except as indicated for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.9.1 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.9.2 Topsoil and Seed

Provide as specified in Section 32 93 00 EXTERIOR PLANTS AND SEEDING.

3.10 DISPOSITION OF SURPLUS MATERIAL

Remove from Owner property all surplus or other soil material not required or not suitable for filling or backfilling, along with brush, refuse, stumps, roots, and timber. Properly disposed of in accordance with all applicable laws and regulations. Prepare plan for Disposition of Surplus Materials to include permissions document to dispose of nonsalable products.

3.11 TESTING

Perform testing as indicated in Table 1. Submit Material Test Reports within [24 hours] [7 days] of tests being completed.[In addition, submit test data in accordance with Section 01 31 20 PROJECT TECHNICAL DATA MANAGEMENT AND VISUALIZATION.]

Material Type [list materials to be tested as identified in paragraph DEFINITIONS]	Location of Material	Test Method	Test Frequency
		Density - [ASTM D1556/D1556M] [ASTM D2167] [ASTM D6938] [ASTM D8167/D8167M]. [When ASTM D6938 or ASTM D8167/D8167M is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556/D1556M.]	One test per [2000] [_____] square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines. Double testing frequency for areas compacted by hand-operated machines. [If ASTM D6938 or ASTM D8167/D8167M is used, check in-place densities by ASTM D1556/D1556M as follows: One check test per lift for every [6] [10] tests.] [Where ASTM D8167/D8167M is used, provide water content verification in accordance with ASTM D2216 for each test.]
		Moisture Content - ASTM D2216	Two tests per day for each type of fill and backfill. Sample taken immediately prior to compaction after moisture conditioning.

Material Type [list materials to be tested as identified in paragraph DEFINITIONS]	Location of Material	Test Method	Test Frequency
		Moisture Density Relationship - [ASTM D698][ASTM D1557]	One representative test per [500][_____] cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density. Sample to be taken from stockpile or location of placement.
		Relative Density - ASTM D4253 and ASTM D4254	One test per [2000] [_____] square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines. Double testing frequency for areas compacted by hand-operated machines.

Material Type [list materials to be tested as identified in paragraph DEFINITIONS]	Location of Material	Test Method	Test Frequency
		Gradation - ASTM C136/C136M	One representative test per [500][_____] cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density. Sample to be taken from stockpile or location of placement.
		Atterberg Limits - ASTM D4318	One representative test per [500][_____] cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density. Sample to be taken from stockpile or location of placement.
		Organic Content Test - ASTM D2974, Method C	One representative test per [200][_____] lineal [feet] of embankment.

-- End of Section --

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DIVISION 31 - EARTHWORK

SECTION 31 05 19.13

GEOTEXTILES FOR EARTHWORK

-- End of Section Table of Contents --

SECTION 31 05 19.13

GEOTEXTILES FOR EARTHWORK

PART 1 GENERAL

1.1 UNIT PRICES

1.1.1 Payment

Payment will be made at the contract unit price and will constitute full compensation to the Contractor for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the geotextile; this includes subgrade perparation.. The following items are included in the contract unit price for Geotextiles and will not be counted a second time in the process of determining the extent of geotextile placed: Material and associated equipment and operation used in laps, seams, or extra length; securing pins and associated material, equipment, and operations; and material and associated equipment and operations used to provide cushioning layer of sand or gravel or both to permit increase in allowable drop height of stone. No payment will be made for geotextiles replaced because of waste, contamination, damage, repair, or due to Contractor fault or negligence.

1.1.2 Measurement

Installed geotextiles will be measured for payment in place to the nearest square yard of protected area as delineated in the drawings.

1.1.3 Unit of Measure

The unit of measure for each pay item will be as follows:
Geotextile: SY (Square Yard)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4354	(2012; R 2020) Sampling of Geosynthetics for Testing
ASTM D4873/D4873M	(2017) Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
ASTM D4884/D4884M	(2014a) Strength of Sewn or Thermally Bonded Seams of Geotextiles

1.3 SUBMITTALS

Engineer approval is required for submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacured Quality Control Sampling And Testing

A minimum of 7 days prior to scheduled use, manufacturer's quality control manual.

SD-04 Samples

Geotextiles

Minimum of 60 days prior to the beginning of installation of the same textile

SD-06 Test Reports

Geotextiles
Site Verification

SD-07 Certificates

Geotextiles
Needle Punched Geotextile

A minimum of 7 days prior to scheduled use, manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section. For needle punched geotextiles, the manufacturer shall also certify that the geotextile has been continuously inspected using permanent on-line full-width metal detectors and does not contain any needles which could damage other geosynthetic layers. The certificate of compliance shall be attested to by a person having legal authority to bind the geotextile manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver only approved geotextile to the project site. Label, ship, store, and handle all geotextile in accordance with ASTM D4873/D4873M. Do not use hooks, tongs, or other sharp instruments for handling geotextile.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General

Provide geotextile that is a heavy weight 8oz fabric typical of roadway subgrade applications.

2.1.2 Geotextile Fiber

Use fibers consisting of a long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polyamides. Add stabilizers and/or inhibitors to the base polymer, if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Do not add reclaimed or recycled fibers or polymer to the formulation. Form geotextile into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. Finish the edges of the geotextile to prevent the outer fiber from pulling away from the geotextile.

2.1.3 Seams

Overlap seams of the geotextile a minimum of 12 inches in direction of flow.

2.1.4 Securing Pins

Secure the geotextile to the embankment or foundation soil by pins to prevent movement prior to placement of revetment materials. Other appropriate means to prevent movement such as staples, sand bags, and stone could also be used.

2.2 INSPECTIONS, VERIFICATIONS, AND TESTING

2.2.1 Manufacturing and Sampling

Provide geotextiles and factory seams meeting the requirements specified in TABLE 1.

2.2.1.1 Conformance Testing

Perform conformance testing in accordance with the manufacturers approved quality control manual. Submit manufacturer's quality control conformance test results.

2.2.1.2 Factory Sampling

Randomly sample geotextiles in accordance with ASTM D4354 (Procedure Method A). Sample factory seams at the frequency specified in ASTM D4884/D4884M. Provide all samples from the same production lot as will be supplied for the contract, of the full manufactured width of the geotextile by at least 10 feet long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Identify samples submitted for testing by manufacturers lot designation.

2.2.1.3 Needle Punched Geotextile

For needle punched geotextile, provide manufacturer certification that the geotextile has been inspected using permanent on-line metal detectors and does not contain any needles.

2.2.1.4 Manufacturer Certification

All brands of geotextile and all seams to be used will be accepted on the basis of mill certificates or affidavits. Submit duplicate copies of the mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. Attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification.

2.2.2 Site Verification and Testing

Collect samples at approved locations upon delivery to the site at the request of the Engineer. Test samples to verify that the geotextile meets the requirements specified in TABLE 1. Identify samples by manufacturers name, type of geotextile, lot number, roll number, and machine direction. Perform testing at an approved laboratory. Submit test results from the lot under review for approval prior to deployment of that lot of geotextile. Immediately rewrap rolls which are sampled in their protective covering.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The surface underlying the geotextile shall be smooth and free of ruts or protrusions which could damage the geotextile. Prior to commencing any geotextile installation, all subgrade surfaces shall be inspected to assure that surfaces are reasonably smooth and free of mounds, dips, or windrows. Once the placement surface is approved, geotextiles can be placed in areas identified on the project drawings.

