



Geologic Hazard Site Assessment

Lake Erie Pit 1 Expansion

Southeast corner of Rosario Road & Marine Drive

Project # PS2220529-0

Prepared for:

Lake Erie Trucking, LLC

13540 Rosario Road, Anacortes, WA 98221

August 11, 2022



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13540 Rosario Road, Anacortes, WA 98221

Prepared by:

Wood Environment & Infrastructure Solutions, Inc.

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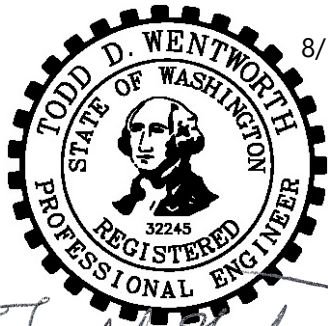
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August 11, 2022

Wood Environment & Infrastructure Solutions, Inc.



8/11/2022

A handwritten signature in black ink that reads 'Todd D. Wentworth'.

Todd D. Wentworth, P.E., L.G.

Principal Geotechnical Engineer

A handwritten signature in blue ink that reads 'Milan Radic'.

Milan Radic, P.E.

Senior Geotechnical Engineer

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FS	factor of safety
msl	mean sea level
Wood	Wood Environment and Infrastructure Solutions, Inc.

1.0 Introduction

Wood Environment and Infrastructure Solutions, Inc. (Wood) understands that Lake Erie Trucking, LLC is seeking a permit to expand operations of the Lake Erie Pit 1 gravel mine towards the south. The expansion area includes tax parcels: P19161, P19164, P19158, P90028, and P19155. The goal is to gain access to more resources in order to continue mine operations further into the future. Various studies have been completed already as part of the permitting process (Skagit County 2020). A Special Use Permit was approved by Skagit County on November 30, 2020 (Skagit County, 2020); however, upon appeal, the Hearing Examiner determined that a geologic hazard site assessment is needed in order to fulfill Section 14.24.400 of the Skagit County Critical Areas Ordinance (Skagit County, 2021). This report is intended to meet the requirement for a geologic hazard site assessment.

2.0 Site and project description

The site is located on Fidalgo Island just south of Lake Erie, near 13500 Rosario Road, Township 34 North, Range 1 East, Section 11, Northwest ¼, as shown on Figure 1. The site contains a local high point in elevation between the coastline of Burrows Bay to the northwest, Lake Erie to the northeast, and Devil's Elbow Lake to the south. The surface elevation ranges from 420 feet down to 290 feet above mean sea level (msl) at the current base of mining operations. The surface slopes moderately over most of the area, except where mining excavations have created near-vertical and very steep slopes. The proposed expansion area has been graded with access roads and small excavations for mining aggregates and for controlling surface water runoff.

The current mining area is bare or vegetated with pioneering grasses, bushes, and saplings, and the proposed expansion area is fully vegetated with second-growth trees and shrubs.

The proposed use of the expansion area is displayed in Figures 2 through 5. Dry mining will consist of excavating the bank run sand and gravel, loading it into trucks, and transporting to construction sites. Excavation could extend down to elevation 250 feet above msl. The final reclamation plan consists of backfilling the excavated bank to form a prism of fill with 2H:1V (horizontal:vertical) slopes, and backfilling excavations in the northern portion to raise grades and form 2H:1V fill slopes, as shown in Figures 3 through 5.

2.1 Site Reconnaissance

Wood visited the site March 18, 2022. We met with Brandt Wooding of Lake Erie Trucking, LLC, who gave us a tour of the Lake Erie Pit 1 and answered questions. The photographs in Appendix A were taken during the site visit.

There were no ongoing operations occurring at Pit 1 and there was no evidence of recent mining (grass and shrubs were encroaching onto the access roads). First, Wood visited the most recent mining area of Pit 1, accessed from Rosario Road on the north near Marine Drive. The excavated sidewalls of Pit 1 were near-vertical for the upper 30 feet, and sloughed soil formed steep slopes of about 1.3H:1V down to the level base of Pit 1 (see photographs 1 through 3 in Appendix A).

The upper slope exposed on the east side appeared to consist of glacial till because the soil was able to stand vertical and consisted of a well-graded mixture of grain sizes with a large percentage of fines (silt and clay). The south and east sidewalls of Pit 1 appeared to consist of advance outwash because the soil was also able to stand vertical and stratification of sand was clearly visible (the grain sizes were stratified into thin layers).

No groundwater seepage was observed through the excavated slopes and no evidence of significant erosion was observed.

Second-growth vegetation of young conifers and deciduous trees and shrubs surrounded the Pit 1 mining area, both directly at the top of the cut slopes and forming a buffer to the north between the excavation area and Rosario Road.

Wood also visited the proposed expansion area to the south of the existing Pit 1 via an access road from Rosario Road on the west near Edith Point Road. This area was less developed, with some grading for access roads, and ditches and stormwater ponds for drainage and erosion control. Minor excavations for mining gravel may have occurred in the past. Wood observed monitoring well BJF-103, recently installed for the hydrogeologic studies related to the permit application for the expansion (see Photograph 4 in Appendix A). The surface of the expansion area slopes gently to moderately (less than 40 percent) from a high point near the middle of the area to the south, west, and east. Most of the expansion area is well-vegetated with second growth trees and brush. We did not notice any signs of slope instability or significant erosion.

2.2 Site Research

Wood reviewed previous relevant studies of the site. The following documents provided information on the existing conditions, site geology and groundwater, the proposed expansion, and the final reclamation plan:

- Lake Erie Pit Well Reconnaissance (NWGC, 2019);
- Observation Well Installation (Maul Foster, 2017); and
- Hydrogeologic Site Assessment Report (Maul Foster, 2016).