3.2 INSTALLATION OF THE GEOTEXTILE

3.2.1 General

Place the geotextile in the manner and at the locations shown. At the time of installation, reject the geotextile if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.2.2 Placement

Place the geotextile with the long dimension perpendicular to the trench and laid smooth and free of tension, stress, folds, wrinkles, or creases. Place the strips to provide a minimum width of 12 inches of overlap for each joint. The placement procedure requires that the length of the geotextile be approximately 10 percent greater than the slope length. Adjust the actual length of the geotextile used based on initial installation experience. Temporary pinning of the geotextile to help hold it in place until the bedding layer or riprap is placed will be allowed. Remove the temporary pins as the bedding, granular material, orriprap is placed to relieve high tensile stress which may occur during placement of material on the geotextile. Design protection of riprap in compliance with EM 1110-2-1601. Perform trimming in such a manner that the geotextile is not damaged in any way.

3.3 PROTECTION

Protect the geotextile at all times during construction from contamination by surface runoff; remove any geotextile so contaminated and replaced with uncontaminated geotextile. Replace any geotextile damaged during its installation or during placement of material at no cost to the Owner. Schedule the work so that the covering of the geotextile with a layer of the specified material is accomplished within 7 calendar days after placement of the geotextile. Failure to comply will require replacement of geotextile. Protect the geotextile from damage prior to and during the placement of riprap or other materials. This may be accomplished by limiting the height of drop to less than 1 foot, by placing a cushioning layer of sand or gravel on top of the geotextile before placing the material, or other methods deemed necessary. Care should be taken to ensure that the utilized cushioning materials will not impede the flow of water. Before placement of riprap or other materials, demonstrate that the placement technique will not cause damage to the geotextile. Do not allow equipment on the unprotected geotextile.

3.4 PLACEMENT OF COVER MATERIAL

Do not cover geotextile prior to inspection and approval by Engineer. After approval, perform placing of cover material in a manner to ensure intimate contact of the geotextile with the prepared surface and with the cover material. Do not damage the geotextile, including tear, puncture, or abrasion, during placement. On sloping surfaces place the cushioning material from the bottom of the slopes upward. During placement, the height of the drop of riprap material greater than 12 inches is not permitted. Uncover any geotextile damaged beneath the cushioning material, as necessary, and replaced at no cost to the Owner.

3.5 OVERLAPPING AND SEAMING

3.5.1 Overlapping

The overlap of geotextile must be 12 inches. Appropriate measures will be taken to ensure required overlap exists after cushion placement.

3.6 FIELD TESTING

Field test geotextile in tension.

-- End of Section --

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DIVISION 31 - EARTHWORK

SECTION 31 11 00

CLEARING AND GRUBBING

-- End of Section Table of Contents --

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 WORK DESCRIPTION

Work under this section includes clearing exposed surface debris and waste, removal of trees, shrubs, and other plant life, clearing, grubbing, and removal and disposal. Materials unsuitable for on-site disposal are to be considered SELECT WASTE DEBRIS and disposed of off-site. Work shall not extend beyond the property boundary except for Contactor installed site controls and stormwater BMPs prior to clearing and grubbing or waste removal. Trees and objects designated to remain shall be preserved free from injury and defacement.

1.2 REGULATORY REQUIREMENTS

Conform to applicable code for environmetal requirements and disposal of debris. Burning is allowed on-site if allowed per local regulations.

1.3 MEASUREMENT

Mesurement for site clearing and grubbing shall be based on the plan view surface area, in acres, that must be cleared and grubbed as indicated on the drawings and specifications.

1.4 PAYMENT

Acceptable clearing and grubbing will be paid for at the respective contract unit price in the bidding schedule. Payment includes site clearing and grubbing, sorting, locating, and disposing of waste materials, brush and tree removal, and all other items necessary to prepare the site for contruction. Site clearing and grubbing shall be limited to the work limits and clearing and grubbing area shown on the drawings.

1.5 UNIT OF MEASURE

The unit of measure for each pay item will be as follows:
Clearing and Grubbing (including Disposal): Acre (AC)

1.6 SUBMITTALS

Engineer approval is required for submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

1.7 DEFINITIONS

1.7.1 Trees

The line of demarcation between brush and trees, for the purpose of distinguishing clearing requirements, is that trees, as used, will be considered as that woody growth not falling within the limits of brush as defined below.

1.7.2 Brush

Brush is that growth which is less than 2 inches in diameter measured 6 inches from the ground on the uphill side and is less than 6 feet in height measured from the ground on the uphill side.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.1.2 Trees, Shrubs, and Existing Facilities

Protect trees and vegetation to be left standing from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Engineer immediately of damage to or an encounter with an unknown existing utility line. The Contractor is responsible for the repair of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, notify the Engineer in ample time to minimize interruption of the service. Refer to Section 01 30 00 ADMINISTRATIVE REQUIREMENTS and Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS for additional utility protection.

3.2 CLEARING

Clearing consists of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Clearing also includes the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Cut off flush with or below the original ground surface trees, stumps, roots, brush, and other vegetation in areas to be cleared, except such trees and vegetation as may be indicated or directed to be left standing. Trim dead branches 1-1/2 inches or more in diameter on trees designated to be left standing within the cleared areas and trim all branches to the heights indicated or directed. Neatly cut close to the bole of the tree or main branches, limbs and branches to be trimmed.

3.2.1 Tree Removal

Where indicated or directed, remove trees and stumps that are designated as trees from areas outside those areas designated for clearing and grubbing. This work includes the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Dispose of trees as specified in paragraph DISPOSAL OF MATERIALS.

3.2.2 Pruning

Trim trees designated to be left standing within the cleared areas of dead branches 1-1/2 inches or more in diameter; and trim branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches.

3.2.3 Grubbing

Grubbing consists of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Remove material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract. Fill depressions made by grubbing with suitable material and compact to make the surface conform with the original adjacent surface of the ground.

3.3 DISPOSAL OF MATERIALS

Dispose of excess materials in accordance with the approved solid waste management permit and include those materials in the solid waste management report.

All wood or wood like materials, except for salable timber, remaining from clearing, prunning or grubbing such as limbs, tree tops, roots, stumps, logs, rotten wood, and other similiar materials is the property of the Contractor and dispose of as specified. All non-saleable timber and wood or wood like materials remaining from timber harvesting such as limbs, tree tops, roots, stumps, logs, rotten wood, and other similiar materials is the property of the Contractor and dispose of as specified.

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DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 15 00

AGGREGATE AND QUARRY SPALL SURFACING

-- End of Section Table of Contents --

SECTION 32 15 00

AGGREGATE AND QUARRY SPALL SURFACING

PART 1 GENERAL

1.1 WORK DESCRIPTION

Work under this section includes surfacing of a stabilized contruction entrance/exit and other site access routes as indicated in the project plans.

Geotextile shall be installed proior to any placement of aggregate accordance with Section 31 05 19.13 and the project drawings.

1.2 UNIT PRICES

1.2.1 Measurement

Measure the quantity of aggregate surface course completed and accepted, as determined by the Engineer.

1.2.2 Unit of Measure

The unit of measure for each pay item will be as follows:
Quarry Spall 4"-8": TON
6" Cobble: TON

1.2.3 Payment

Quantities of aggregate surface course, determined as specified above, will be paid for at the respective contract unit prices, which will constitute full compensation for the construction and completion of the aggregate surfacematerial including all labor and incindentals necessary to complete the work required by this section. Earthwork required for and related to this work (including excavation, grading, embankment, etc.) shall be paid for in accordance with Section 31 00 00 EARTHWORK.

1.2.4 Waybills and Delivery Tickets

Submit copies of waybills and delivery tickets during progress of the work. Before the final payment is allowed, file certified waybills and certified delivery tickets for all aggregates actually used.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm

	(18-in.) Drop
AASHTO T 224	(2010) Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

ASTM C131/C131M	(2020) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D422	(1963; R 2007; E 2014; E 2014) Particle-Size Analysis of Soils
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2216	(2019) Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM E11	(2024) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

1.4 DEGREE OF COMPACTION

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in ASTM D1557 abbreviated as a percent of laboratory maximum dry density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve will be expressed as a percentage of the laboratory maximum dry density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224.

1.5 SUBMITTAL REQUIREMENTS

Contractor shall submit test results and other evidence of the materials, or sources of materials, to demonstrate compliance with the specifications in this section. The Contractor shall pay all costs associated with testing of materials proposed for acceptance. The Contractor shall also provide material samples, when requested by the Engineer, to allow independent analysis and testing when the Engineer elects do to so. Samples shall be 1.0 cubic foot for each type of material and shall be tagged with the name of the source and the pit number.

Following initial sampling, testing, and demonstration of contract compliance by the Contractor, samples shall be submitted of all materials to be used 30 days in advance of use to allow checks by the Engineer for compliance with the specifications. Samples shall consist of 1.0 cubic foot of each type of material and shall be tagged with the name of source and pit number.

1.6 SUBMITTALS

Engineer approval is required for submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools

List of proposed equipment to be used in performance of construction work including descriptive data.

Waybills And Delivery Tickets

SD-04 Samples

Aggregate

SD-06 Test Reports

Sampling And Testing

1.7 EQUIPMENT, TOOLS, AND MACHINES

All plant, equipment, and tools used in the performance of the work will be subject to approval by the Engineer before the work is started. Maintain all plant, equipment, and tools in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Provide adequate equipment having the capability of minimizing segregation, producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

1.8 QUALITY ASSURANCE

Sampling and testing are the responsibility of the Contractor.The Contractor shall submit test results and other evidence, as necessary, to demonstrate compliance of the materials and sources of materials proposed for use under this section. The Contractor shall sample and test, at its expense, materials proposed to satisfy the specifications herein.

Tests will be made in accordance with the following: ASTM D2216 and ASTM D6938 (moisture content), ASTM C136/C136M and ASTM D422 (gradation), ASTM D6938 (density in place), and ASTM D1557 (moisture-density relationships).

1.9 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 35 degrees F and on subgrades that are not frozen of contain frost. It is the responsibility of the Contractor to protect, by approved method or methods, all areas of surfacing that have not been accepted by the Engineer. Bring surfaces damaged by freeze, rainfall, or other weather conditions to a satisfactory condition.

PART 2 PRODUCTS

2.1 AGGREGATES

Provide aggregates consisting of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined. Provide aggregates free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign materials. The Contractor is responsible for obtaining materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein after all compaction and proof rolling operations have been completed.

The Contractor is solely responsible for determining the source of aggregate material. The Contractor is solely responsible for all permits, pit development costs, re-grading, reclamation of any pits used as required by law, and all associated work. Selective removal, screening, or mixing of material is permitted to attain the gradations required.

2.1.1 Coarse Aggregates

The material retained on the No. 4 sieve is known as coarse aggregate. Use only coarse aggregates that are reasonably uniform in density and quality. Use only coarse aggregate having a percentage of wear not exceeding 50 percent after 500 revolutions as determined by ASTM C131/C131M. The amount of flat and/or elongated particles must not exceed 20 percent. A flat particle is one having a ratio of width to thickness greater than three; an elongated particle is one having a ratio of length to width greater than three. When the coarse aggregate is supplied from more than one source, aggregate from each source must meet the requirements set forth herein.

2.1.2 Fine Aggregates

The material passing the No. 4 sieve is known as fine aggregate. Fine aggregate consists of screenings, sand, soil, or other finely divided mineral matter that is processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements

Aggregate material to be used for construction entrance shall consist of crushed stone of 4 inch to 8 inch in diameter. Fractured rock will be used only temporary therefore, gradation requirements are not specified. Suitibility of fractured rock will be determined by the Engineer.

Gradation requirements specified in TABLE I apply to the completed aggregate surface. It is the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. TABLE I shows permissible gradings for granular material used in aggregate surface roads and airfields. Use sieves conforming to ASTM E11.

TABLE I. GRADATION FOR AGGREGATE SURFACE COURSES Percentage by Weight Passing Square-Mesh Sieve				
Sieve Designation	No. 1	No. 2	No. 3	No. 4
1 inch	100	100	100	100
3/8 inch	50-85	60-100	--	--
No. 4	35-65	50-85	55-100	70-100
No. 10	25-50	40-70	40-100	55-100
No. 40	15-30	24-45	20-50	30-70
No. 200	8-15	8-15	8-15	8-15

2.2 LIQUID LIMIT AND PLASTICITY INDEX

The portion of the completed aggregate surface course passing the No. 40 sieve must have a maximum liquid limit of 35 and a plasticity index of 4 to 9.

2.3 SOURCE QUALITY CONTROL

One sample shall be taken for every 200 cubic yards of aggregate material at a given source. The Contractor will sample and test the materials proposed to satisfy the specifications herein. If tests indicate materials do not meet specified requirements, change material or material source and retest until material meets requirements. Any material that is not within the specifications and placed by the Contractor will be removed and replaced by the Contractor at the Contractor's expense.

PART 3 EXECUTION

3.1 STOCKPILING MATERIAL

Contractor shall minimize stockpile of materials onsite and shall only stockpile onsite at locations approved by the Engineer. Prior to stockpiling the material, clear and level the storage sites. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Stockpile aggregates in such a manner that will prevent segregation. Stockpile aggregates and binders obtained from different sources separately. Ensure that stockpiles are placed in areas free of contamination.

3.2 PREPARATION OF PLACEMENT AND UNDERLYING SUBGRADE

Coordinate placement of aggregate with other work to avoid contamination of materials during placement and avoid potential contamination after placement. Clean the subgrade and shoulders of all foreign substances. Do not construct the surface course on subgrade that is frozen material.

Correct ruts or soft yielding spots in the subgrade, areas having inadequate compaction and deviations of the surface from the requirements set forth herein by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade and recompacting to density requirements specified in Section 31 00 00 EARTHWORK . Do not allow traffic or other operations to disturb the completed subgrade and maintain in a satisfactory condition until the surface course is placed.

Geotextile will then be installed as identified in Section 31 05 19.13 GEOTEXTILES FOR EARTHWORK. Placement of quarry spall and/or aggregate shall not commence until inspection and approval of geotextile by Owner. The completed and approved geotextile installation shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the aggregate is placed.

3.3 GRADE CONTROL

During construction, maintain the lines and grades including crown and cross slope indicated for the aggregate surface course by means of line and grade stakes placed by the Contractor in accordance with the SPECIAL CONTRACT REQUIREMENTS.

3.4 PLACEMENT OF AGGREGATE

Place aggregate in coordination with other work to avoid contamination of clean materials. Fill areas to contours and elevations with unfrozen materials and employ a placement method that does not disturb or damage other work.

Place the aggregate material on the prepared surface in layers of uniform thickness with an approved spreader. Place to the thickness specified on the drawings. When a compacted layer 6 inches or less in thickness is required, place the material in a single layer. When a compacted layer in excess of 6 inches is required, place the material in layers of equal thickness. No layer shall be thicker than 6 inches when compacted. The layers shall be placed so that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the aggregate is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed.

Maintain optimum moisture content of fill materials to attain required compaction density. Slope grade as indicated on the plans and make grade changes gradual. Do not haul more fill material than necessary to complete the work.

3.5 LAYER THICKNESS

Place the aggregate material on the subgrade in layers of uniform thickness. Compact the completed aggregate surface course to the thickness indicated. No individual layer may be thicker than 6 inches nor be thinner than 3 inches in compacted thickness. Compact the aggregate surface course to a total thickness that is within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course will be considered as conforming to the specified thickness requirements. The average job thickness will be the average of all thickness measurements taken for the job and must be within 1/4 inch of the thickness indicated. Measure the total thickness of the aggregate surface course at intervals of one measurement for each 500 square yards of surface course. Measure total thickness using 3 inch diameter test holes penetrating the aggregate surface course.