Wood also reviewed the Skagit County LIDAR map created using Lidar2016Hillshade encompassing the site, which is reproduced as Figure 6. The map clearly depicts evidence of landslides along the coastal bluffs west of the site and grading due to the mining on the site. The head scarp of the nearest coastal bluff is approximately 300 feet northwest of the northwest sidewall of the existing Pit 1 and is approximately 800 feet northwest of the proposed expansion. Rosario Road runs between the site and the coastal bluffs, and the cut slope between Rosario Road and the site is clearly visible. The cut slope graded for Rosario Road is not considered a geologic hazard as it is not a natural slope but is an engineered and maintained slope.

3.0 Subsurface Conditions

The subsurface conditions at the site have been described thoroughly in the previous hydrogeologic studies (Maul Foster, 2016 and 2017; and NWGC, 2019). The conditions are summarized in this section and incorporated into our slope stability modeling in Section 4.0.

3.1 Geologic Conditions

Based on available published maps, the geology of the site generally consists of glacial till overlying glacial advance outwash soils. Ophiolite rock outcrops are present nearby to the north and east, and are probably present below the glacial soils at an undetermined depth (Miller and Pessel, 1986).

The mapped geology is consistent with the well drilling observations (Maul Foster, 2017) which interpreted the soil stratigraphy to consist of glacial till in the upper 35 feet below ground surface), overlying glacial advance outwash to the full depth of drilling of 277 feet below ground surface.

Additionally, Wood observed glacial till and advance outwash in the mining sidewalls during our site reconnaissance, confirming the mapped stratigraphy.

Glacial till is generally defined as an over-consolidated mixture of gravel, sand, silt, and clay that was deposited and overridden by a prehistoric glacial ice mass, thereby over-consolidating the soils to densities ranging from dense to very dense. Thus, these materials possess relatively high shear strengths, low compressibility, and low permeability.

Advance outwash is characterized by moderately sorted sands and gravels deposited by streams associated with the advancing glacier. Advance outwash, deposited in front of the advancing glacial ice mass, has been compacted (over-consolidated) by the overriding glacier resulting in dense to very dense deposits and is found below glacial till.

A relatively thin layer of glacial lacustrine soils was encountered near elevation 250 feet above msl while drilling observation well BJF-103. Glacial lacustrine soils form when sediments are deposited in lakes in front of advancing glaciers and then overridden by the glacier, resulting in very stiff to hard deposits of silt, fine sand, and clay.

3.2 Groundwater Conditions

The previous hydrogeologic studies (Maul Foster, 2016 and 2017; and NWGC, 2019) provide detailed information regarding the groundwater elevation, groundwater flow direction, and conclude that the mining operation is unlikely to have any impact on the groundwater.

To summarize, the regional unconfined groundwater table was interpreted to be near elevation 190 feet above msl, which is approximately 60 feet below the proposed mining excavation level. Groundwater flows north, toward Lake Erie, as shown in Figure 2. Due to concerns that Devil's Elbow Lake (elevation 363 feet above msl) could be a source of water seepage into the Pit 1 sidewalls, a groundwater observation well, BJF-103, was installed in the proposed expansion area, between the existing gravel pit and Devil's Elbow Lake (Figure 2). Only the deep regional groundwater at elevation 190 feet above msl was encountered and no evidence of shallower groundwater was found.

The previous hydrogeologic studies concluded that the proposed mine operations and reclamation plan would not affect the water levels in Devil's Elbow Lake. Additionally, because there will be no groundwater withdrawals and stormwater will infiltrate into the subsurface, there will be no impact on the downgradient groundwater conditions.

4.0 Slope Stability

Because the site has relatively steep slopes (50 percent grades), we analyzed the slope stability for these site conditions. The following sections describe results of geotechnical engineering analyses for the proposed reclaimed slopes. The analytical models are based on the slopes presented in the Hydrogeologic Site Assessment Report (Maul Foster, 2016) as cross sections A-A' and B-B', and Wood's interpretation of the soil stratigraphy and strengths. The soil stratigraphy is based on the updated cross section B-B' presented in the observation well installation letter (Maul Foster, 2017), which included the soils log for observation well BJF-103. The interpreted geologic cross sections are presented in Figures 3 through 5.

4.1 Soil Strength Parameters

Table 1 presents the interpretation of geological units (supplied by Maul Foster [2016]), and correlated soil properties selected from the range provided in Engineering Geology in Washington (Koloski et al., 1989). For the fill to be used to create the final reclaimed slopes, we assumed Common Borrow per

Washington State Department of Transportation (WSDOT) Standard Specification 9-03.14(3) (WSDOT, 2022a) would be applicable, and the soil strength properties for the Common Borrow were correlated with Table 5-2 in the *Geotechnical Design Manual* (WSDOT, 2022b).

Table 1. Correlated Soil Strength Properties

Material	USCS Soil Type	Soil Friction Angle (degrees)	Cohesion (psf)	Apparent Cohesion ¹ (psf)	Moist Unit Weight (pcf)
Common Borrow	SM, GM	34	0	100	125
Glacial Outwash	SW, GW	38	0	200	130
Glacial Lacustrine	ML, SM	32	200	0	120

Note:

1. Apparent cohesion used only to evaluate stability for the seismic pseudostatic case.

Abbreviations

pcf = pounds per cubic foot

USCS = Unified Soil Classification System

psf = pounds per square foot

By modeling the existing slope conditions at cross section A–A', Wood back-calculated soil properties of the advance outwash, a dominant soil unit, to match a factor of safety 1.0 under current static condition. The resulting soil strength required a friction angle of 42 degrees and 200 pounds per square foot apparent cohesion. These values are plausible but rather high, so to be more conservative, Wood reduced the soil strength of the advance outwash to correlated values reported in Engineering Geology in Washington (Koloski et al., 1989).

4.2 Slope Stability Analyses

Wood performed two-dimensional, limit equilibrium overall (global) stability analyses based on the method of slices according to Morgenstern-Price method, using the Slope/W software module in GeoStudio 2016 (Geo-Slope, 2016). This program employs limit equilibrium methods widely used in geotechnical engineering practice.