3.6 COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D1557 abbreviated herein as percent laboratory maximum density. Compact each layer of the aggregate surface course with approved compaction equipment, as required in the following paragraphs. Maintain the water content during the compaction procedure at optimum or at the percentage specified by the Engineer. Compact the mixture with mechanical tampers in locations not accessible to rollers. Continue compaction until each layer through the full depth is compacted to at least 95 percent of laboratory maximum density. Remove any materials that are found to be unsatisfactory and replace them with satisfactory material or rework them to produce a satisfactory material.

3.7 EDGES OF AGGREGATE SURFACE COURSE

Place approved material along the edges of the aggregate surface course in such quantity as to compact to the thickness of the course being constructed. Simultaneously roll and compact at least 1 foot of shoulder width with the rolling and compacting of each layer of the surface course when the course is being constructed in two or more layers.

3.8 SMOOTHNESS TEST

Construct each layer so that the surface shows no deviations in excess of 3/8 inch when tested with a 10 foot straightedge applied both parallel with and at right angles to the centerline of the area to be paved. Correct deviations exceeding this amount by removing material, replacing with new material, or reworking existing material and compacting, as directed.

3.9 FIELD QUALITY CONTROL

Material shall be tested in accordance with the Specifications. If tests indicate work does not meet the specified requirements, Contractor shall removal and replace at no additional cost to the Owner.

3.10 MAINTENANCE

Maintain the aggregate surface course in a condition that will meet all specification requirements until accepted.

-- End of Section --

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WIRE FENCES AND GATES

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SECTION 32 31 26

WIRE FENCES AND GATES

PART 1 GENERAL

1.1 WORK DESCRIPTION

Work includes supplying materials for installation of two single lane closure gates, one steel frame gate and wire fence. Install gates and fencing as shown on the drawings and in accordance with these specifications.

1.1.1 MEASUREMENT

Measurement for the fence shall be based on the nearest lineal foot of fence installed as measured by the Owner.

There will be no direct measurement for the metal gate installation.

1.1.2 PAYMENT

Payment for the fence installation will be made at the contract unit price set forth in the bidding schedule, which payment shall constitute full compensation for all labor, equipment, posts, rails, accessories, and all hardware to construct and install the fence as shown on the plans.

Payment for the single lane closure gates, steelframe gate and installation shall be at the lump sum price as shown on the bidding schedule of the contract documents. This lump sum price shall include all labor, equipment, posts, tension wire, accessories, gate material, and all hardware to construct and install the gates as shown on the plans.

1.1.3 UNIT OF MEASURE

The unit of measure for each pay item will be as follows:
Fencing: Linear Foot (LF)
Single Lane Closure Gate: Lump Sum (LS)
Steel Frame Grate: Lump Sum (LS)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A116	(2022) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A702	(2022) Standard Specification for Steel Fence Posts, Hot Wrought
ASTM A780/A780M	(2020) Standard Practice for Repair of

Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191/3	(2023; Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)

1.3 SUBMITTALS

Engineer approval is required for submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings

SD-03 Product Data

Fence Fabric

Gates

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide a fencing system as described herein.

Submit Installation Drawings clearly indicating fence installation, location of gates, corners, and ends; gate assembly, gate hardware, catalog data and accessories.

2.2 COMPONENTS

2.2.1 Fence Fabric

Provide fence fabric conforming to the following requirements.

2.2.1.1 Woven Wire

ASTM A116 [No. 9 farm] [No. 12-1/2 close mesh] [No. 14-1/2 wolf-proof] [No. 13 poultry and garden] [No. 14-1/2 chick] fence; grade, size as indicated.[Provide fittings that conform to ASTM F626.]

2.2.2 Gates

Provide gate type and swing shown conforming to ASTM F900 or ASTM F1184, ASTM A153/A153M. Provide gate frames conforming to strength and coating requirements of ASTM F1083 for Group IA, steel pipe, nominal pipe size (NPS) 1-1/2. [Provide polyvinyl chloride-coated steel pipe gate frames(Group IA)(Group IC), a nominal pipe size (NPS) 1-1/2, conforming to ASTM F1043. Polyvinyl chloride coating to be minimum thickness 0.01 inch, fused and adhered to the exterior zinc coating of the framing members.] Provide gate leaves more than 8 feet wide with either intermediate members and diagonal truss rods or tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8 feet wide with truss rods or intermediate braces. Provide intermediate braces on all gate frames with an electro-mechanical lock. Attach gate fabric to the gate frame by method standard with the manufacturer. Welding is not permitted. Furnish latches, hinges, stops, keepers, rollers, and other hardware items as required for the operation of the gate. Arrange latches for padlocking so the padlock is accessible from both sides of the gate. Provide stops for holding the gates in the open position.

2.2.3 Posts

2.2.3.1 Metal Posts for Farm Style Fence

Provide metal line posts conforming to ASTM A702 [zinc-coated][enamel paint finish], [T-section] [U-Section], length as indicated, and accessories conforming to ASTM A702.[Provide FS RR-F-191/3 Steel pipe end and corner posts: Class 1, steel pipe, Grade A Regular Strength, in [minimum sizes listed in FS RR-F-191/3 for each class and grade] [size [_____]].[Provide PVC color coating, minimum thickness, 0.01 inch fused and adhered to the exterior coating of the post or rail in accordance with ASTM F1043; color to match fabric in accordance with ASTM F934.]]

2.2.3.2 Wood Posts

Provide wood posts cut from sound and solid trees free from short or reverse bends in more than one plane. Make tops convex rounded or inclined. Provide posts free of ring shake, season cracks more than 1/4 inch wide, splits in the end, and unsound knots. Provide posts of size and shape indicated. Treat posts in accordance with AWPA U1.

2.3 MATERIALS

2.3.1 Concrete

ASTM C94/C94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Provide grout consisting of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Clearing

Clear the area on each side of the fence as indicated in the plans.

3.1.2 Line and Grade

Install fence to the lines and grades indicated. Space line posts equidistant at intervals not exceeding 10 feet. Set terminal (corner, gate, and pull) posts at abrupt changes in vertical and horizontal alignment. Provide continuous fabric between terminal posts; however, ensure runs between terminal posts do not exceed 500 feet. Repair any damage to galvanized surfaces, including welding, with paint containing zinc dust in accordance with ASTM A780/A780M.

3.1.3 Excavation

Clear loose material from all post holes. Spread waste material where directed. Eliminate ground surface irregularities along the fence line to the extent necessary to maintain a [1] [2] inch clearance between the bottom of the fabric and finish grade.

3.2 INSTALLATION

3.2.1 Installation

Install fence system per approved installation drawings.

3.2.2 Post

For wood posts (Farm Style Fence), excavate to depth indicated and brace post until backfill is completed. Place backfill in layers of 9 inches or less, moistened to optimum condition, and compacted with hand tampers or other approved method. Set posts plumb and in proper alignment. Drive metal posts or set in concrete as indicated.

3.2.3 Gate Assembly

For farm style fencing, provide standard metal gate assemblies with frame and fittings necessary for complete installation or wood gates as shown.

3.3 CLEAN UP

Remove waste fencing materials and other debris from work site daily.

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EXTERIOR PLANTS AND SEEDING

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SECTION 32 93 00

EXTERIOR PLANTS AND SEEDING

PART 1 GENERAL

1.1 WORK DESCRIPTION

1.1.1 Seeding and Planting

Work required under this section includes seeding and planting operations of all disturbed areas as indicated on the design drawings and specified herein. The work shall consist of ground surface preparation; furnishing, applying and incorporating fertilizer, mulch, water, tackifier, and seed into the soil; furnishing and planting native plants, and cleanup. Hydroseed mixes shall be native seed mixes and applied to specific areas as specified in the Project Drawings.

1.2 MEASUREMENT

Measurement for all mulching, fertilizing, and hydroseeding operations shall be by the number of acres upon which seed is applied. The actual quantity shall be measured by the Engineer and shall be based on the plan view area.

Plantings will be measured per each.

1.3 PAYMENT

Payment for mulching, fertilizing, and hydroseeding operations shall be made at the unit price bid per acre as shown on the bidding schedule of the contract documents. This payment shall constitute full compensation for labor, equipment, tools, materials, and incidentals necessary to accomplish the work specified.

Payment for planting operations shall be made at the unit price bid per each as shown on the bidding schedule of the contract documents. This payment shall constitute full compensation for labor, equipment, tools, materials, and incidentals necessary to accomplish the work specified.

1.4 UNIT OF MEASURE

The unit of measure for each pay item will be as follows:
Native Seed Mix: Acre (AC)
Native Shrubs and Trees, Seedlings Installed(1-gal): Each (EA)

1.5 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICANHORT (AH)

ANSI/ANLA Z60.1 (2004) American Standard for Nursery Stock

TREE CARE INDUSTRY ASSOCIATION (TCIA)

TCIA A300P1	(2017) ANSI A300 Part1: Tree Care Operations - Trees, Shrubs and Other Woody Plant Maintenance Standard Practices - Pruning

1.6 RELATED REQUIREMENTS

Section 31 00 00 EARTHWORK, applies to this section in regard to excavation, grading, and embankment. Contractor shall furnish and place topsoil prior to seeding operations in accordance with Section 02 66 13 SELECT FILL AND TOPSOIL FOR LANDFILL COVER.

1.7 SUBMITTALS

Engineer approval is required for submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

State Landscape Contractor's License

Time Restrictions and Planting Conditions

Indicate anticipated dates and locations for each type of planting.

SD-03 Product Data

Peat

Composted Derivatives

Organic Mulch Materials

Seed Mixture

Wood Cellulose Fiber Mulch

Fertilizer

Tackifier

SD-06 Test Reports

Topsoil Composition Tests; (reports and recommendations

SD-07 Certificates

Nursery Certifications

State Certification and Approval for Seed, Mulch, and Plants

1.8 DELIVERY, STORAGE, AND HANDLING

1.8.1 Delivery

1.8.1.1 Seed Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

1.8.1.2 Branched Plant Delivery

Deliver with branches tied and exposed branches covered with material which allows air circulation. Prevent damage to branches, trunks, root systems, and root balls and desiccation of leaves.

1.8.1.3 Soil Amendment Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to state and federal laws. Instead of containers, lime may be furnished in bulk with a certificate indicating the above information. Store in dry locations away from contaminates.

1.8.1.4 Plant Labels

Deliver plants with durable waterproof labels in weather-resistant ink. Provide labels stating the correct botanical and common plant name and variety as applicable and size as specified in the list of required plants. Attach to plants, bundles, and containers of plants. Groups of plants may be labeled by tagging one plant. Labels must be legible for a minimum of 60 days after delivery to the planting site.

1.8.2 Storage

1.8.2.1 Plant Storage and Protection

Store and protect plants not planted on the day of arrival at the site as follows:

a. Shade and protect plants in outside storage areas from the wind and direct sunlight until planted.

b. Heel-in bare root plants.

c. Protect balled and burlapped plants from freezing or drying out by covering the balls or roots with moist burlap, sawdust, wood chips, shredded bark, peat moss, or other approved material. Provide covering which allows air circulation.

d. Keep plants in a moist condition until planted by watering with a fine mist spray.

e. Do not store plant material directly on concrete or bituminous surfaces.

1.8.2.2 Fertilizer, and Mulch Storage

Store in dry locations away from contaminants.

1.8.2.3 Topsoil

Prior to stockpiling topsoil, eradicate on site undesirable growing vegetation. Clear and grub existing vegetation three to four weeks prior to stockpiling existing topsoil.

1.8.3 Handling

Do not drop or dump plants from vehicles. Avoid damaging plants being moved from nursery or storage area to planting site. Handle container plants carefully to avoid damaging or breaking the earth ball or root structure. Do not handle plants by the trunk or stem. Remove damaged plants from the site.

1.8.4 TIME LIMITATION

Except for container-grown plant material, the time limitation from digging to installing plant material must be a maximum of 90 days. The time limitation between installing the plant material and placing the mulch must be a maximum of 24 hours.

Apply seed within twenty four hours after seed bed preparation.

1.9 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.9.1 Planting Dates

[Plant all plants from [_____] to [_____].

][1.9.1.1 Deciduous Material

Deciduous material from [_____] to [_____] for spring [/summer] planting and from [_____] to [_____] for fall [/winter] planting.

][1.9.1.2 Evergreen Material

Evergreen material from [_____] to [_____] for spring [/summer] planting and from [_____] to [_____] for fall [/winter] planting.

]1.9.2 Restrictions

Do not plant when ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit

1.10 PLASTIC IDENTIFICATION

Provide product data indicating polymeric information in Operation and Maintenance Manual.

Type 1: Polyethylene Terephthalate (PET, PETE).

Type 2: High Density Polyethylene (HDPE).

Type 3: Vinyl (Polyvinyl Chloride or PVC).

Type 4: Low Density Polyethylene (LDPE).

Type 5: Polypropylene (PP).

Type 6: Polystyrene (PS).

Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Classification

Contractor shall furnish and apply the seed mixture specified below in paragraph entitled 'Seed Mixture' to all disturbed areas. Proportion the seed mixture by weight. Submit documentation of proposed mixture in writing to be approved by the Engineer. Submittal shall include, at a minimum, the percentage of purity, germination, weed content, and certified weed free seed. Contractor shall submit to the Engineer documentation from the seed supplier showing actual bulk weights of the individual seed types combined in the mix. Label in conformance with AMS Seed Act and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected.

2.1.2 Planting Dates

All disturbed aread shall be seeded, fertilized, and mulched prior to project closeout. Irrigation shall be provided and maintained for a period of 45 days to ensure plant and seed growth.

2.1.3 Seed Mixture by Weight

The following seed mixture shall be used to revegetate the site (*MIXES SHOWN IN TABLE ARE PLACE HOLDERS FROM ANOTHER PROJECT AND WILL BE UPDATED FOR EATONVILLE LANDFILL WHEN KNOWN*):

Botanical Name	Common Name	Percent of Mix
Elymus trachycaulus ssp. trachycaulus	Slender wheatgrass "Revenue"	15%
Poa ampla	Big bluegrass "Sherman"	10%
Bromus marginatus	Mountain brome "Bromar"	10%
Lolium multiflorum	Annual Rye	10%
Elymus glaucus	Blue wildrye "Arlington"	12%
Achillea millefolium	Yarrow	5%

Botanical Name	Common Name	Percent of Mix
Lupinus argenteus ssp. rubicaulis	Mountain Lupin	3%
Chamaenerion angustifolium	Fireweed	5%
Solidago canadensis	Canada Goldenrod	5%
Clarkia pulchella pursh	Clarkia	5%
Gaillardia aristata pursh	Blanket Flower	5%
Phlox ssp.	Slender Phlox	5%
Fragaria vesca	Woodland Strawberry	5%
Castilleja mutis	Indian Paintbrush	5%
Total		100%

2.2 PLANTS

2.2.1 Regulations and Varieties

Furnish nursery stock in accordance with ANSI/ANLA Z60.1, except as otherwise specified or indicated. Each plant or group of planting must have a "key" number indicated on the nursery certifications of the plant schedule. Furnish plants, including turf grass, grown under climatic conditions similar to those in the locality of the project. [Spray plants budding into leaf or having soft growth with an antidesiccant before digging]. Plants of the same specified size must be of uniform size and character of growth. All plants must comply with all Federal and State Laws requiring inspection for plant diseases and infestation.