Wood modeled critical cross sections for slope geometry as summarized below:

1. Cross section A–A' (west to east) current west slope condition, Static Case;
2. Cross section A–A' (west to east) 2H:1V reclaimed west slope condition, Static Case;
3. Cross section A–A' (west to east) 2H:1V reclaimed west slope condition, Pseudostatic Case;
4. Cross section A–A' (west to east) reclaimed east slope condition, Static Case;
5. Cross section A–A' (west to east) reclaimed east slope condition, Pseudostatic Case;
6. Cross section B–B' (north to south) reclaimed south slope condition, Static Case; and
7. Cross section B–B' (north to south) reclaimed south slope condition, Pseudostatic Case.

We selected a target factor of safety (FS) for static and pseudo-static conditions of 1.3 and 1.1, respectively, for slip surfaces anywhere near the slope (no designated buffer) to verify the stability of the proposed final slopes. The static FS of 1.3 is what WSDOT uses for embankment and cut slopes that are not supporting structures. WSDOT does not require slopes without structures to be stable under seismic conditions, but they use an FS of 1.1 for slope that support structures.

Relative to the proposed 50-foot buffer between the top of the final slopes and the property line, all of the models for potential slip surfaces behind the buffer resulted in an FS greater than the 1.5 for static and 1.25 for seismic, as required by the Skagit County Critical Areas Code.

Global stability analyses of the reclaimed slopes considered shallow slip surfaces as well as deep-seated slip surfaces penetrating below the weaker glacial lacustrine layer and the groundwater table, defined at elevation 190 feet above msl per the previous hydrogeologic studies (Maul Foster, 2016 and 2017; and NWGC, 2019). The broad range cases demonstrate that deep-seated landslides are not likely.

Wood determined a pseudo-static horizontal seismic acceleration equivalent to one-half of site adjusted peak ground acceleration based on 7 percent probability of exceedance in 75 years, accessed via BEToolbox (WSDOT, 2022c). The pseudo-static horizontal seismic acceleration is 0.22g.

The results are presented in Table 2 and shows that reclaimed slopes meet or exceed the target FS. Slope stability results are shown in Appendix B.

Table 2. Overall Stability Evaluation Results

Cross Section	Location	Condition	Case	Target FS	Calculated FS	Exhibit ¹
A-A'	West Slope	Current ²	Static	1.0	1.0	B.1
A-A'	West Slope	Reclaimed	Static	1.3	1.9	B.2
			Static – Broad Range		1.9	B.3
			Pseudo Static	1.1	1.3	B.4
			Pseudo Static – Broad Range		1.3	B.5
A-A'	East Slope	Reclaimed	Static	1.3	1.4	B.6
			Static – Broad Range		1.4	B.7
			Pseudo Static	1.1	1.1	B.8
			Pseudo Static – Broad Range		1.1	B.9
B-B'	South Slope	Reclaimed	Static	1.3	1.7	B.10
			Static – Broad Range		1.7	B.11
			Pseudo Static	1.1	1.3	B.12
			Pseudo Static – Broad Range		1.3	B.13

Note:

1. Exhibits can be found in Appendix B.

2. Model used to back-calculate soil strength of glacial outwash

Abbreviations:

FS = factor of safety

4.3 Coastal Bluffs

The proposed mining operations will not have any impact on the coastal bluffs because the excavations will be too far away (300 to 800 feet).

The instability of coastal bluffs is usually related to (listed from major to minor causation): over-steepened slope; waves eroding the toe and creating over-steepened slopes; erosion from surface water flowing over

the slopes; groundwater seepage through the face of the slope; and occasionally due to over-loading at the top of the slope (such as roads and buildings).

The site is too far away from the coastal bluffs to cause any changes in these conditions except for possibly groundwater seepage and the previous hydrogeologic studies for the site (Maul Foster, 2016 and 2017; and NWGC, 2019) addressed this possibility. The studies concluded the proposed site development will not impact the groundwater table or the stability of the coastal bluffs because groundwater flows from the site towards the northeast, away from the bluffs; excavations at the site will not extend down into the groundwater table; and stormwater will be managed and infiltrated on site.

5.0 Conclusions and recommendations

The geologically hazardous areas on the site consist of landslide hazards due to slopes steeper than 40 percent and higher than 10 feet. These slopes are present due to the mining excavations and the final mine reclamation will include slopes graded to 2H:1V (50 percent). Quantitative engineering analyses of these slopes has determined that they will be stable with FSs that meet the Skagit County critical area code requirements and the standard of engineering practice.

Adjacent to the west of the site is the road cut for Rosario Road, which is steeper than 40 percent and higher than 10 feet. However, this is an engineered slope that was designed and is maintained by Skagit County, and therefore is considered stable. Additionally, the proposed expansion of Pit 1 will not affect this slope.

Coastal bluffs are located 300 to 800 feet west of the site and the proposed expansion of Pit 1 will not affect these slopes, because the proposed expansion plans will not change the regional groundwater conditions.

6.0 Limitations

1. The work performed in the preparation of this report and the conclusions presented herein are subject to the following:
 - a. The contract between Wood and the Client, including any subsequent written amendment or Change Order duly signed by the parties (hereinafter together referred as the "Contract");
 - b. Any and all time, budgetary, access and/or site disturbance, risk management preferences, constraints or restrictions as described in the Contract, in this report, or in any subsequent communication sent by Wood to the Client in connection to the Contract; and
 - c. The limitations stated herein.
2. **Standard of care:** Wood has prepared this report in a manner consistent with the level of skill and care ordinarily exercised by reputable members of Wood's profession, practicing in the same or similar locality at the time of performance, and subject to the time limits and physical constraints applicable to the scope of work, and terms and conditions for this assignment. No other warranty, guaranty, or representation, expressed or implied, is made or intended in this report, or in any other communication (oral or written) related to this project. The same are specifically disclaimed, including the implied warranties of merchantability and fitness for a particular purpose.
3. **Limited locations:** The information contained in this report is restricted to the site and structures evaluated by Wood and to the topics specifically discussed in it, and is not applicable to any other aspects, areas, or locations.