2.2.2 Shape and Condition

Well-branched, well-formed, sound, vigorous, healthy planting stock free from disease, sunscald, windburn, abrasion, and harmful insects or insect eggs and having a healthy, normal, and undamaged root system.

2.2.2.1 Deciduous Trees and Shrubs

Symmetrically developed and of uniform habit of growth, with straight boles or stems, and free from objectionable disfigurements.

2.2.2.2 Evergreen Trees and Shrubs

Well developed symmetrical tops with typical spread of branches for each particular species or variety.

2.2.2.3 Ground Covers and Vines

Number and length of runners and clump sizes indicated, and of the proper age for the grade of plants indicated, furnished in removable containers, integral containers, or formed homogeneous soil section.

2.2.3 Plant Size

Minimum sizes measured after pruning and with branches in normal position, must conform to measurements indicated, based on the average width or height of the plant for the species as specified in ANSI/ANLA Z60.1. Plants larger in size than specified may be provided with approval of the [Contracting Officer] [_____]. When larger plants are provided, increase the ball of earth or spread of roots in accordance with ANSI/ANLA Z60.1.

2.2.4 Root Ball Size

All box-grown, field potted, field boxed, collected, plantation grown, bare root, balled and burlapped, container grown, processed-balled, and in-ground fabric bag-grown root balls must conform to ANSI/ANLA Z60.1. All wrappings and ties must be biodegradable. Root growth in container grown plants must be sufficient to hold earth intact when removed from containers. Root bound plants will not be accepted.

[2.2.4.1 Mycorrhizal fungi inoculum

Before shipment, root systems must contain mycorrhizal fungi inoculum.

]2.2.5 Growth of Trunk and Crown

2.2.5.1 Deciduous Trees

A height to caliper relationship must be provided in accordance with ANSI/ANLA Z60.1. Height of branching must bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees must not be "poled" or the leader removed.

a. Single stem: The trunk must be reasonably straight and symmetrical with crown and have a persistent main leader.

b. Multi-stem: All countable stems, in aggregate, must average the size specified. To be considered a stem, there must be no division of the trunk which branches more than 6 inches from ground level.

2.2.5.2 Palms

Palms must have the specified height as measured from the base of the trunk to the base of the fronds or foliage in accordance with ANSI/ANLA Z60.1. The palm must have straight trunk and healthy fronds or foliage as typical for the variety grown in the region of the project. Palms trimmed or pruned for delivery must retain a minimum of 6 inches of foliage at the crown as a means of determining plant health.

2.2.5.3 Deciduous Shrubs

Deciduous shrubs must have the height and number of primary stems recommended by ANSI/ANLA Z60.1. Acceptable plant material must be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

2.2.5.4 Coniferous Evergreen Plant Material

Coniferous Evergreen plant material must have the height-to-spread ratio recommended by ANSI/ANLA Z60.1. The coniferous evergreen trees must not be "poled" or the leader removed. Acceptable plant material must be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired must be as indicated.

2.2.5.5 Broadleaf Evergreen Plant Material

Broadleaf evergreen plant material must have the height-to-spread ratio recommended by ANSI/ANLA Z60.1. Acceptable plant material must be well shaped and recognized by the trade as typical for the variety grown in the region of the project.

2.2.5.6 Ground Cover and Vine Plant Material

Ground cover and vine plant material must have the minimum number of runners and length of runner recommended by ANSI/ANLA Z60.1. Plant material must have heavy, well developed and balanced crown with vigorous, well developed root system and must be furnished in containers.

2.3 TOPSOIL

2.3.1 Existing Soil

Modify to conform to requirements specified in paragraph COMPOSITION.

2.3.2 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph COMPOSITION. When available topsoil must be existing surface soil stripped and stockpiled on-site in accordance with Section 31 00 00 EARTHWORK.

2.3.3 Off-Site Topsoil

Conform to requirements specified in paragraph COMPOSITION. Additional topsoil must be furnished by the Contractor.

2.4 FERTILIZER

Fertilizer shall be as recommended by the seed supplier for use with hydroseeding. The fertilizer shall be uniform in composition and in good condition for application by suitable equipment. It shall be labeled with the manufacturer's guaranteed analysis as governed by applicable fertilizer laws. Any fertilizer which becomes contaminated or damaged, making it unsuitable for use, will not be accepted.

Fertilizer shall be amended to the plantings as recommended by the nursery/supplier.

2.5 MULCH

Free from noxious weeds, mold, pesticides, or other deleterious materials.

2.5.1 Wood Cellulose Fiber Mulch

Use recovered materials of either paper-based (100 percent post-consumer content), staw based, or wood-based (100 percent total recovered content) hydraulic mulch. Processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of materials application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 5.5 to 8.2 . Use with hydraulic application of grass seed and fertilizer. Supply Enviroblend, Hydrostraw mix, or approved equal.

2.5.2 Tackifier

Tackifier shall be as recommended by the seed supplier for use with hydroseeding considering the specific existing and design conditions.

2.6 EROSION CONTROL MATERIALS

Erosion control blanket and fiber rolls shall be furnished and installed by the Contractor following seeding operations, where indicated on the drawings, conforming to Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

2.7 WATER

Water used shall be of irrigation quality and free of impurities that would be detrimental to plant growth..

2.8 SOURCE QUALITY CONTROL

The Engineer will inspect plant materials at the project site and approve them. Tag plant materials for size and quality.

PART 3 EXECUTION

3.1 EXTENT OF WORK

Provide soil preparation, including [soil conditioners] [and] [soil amendments] prior to planting. Provide [tree,] [shrub,] [vine,] [groundcover,] [seed,] [and] [sod] planting, [post-planting fertilizer,] [edging,] [staking,] [guying,] [weed control fabric,] [erosion control material,] [root control barrier] installation,[_____,] [and] [mulch topdressing] of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.2 PREPARATION

3.2.1 Layout

Stake out approved plant material locations and planter bed outlines on the project site before digging plant pits or beds. The Contracting Officer reserves the right to adjust plant material locations to meet field conditions. Do not plant closer than [12] [24] [36] [_____] inches to a [building wall,] [pavement edge,] [fence or wall edge] [and] [other similar structures].

3.2.2 Soil Preparation

[3.2.2.1 pH Adjuster Application Rates

Apply pH adjuster at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

[Lime [_____] pounds per acre [_____] pounds per 1000 square feet

][Sulfur [_____] pounds per acre [_____] pounds per 1000 square feet

][Iron [_____] pounds per acre [_____] pounds per 1000 square feet

][Aluminum Sulfate [_____] pounds per acre [_____] pounds per 1000 square feet

]][3.2.2.2 Soil Conditioner Application Rates

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

[Peat [_____] cubic yard per acre [_____] cubic yards per 1000 square feet

][Sand [_____] cubic yard per acre [_____] cubic yards per 1000 square feet

][Compost Derivatives [_____] cubic yard per acre [_____] cubic yards per 1000 square feet

][Gypsum [_____] cubic yard per acre [_____] cubic yards per 1000 square feet

][Rotted Manure [_____] cubic yard per acre [_____] cubic yards per 1000 square feet

]]3.2.2.3 Fertilizer Application Rates

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

[Organic granular fertilizer [[_____] pounds per acre] [[_____] pounds per 1000 square feet].

]

[Fertilizer Tablets for Trees and Shrubs]			
	[Container/Caliper Size]	[Tablet Size]	[No. of Tablets]
[Shrub:]	[[_____]]	[[_____]]	[[_____]]
[Tree:]	[[_____]]	[[_____]]	[[_____]]

[3.2.3 Root Control Barrier

[Install geotextile fabric in the soil in a [vertical] [horizontal] [and] [surrounding] application. Use appropriate holding device to assure fabric position. For vertical or horizontal application, a minimum [2] [_____] inch soil cover is required over the top [surface] [edge]. A minimum [18] [_____] inch extension of fabric beyond the structure area to be protected is required to prevent root growth from growing around fabric edges.][Install [cylindrical] [linear] polypropylene barrier a minimum [1/2] [one] [_____] inch above finish grade to prevent root growth over the barrier. Backfill the outside of the barrier with 3/4 to one gravel a minimum width of [2] [_____] inches. For linear barrier application use appropriate device to connect two pieces.]