4. **Information utilized:** The information, conclusions, and estimates contained in this report are based exclusively on: i) information available at the time of preparation, ii) the accuracy and completeness of data supplied by the Client or by third parties as instructed by the Client, and iii) the assumptions, conditions and qualifications/limitations set forth in this report.
5. **Accuracy of information:** No attempt has been made to verify the accuracy of any information provided by the Client or third parties, except as specifically stated in this report (hereinafter "Supplied Data"). Wood cannot be held responsible for any loss or damage, of either contractual or extra-contractual nature, resulting from conclusions that are based on reliance on the Supplied Data.
6. **Report interpretation:** This report must be read and interpreted in its entirety, as some sections could be inaccurately interpreted when taken individually or out of context. The contents of this report are based on the conditions known and information provided as of the date of preparation. The text of the final version of this report supersedes any other previous versions produced by Wood.
7. **No legal representations:** Wood makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.
8. **Decrease in property value:** Wood shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **No third-party reliance:** This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or Contract. Any use or reproduction that any third party makes of the report, in whole or in part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Wood does not represent or warrant the accuracy, completeness, merchantability, fitness for purpose, or usefulness of this document, or any information contained in this document, for use or consideration by any third party. Wood accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on this report or anything set out therein, including without limitation, any indirect, special, incidental, punitive or consequential loss, liability or damage of any kind.
10. **Assumptions:** Where design recommendations are given in this report, they apply only if the project contemplated by the Client is constructed substantially in accordance with the details stated in this report. It is the sole responsibility of the Client to provide to Wood changes made in the project, including but not limited to details in the design, conditions, engineering, or construction that could in any manner whatsoever impact the validity of the recommendations made in the report. Wood shall be entitled to additional compensation from Client to review and assess the effect of such changes to the project.
11. **Time dependence:** If the project contemplated by the Client is not undertaken within a period of 18 months following the submission of this report, or within the time frame understood by Wood to be contemplated by the Client at the commencement of Wood's assignment, and/or if any changes are made—for example, to the elevation, design or nature of any development on the site, its size and configuration, the location of any development on the site and its orientation, the use of the site, performance criteria, and the location of any physical infrastructure—the conclusions and recommendations presented herein should not be considered valid unless the impact of the said

changes is evaluated by Wood, and the conclusions of the report are amended or are validated in writing accordingly.

Advancements in the practice of geotechnical engineering, engineering geology and hydrogeology and changes in applicable regulations, standards, codes, or criteria could impact the contents of the report, in which case, a supplementary report may be required. The requirements for such a review remain the sole responsibility of the Client or their agents.

Wood will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

12. **Limitations of visual inspections:** Where conclusions and recommendations are given based on a visual inspection conducted by Wood, they relate only to the natural or man-made structures, slopes, etc. inspected at the time the site visit was performed. These conclusions cannot and are not extended to include those portions of the site or structures that were not reasonably available, in Wood's opinion, for direct observation.
13. **Limitations of site investigations:** Site exploration identifies specific subsurface conditions only at those points from which samples have been taken and only at the time of the site investigation. Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions.

The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation, and an engineering opinion is rendered about overall subsurface conditions and their likely behavior with regard to the proposed development. Despite this investigation, conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

Final sub-surface/bore/profile logs are developed by geotechnical engineers based on their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports.

Bedrock, soil properties, and groundwater conditions can be significantly altered by environmental remediation and/or construction activities, such as the use of heavy equipment or machinery, excavation, blasting, pile-driving, or draining or other activities conducted either directly on site or on adjacent terrain. These properties can also be indirectly affected by exposure to unfavorable natural events or weather conditions, including freezing, drought, precipitation, and snowmelt.

During construction, excavation is frequently undertaken that exposes the actual subsurface and groundwater conditions between and beyond the test locations, which may differ from those encountered at the test locations. It is recommended that Wood be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered at the test locations, that construction work has no negative impact on the geotechnical aspects of the design, to adjust recommendations in accordance with conditions as additional site information is gained, and to deal quickly with geotechnical considerations if they arise.

Interpretations and recommendations presented herein may not be valid if an adequate level of review or inspection by Wood is not provided during construction.

14. **Factors that may affect construction methods, costs and scheduling:** The performance of rock and soil materials during construction is greatly influenced by the means and methods of construction.

Where comments are made relating to possible methods of construction, construction costs, construction techniques, sequencing, equipment or scheduling, they are intended only for the guidance of the project design professionals, and those responsible for construction monitoring. The number of test holes may not be sufficient to determine the local underground conditions between test locations that may affect construction costs, construction techniques, sequencing, equipment, scheduling, operational planning, etc.

Any contractors bidding on or undertaking the works should draw their own conclusions as to how the subsurface and groundwater conditions may affect their work, based on their own investigations and interpretations of the factual soil data, groundwater observations, and other factual information.

15. **Groundwater and dewatering:** Wood will accept no responsibility for the effects of drainage and/or dewatering measures if Wood has not been specifically consulted and involved in the design and monitoring of the drainage and/or dewatering system.
16. **Environmental and hazardous materials aspects:** Unless otherwise stated, the information contained in this report in no way reflects on the environmental aspects of this project, since this aspect is beyond the scope of work and the Contract. Unless expressly included in the scope of work, this report specifically excludes the identification or interpretation of environmental conditions such as contamination, hazardous materials, wildlife conditions, rare plants, or archeology conditions that may affect use or design at the site. This report specifically excludes the investigation, detection, prevention, or assessment of conditions that can contribute to moisture, mold or other microbial contaminant growth, and/or other moisture-related deterioration, such as corrosion, decay, or rot in buildings or their surroundings. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.
17. **Effect of iron minerals:** This report does not address issues related to the discovery or presence of iron minerals, such as pyrite, or the effects of iron minerals, if any, in the soil or to be used in concrete. Should specific information be required, additional testing may be requested by the Client for which Wood shall be entitled to additional compensation.

7.0 References

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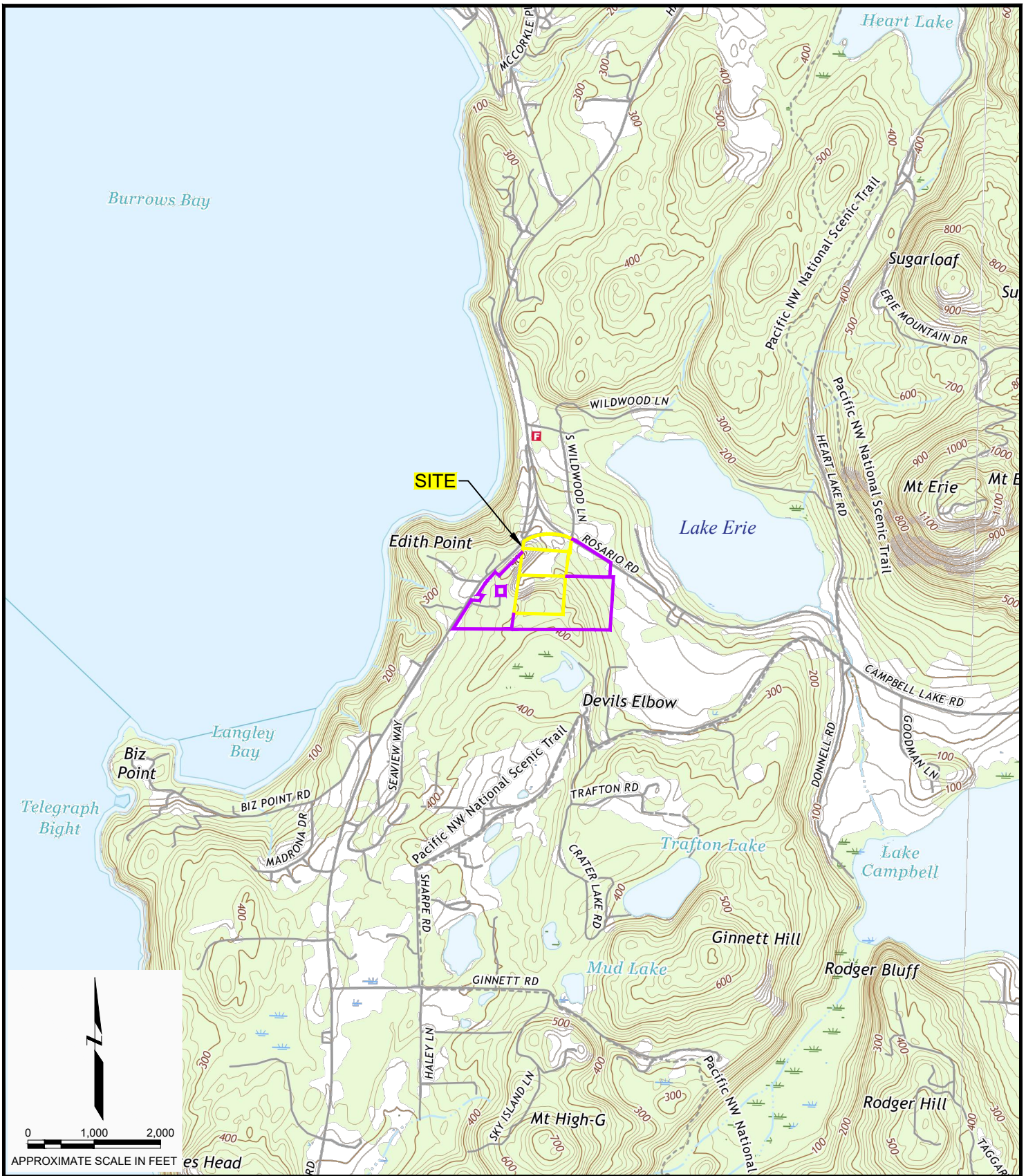
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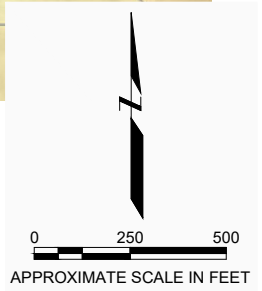
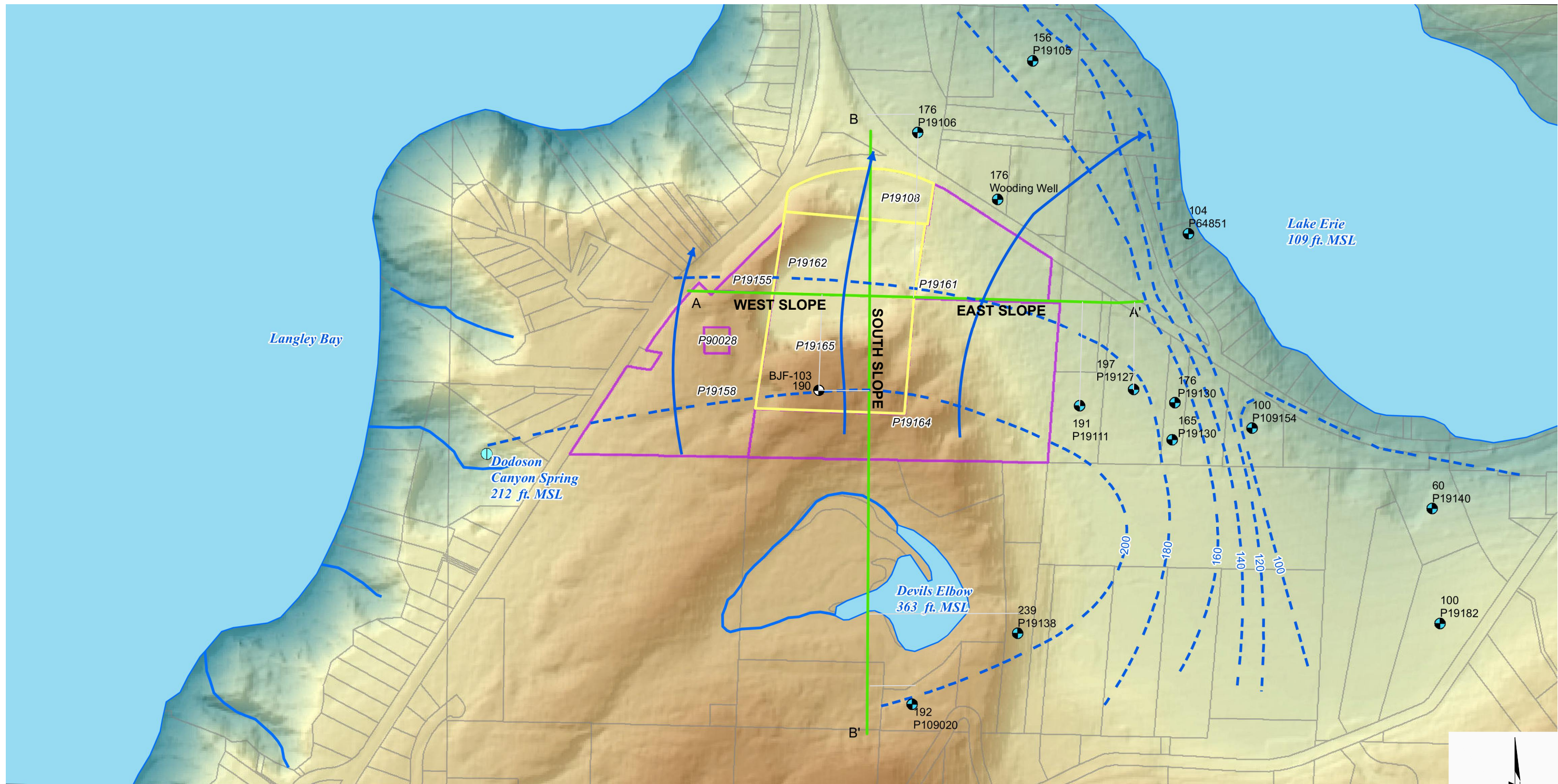
Figures