][3.2.4 Subsoil Drainage for Plant Pits and Beds

Provide as indicated.[Lay perforated drain pipe with perforations down.] Backfill trenches as specified in Section 31 00 00 EARTHWORK.

]3.3 SEEDING

3.3.1 Seed Application Seasons and Conditions

Immediately before seeding, restore soil to proper grade. Do not seed when ground is muddy frozen, snow covered, or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in the above seeding dates or conditions, submit a written request to the Contracting Officer stating the special conditions and proposed variance. Apply seed within twenty four hours after seedbed preparation. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

3.3.2 Seed Application Method

Seeding method must be hydroseeding.

3.3.2.1 Hydroseeding

First, mix water and fiber. Wood cellulose fiber, paper fiber, or recycled paper must be applied as part of the hydroseeding operation. Fiber must be added at 2,000 pounds, dry weight, per acre. Then add and mix seed and fertilizer to produce a homogeneous slurry. Seed must be mixed to ensure broadcasting at the rate of 16 pounds per 1000 square feet. When hydraulically sprayed on the ground, material must form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

The Contractor may use extension hoses to reach the extremities of slopes. Contractor shall remove any equipment tracks on the seedbed prior to final mulching. The Contractor shall use a rake, small harrow, or other acceptable means to remove the tracks.

]3.3.3 Mulching

3.3.3.1 Hay or Straw Mulch

Hay or straw mulch must be spread uniformly at the rate of 2 tons per acre. Mulch must be spread by hand, blower-type mulch spreader, or other approved method. Mulching must be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch must not be bunched or clumped. Sunlight must not be completely excluded from penetrating to the ground surface. All areas installed with seed must be mulched on the same day as the seeding. Mulch must be anchored immediately following spreading.

[3.3.4 Rolling

Immediately after seeding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width. If seeding is performed with cultipacker-type seeder or by hydroseeding, rolling may be eliminated.

]3.3.5 Erosion Control Material

Erosion control blanket and fiber rolls shall be installed by the Contractor following seeding operations, where indicated on the drawings, conforming to Section 01 57 19 ENVIRONMENTAL AND EROSION CONTROLS. Install in accordance with manufacturer's instructions, where indicated or as directed by the Engineer.

3.3.6 Watering

Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of 2 inches without run off. During the germination process, seed is to be kept actively growing and not allowed to dry out. Contractor shall provide temporary irrigation and water for a period of 45 days to sustain growth.

3.4 PLANT BED PREPARATION

Excavate pits and install plants according to supplier's recommendations (including depth and diameter). Prevent damage to roots and plants during planting. Move the plant materials only by supporting the container and remove container in a manner that prevents damage to the root system. Hold plants plumb in the center of the pit during placement until the soil has been tamped firmly around the root ball. Replace plant material whose root balls are cracked or damaged either before or during planting process. Backfill soil mixture shall be placed to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas.

3.5 PLANT INSTALLATION

Excavate pits and install plants according to supplier's recommendations (including depth and diameter). Prevent damage to roots and plants during planting. Move the plant materials only by supporting the container and remove container in a manner that prevents damage to the root system. Hold plants plumb in the center of the pit during placement until the soil has been tamped firmly around the root ball. Replace plant material whose root balls are cracked or damaged either before or during planting process. Backfill soil mixture shall be placed to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas.

3.5.1 Placement of Mulch Topdressing

Place specified mulch topdressing on top of weed control fabric covering total area enclosed by edging. Place mulch topdressing to a depth of [3] [_____] inches.

3.5.2 Mulch Topdressing

Provide mulch topdressing over entire planter bed surfaces and individual plant surfaces including earth mound watering basin around plants to a depth of [3] [_____] inches after completion of plant installation and before watering. Keep mulch out of the crowns of shrubs. Place mulch a minimum 2 to 3 inches[_____] away from trunk of shrub or tree. Place on top of any weed control fabric.

3.5.3 Fertilization

3.5.3.1 Fertilizer Tablets

Place fertilizer planting tablets evenly spaced around the plant pits to the manufacturer's recommended depth.

3.5.3.2 Granular Fertilizer

Apply granular fertilizer as a top coat prior to placing mulch layer and water thoroughly.

3.5.4 Watering

Start watering areas planted as required by temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to a depth of [12] [_____] inches without run off.

3.5.5 Pruning

Prune in accordance with safety requirement of TCIA Z133.

3.5.5.1 Trees and Shrubs

Remove dead and broken branches. Prune to correct structural defects only. Retain typical growth shape of individual plants with as much height and spread as practical. Do not cut central leader on trees. Make cuts with sharp instruments. Do not flush cut with trunk or adjacent branches. Collars must remain in place. Pruning must be accomplished by trained and experienced personnel and must be accordance with TCIA A300P1.

3.5.5.2 Wound Dressing

Do not apply tree wound dressing to cuts.

3.6 RESTORATION AND CLEAN UP

3.6.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation must be restored to original condition at the Contractor's expense.

3.6.2 Clean Up

Excess and waste material must be removed from the installed area and must be [disposed offsite at an approved landfill, recycling center, or composting center][composted on site]. Separate and recycle or reuse the following landscape waste materials: [nylon straps,] [wire,] [ball wrap,] [burlap,] [wood stakes,] [_____]. Adjacent paved areas must be cleared.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

SECTION 35 31 19

ROCK CHUTE

-- End of Section Table of Contents --

SECTION 35 31 19

ROCK CHUTE

PART 1 GENERAL

1.1 WORK DESCRIPTION

To adequately divert surface water from the upper landing and convey it down the steep slope, Contractor shall construct a rock chute according to the design drawings and specifications. The chute shall be lined with riprap placed on top of a geotextile, constructed to the dimensions as shown in the Project Drawings.

Work includes excavation, grading, subgrade preparation, supplying and installing geotextile, supplying and placement of riprap, and any other incidental work items required to complete the construction of the rock chute as described in these specifications and called out in the drawings.

1.2 UNIT PRICES

1.2.1 Unit of Measure

RIPRAP: CY

1.2.2 Measurement

Measurement of the riprap used for the rock chute shall be based on the number of cubic yards of riprap placed. Measurement shall be based on the surface area and thickness (measured perpendicular to the surface) of riprap placed.

Geotextile used for the rock chute installation shall be measured in accordance with provisions of 31 05 19.13 GEOTEXTILES FOR EARTHWORK.

Excavation, grading, and preparation of subbase for rock chute construction shall be considered incidental to this bid item and will not be measured for payment.

1.2.3 Payment

Payment for satisfactorily placed riprap in the rock chute will be made at the applicable contract unit price in the bidding schedule. This unit price shall constitute full compensation for furnishing, hauling, handling, placing, and maintaining the riprap until final acceptance by the Owner.

Payment of installed and accepted geotextile for the rock chute will be made in accordance with the provisions of Section 31 05 19.13 GEOTEXTILES FOR EARTHWORK.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-2-1601	(1991; 1994 Change 1) Engineering and Design -- Hydraulic Design of Flood Control Channels

1.4 DEFINITIONS

1.4.1 Standard Drawings

Details for construction are shown on standard drawings forming a part of these specifications.

1.4.2 Riprap

Riprap is defined as a material having a gradation band similar to those specified in EM 1110-2-1601, Chapter 3, uniform graded material. Riprap is normally produced by mechanical methods, with a jaw crusher and grizzly after the stone has been mined by blasting in a quarry. Riprap gradations have a maximum top size of 3.5 tons.

1.4.3 Graded Stone

Graded Stone is defined as material with gradations that are produced by the mining technique and minimal additional processing other than the use of a skeleton bucket or a bar grizzly. The gradation band have more fines than riprap and have gradations with top size up to 3.5 tons and could be classified as being well graded.

1.5 SUBMITTALS

Engineer approval is required for all submittals with a "G" or "S" classification. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Riprap

SD-06 Test Reports

Gradation Test

SD-07 Certificates

Riprap

Weigh Scale Certification

Certified Weight Scale Tickets

1.6 QUALITY ASSURANCE

1.6.1 Stone

Submit suitable stone samples prior to delivery of any such material to the worksite if stone is not from one of the stone sources listed at the end of this section.

1.6.1.1 General

All stone must be durable material as approved by the Contracting Officer. In case an unlisted source is to be used, show that an adequate quantity of material is available and provide quality test data.[Unlisted sources necessitate an evaluation by the Contracting Officer to determine their acceptability based upon a combination of laboratory test results, prior use in projects of a similar size and scope, and a site inspection by a Government geologist.] Provide stone of a suitable quality to ensure permanence in the structure and in the climate in which it is to be used. Ensure stone is free from cracks, blast fractures, bedding, seams and other defects or discontinuities that would tend to increase its deterioration from natural causes.[Inspect for discontinuities, cracks, fractures, seams and defects by visual examination. If, by visual examination, it is determined that [10][20] percent or more of the stone produced contains significant hairline cracks, then reject all stone produced by the means and measures which caused the fractures.] A hairline crack that is defined as being detrimental must have a minimum width of 4 mil and continuous for one-third the dimension of at least two sides of the stone. [Provide stone that is clean and reasonably free from soil, quarry fines, and contains no refuse.] [Provide stone that is clean and adequately free from all foreign matter. Remove any foreign material adhering to or combined with the stone as a result of stockpiling prior to placement.]

1.6.1.2 Sources

Riprap shall be furnished from any source designated by the Contractor, subject to the conditions herein stated. It is the Contractor's responsibility to determine that the riprap source is capable of providing the quality, quantities, and gradation needed and at the rate needed to maintain the scheduled progress of the work.

During the contract period, both prior to and after materials are delivered to the job site, visual inspections and measurements of the stone materials may be performed by the Owner. If the Owner, during the inspections, finds that the riprap quality, gradation, or weights of rock being furnished are not as specified or are questionable, re-sampling and re-testing is required. If required, this additional sampling and testing shall be performed at the Contractor's expense when test results indicate that the materials do not meet specified requirements. When test results indicate that materials meet specified requirements, an equitable adjustment in the contract price will be made for the sampling and testing. Any material rejected shall be removed or disposed of as specified and at the Contractor's expense.

1.7 CONSTRUCTION TOLERANCES

The finished surface and stone layer thickness is not allowed to deviate from the lines and grades shown by more than the tolerances listed below. Tolerances are measured perpendicular to the indicated neatlines. Ensure extreme limits of the tolerances given are not continuous in any direction for more than [_____] [five] times the nominal stone dimension nor for an area greater than [100][200][1000] square feet of the structure surface.

NEATLINE TOLERANCES		
MATERIAL	ABOVE NEATLINE (inches)	BELOW NEATLINE (inches)
Foundation	[_____]	[_____]
Mattress	[_____]	[_____]
Bedding	[_____]	[_____]
Core	[_____]	[_____]
Underlayer	[_____]	[_____]
Cover	[_____]	[_____]
Armor	[_____]	[_____]
Riprap	[_____]	[_____]
Scour	[_____]	[_____]
Fill	[_____]	[_____]

The intention is that the work is built generally to the required elevations, slope and grade and that the outer surfaces are even and present a neat appearance. Remove or rearrange placed material not meeting these limits as directed by the Contracting Officer. Payment will not be made for excess material which the Contracting Officer allows to remain in place.

PART 2 PRODUCTS

2.1 RIPRAP

2.1.1 General

Rock material used for the rock chute should meet the requirements specified in paragraph REGULATORY REQUIREMENTS and be supplied in accordance with the subparagraph entitled Sources. Specifically, the rock chute shall be constructed of a 12-inch thick layer of riprap with a D50 value of 6-inches. If possible, consideration of the rock source should be given to obtaining rock that is similar in color and texture to the native stone in the project area. Rock shall be of sufficient hardness to resist weathering and shall be free of cracks and other blemishes. Porous rock, such as some limestones, and soft rock, such as shales, shall not be allowed for use as riprap.

2.1.2 Gradation

Use only quarried stone. Provide well graded stone conforming to [the table(s) below and to Plate(s) [_____], [_____], [_____] and [_____] attached at the end of this section][the gradation requirements for [_____], [_____], and [_____] as specified in [paragraph REGULATORY REQUIREMENTS][_____]].

TABLE [_____] - FOR RIPRAP "R90"	
PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	90 - 40
50	40 - 20
15	20 - 5

TABLE [_____] - FOR RIPRAP "R200"	
PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	200 - 80
50	80 - 40
15	40 - 10

TABLE [_____] - FOR RIPRAP "R650"	
PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	650 - 260
50	280 - 130
15	130 - 40

TABLE [_____] - FOR RIPRAP "R1000"	
PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	1000 - 400
50	430 - 200
15	210 - 60

2.1.3 Gradation Test

Perform a gradation test on the riprap in accordance with ASTM D 5519, Test Method A prior to construction of the rock chute. Take the sample in the presence of the Owner and notify the Owner not less than 3 days in advance of each test. In the event of unavailability of the Owner, perform the tests and certify to the Owner that the riprap complies with the specifications. Failure of the test on the initial test sample and any additional sample will be considered cause of rejection of the riprap. The unacceptable rock shall either be reworked to bring the stone within the specified gradation or the rock shall be set aside and not incorporated into the work. Contractor shall provide all necessary screens, scales and other equipment, and operating personnel, to grade the sample. Certification and/or accepted test results must be received by the Owner before the riprap is used in the work.

PART 3 EXECUTION

3.1 SUBBASE PREPARATION

Areas on which geotextile and riprap are to be placed for the rock chute shall be excavated, graded, and compacted to conform to cross sections and grades shown on the contract drawings. Excavation and grading shall be in accordance with Section 31 00 00 EARTHWORK. The prepared subbase shall be approved by the Owner and no material shall be placed thereon until that area has been approved. Refer to Section 31 05 19 GEOTEXTILE for more information on subgrade preparation prior to placement of geotextile.

3.2 GEOTEXTILE

Geotextile installation shall be performed by Contractor personnel in accordance with Section 31 05 19.13 GEOTEXTILES FOR EARTHWORK. Placement of riprap shall not commence until inspection and approval of geotextile by the Owner.

3.3 PLACEMENT OF RIPRAP

Riprap shall be placed in a manner which will produce a well-graded mass of rock with the minimum practicable percentage of voids, and shall be constructed to the lines and grades shown on the contract drawings. Riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacement of the underlying subgrade and geotextile. The riprap shall be delivered and placed in such a manner that will ensure that the riprap in-place will be reasonably homogenous, with the larger rocks uniformly distributed and firmly in contact with the smaller rocks and spalls filling the voids between the larger rock. Placement shall begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material placed on the slope shall be immediately adjacent to previously placed material in such a manner to ensure a relatively homogenous mass. Placing riprap by dumping it into chutes, or by similar methods likely to cause segregation of the various sizes, shall not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope shall not be permitted. No equipment shall be operated directly on the completed stone protection system. At both the upper and lower limits of the riprap section, the rock riprap shall be keyed into the stable bank as shown on the project drawings. Keying of the riprap provides protection from erosion getting behind the riprap layer.

-- End of Section --