CLIENT		PROJECT	DATE
LAKE ERIE TRUCKING, LLC		LAKE ERIE PIT 1 EXPANSION Anacortes, Washington	MAY 2022
Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033		TITLE	SCALE
		SITE VICINITY	AS SHOWN
			PROJECT NO.
			PS22-20529-0
			FIGURE
			1

DRAWN BY: APS CHECKED BY: JKH



Legend

Parcel #

MSL

Approximate Groundwater Elevation (MSL)

Elevation (Feet MSL)

High : 1270.8

Low : -6.7

Legend

Parcel #

MSL

Approximate Groundwater Elevation (MSL)

Elevation (Feet MSL)

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Low : -6.7

Legend

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MSL

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Elevation (Feet MSL)

High : 1270.8

Low : -6.7

Legend

Parcel #

MSL

Approximate Groundwater Elevation (MSL)

Elevation (Feet MSL)

High : 1270.8

Low : -6.7

CLIENT	LAKE ERIE TRUCKING, LLC	PROJECT	LAKE ERIE PIT PIT 1 EXPANSION Anacortes, Washington	DATE	MAY 2022
				SCALE	AS SHOWN
Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033		TITLE	PLAN VIEW OF EXPANSION AREA WITH CROSS SECTION LOCATIONS	PROJECT NO.	PS22-20529-0
				FIGURE	2

DRAWN BY: PM CHECKED BY: JKH

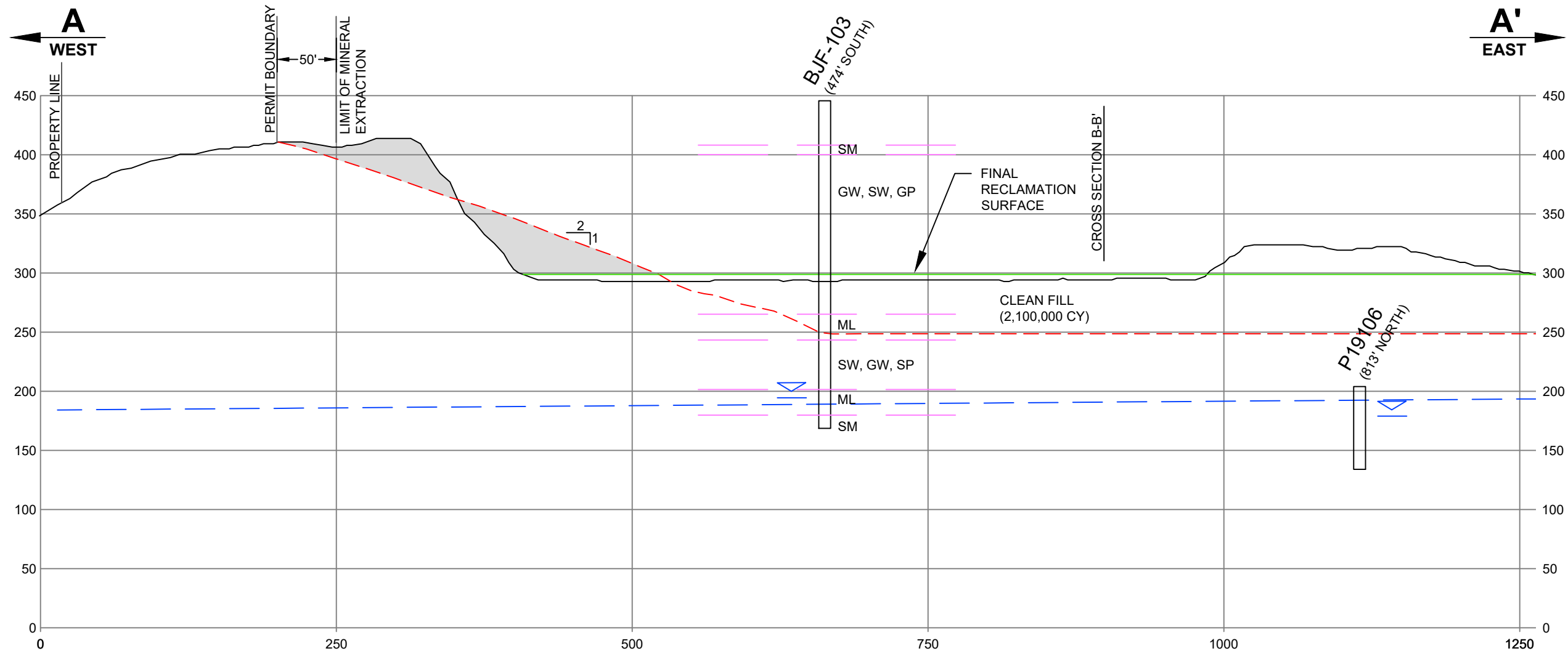
SOURCE:

HYDROGEOLOGIC SITE

ASSESSMENT REPORT

MAUL FOSTER ALONGI

p. 971 544 2139 | www.maulfooster.com

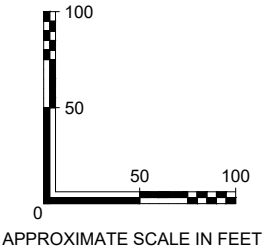


KEY

CL = CLAY
GC = CLAYEY GRAVEL
SC = CLAYEY SAND
SM = SILTY SAND
SW = WELL GRADED SAND
GW = WELL GRADED GRAVEL
ML = SILT
SP = POORLY GRADED SAND

LEGEND

— EXISTING GRADE
— FINAL RECLAMATION SURFACE
- - - BOTTOM OF MINING SURFACE
— LITHOLOGY CONTACT
[Shaded Area] AREA TO BE REGRADED AT FINAL RECLAMATION
- - - INFERRED WATER TABLE



NOTES:

- 100-FT SETBACK TO FINAL RECLAMATION SURFACE IS ONLY APPLICABLE TO PARCEL 19108. ALL OTHER PARCELS WILL MAINTAIN A 50-FT SETBACK TO FINAL RECLAMATION SURFACE.
- MINE TO 10 FEET ABOVE WATER TABLE
- MINE FLOOR RAISED TO 300 FEET WITH 85% COMPACTION
- MSL = MEAN SEA LEVEL
- CY = CUBIC YARDS

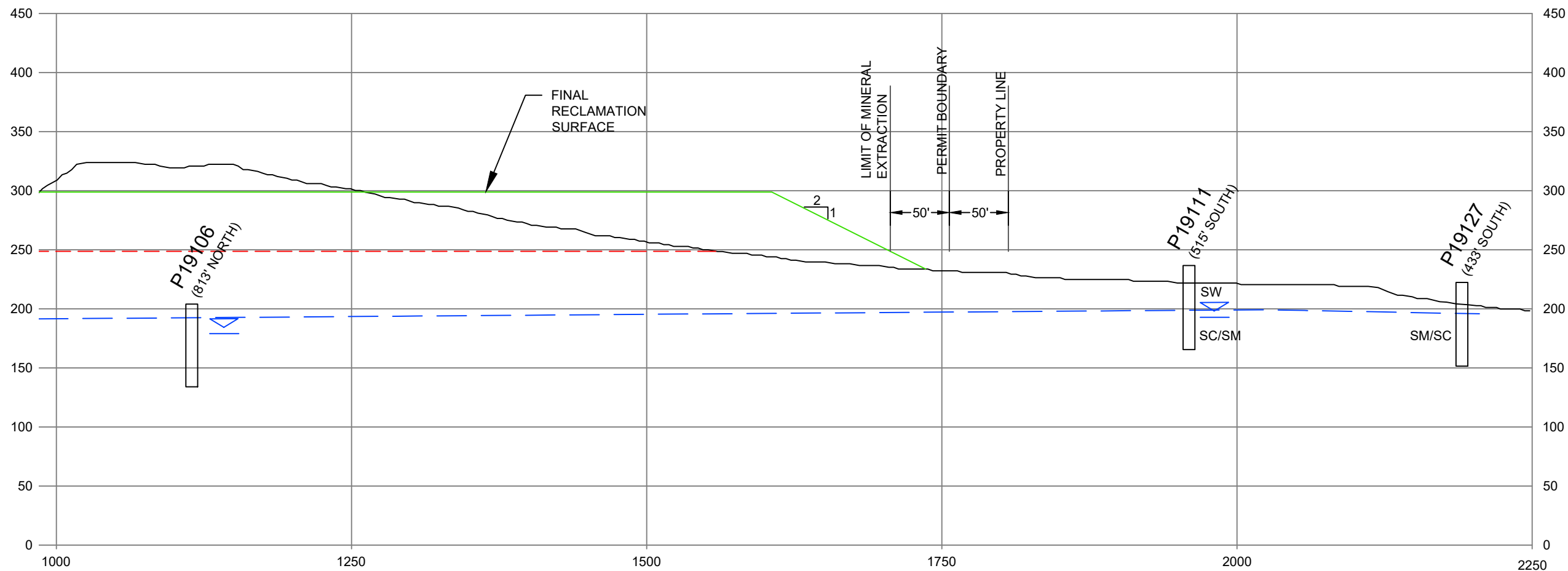
SOURCE:
HYDROGEOLOGIC SITE
ASSESSMENT REPORT



CLIENT	LAKE ERIE TRUCKING, LLC		PROJECT LAKE ERIE PIT PIT 1 EXPANSION Anacortes, Washington	DATE MAY 2022
				SCALE AS SHOWN
Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033			TITLE WEST SLOPE CROSS SECTION A-A'	PROJECT NO. PS22-20529-0
				FIGURE 3

A
WEST

A'
EAST



KEY

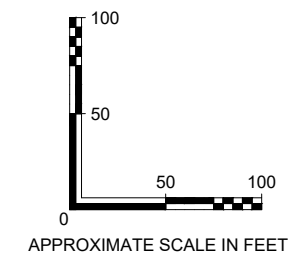
CL = CLAY
GC = CLAYEY GRAVEL
SC = CLAYEY SAND
SM = SILTY SAND
SW = WELL GRADED SAND
GW = WELL GRADED GRAVEL
ML = SILT
SP = POORLY GRADED SAND

LEGEND

— EXISTING GRADE
— FINAL RECLAMATION SURFACE
- - - BOTTOM OF MINING SURFACE
— LITHOLOGY CONTACT
■ AREA TO BE REGRADED AT FINAL RECLAMATION
- - - INFERRED WATER TABLE

NOTES:

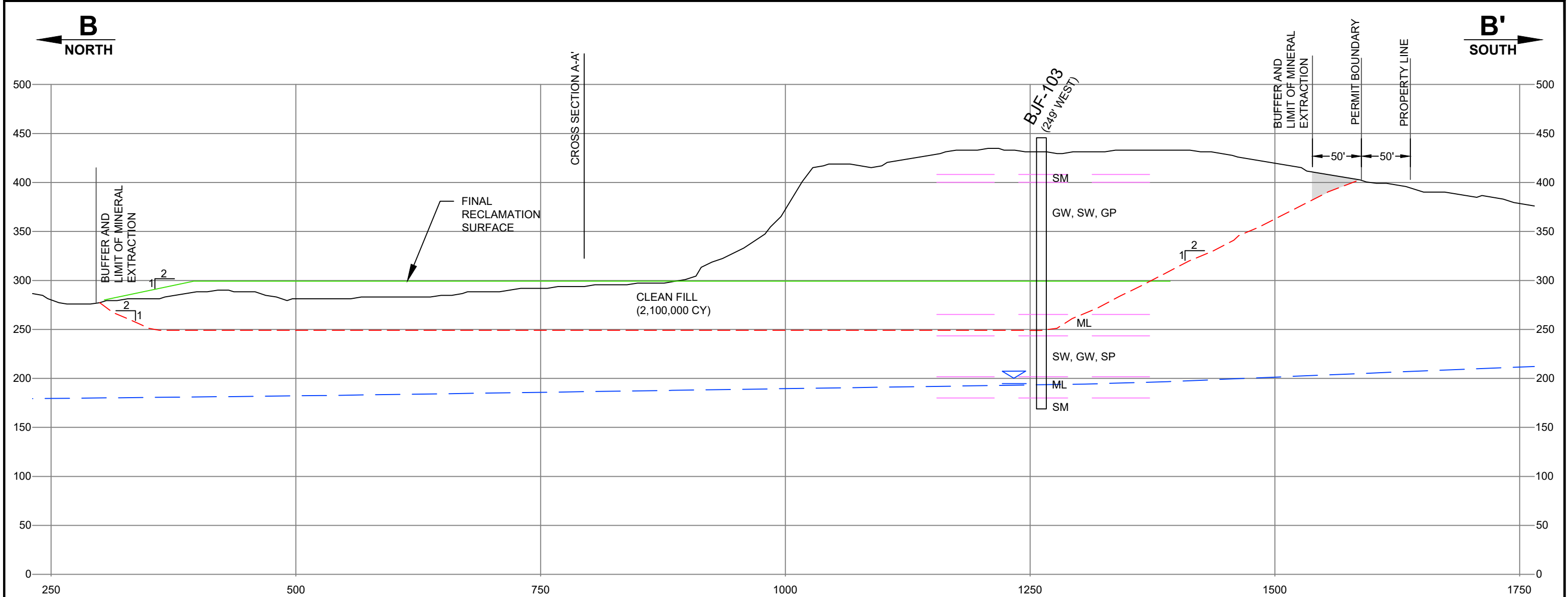
- 100-FT SETBACK TO FINAL RECLAMATION SURFACE IS ONLY APPLICABLE TO PARCEL 19108. ALL OTHER PARCELS WILL MAINTAIN A 50-FT SETBACK TO FINAL RECLAMATION SURFACE.
- MINE TO 10 FEET ABOVE WATER TABLE
- MINE FLOOR RAISED TO 300 FEET WITH 85% COMPACTION
- MSL = MEAN SEA LEVEL
- CY = CUBIC YARDS



SOURCE:
HYDROGEOLOGIC SITE
ASSESSMENT REPORT



CLIENT	LAKE ERIE TRUCKING, LLC		PROJECT LAKE ERIE PIT PIT 1 EXPANSION Anacortes, Washington	DATE MAY 2022
				SCALE AS SHOWN
	Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033		TITLE EAST SLOPE CROSS SECTION A-A'	PROJECT NO. PS22-20529-0
				FIGURE 4

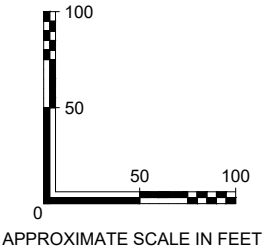


KEY

CL = CLAY
GC = CLAYEY GRAVEL
SC = CLAYEY SAND
SM = SILTY SAND
SW = WELL GRADED SAND
GW = WELL GRADED GRAVEL
ML = SILT
SP = POORLY GRADED SAND

LEGEND

— EXISTING GRADE
— FINAL RECLAMATION SURFACE
- - - BOTTOM OF MINING SURFACE
— LITHOLOGY CONTACT
[Shaded Area] AREA TO BE REGRADED AT FINAL RECLAMATION
- - - INFERRED WATER TABLE



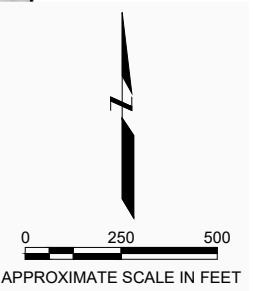
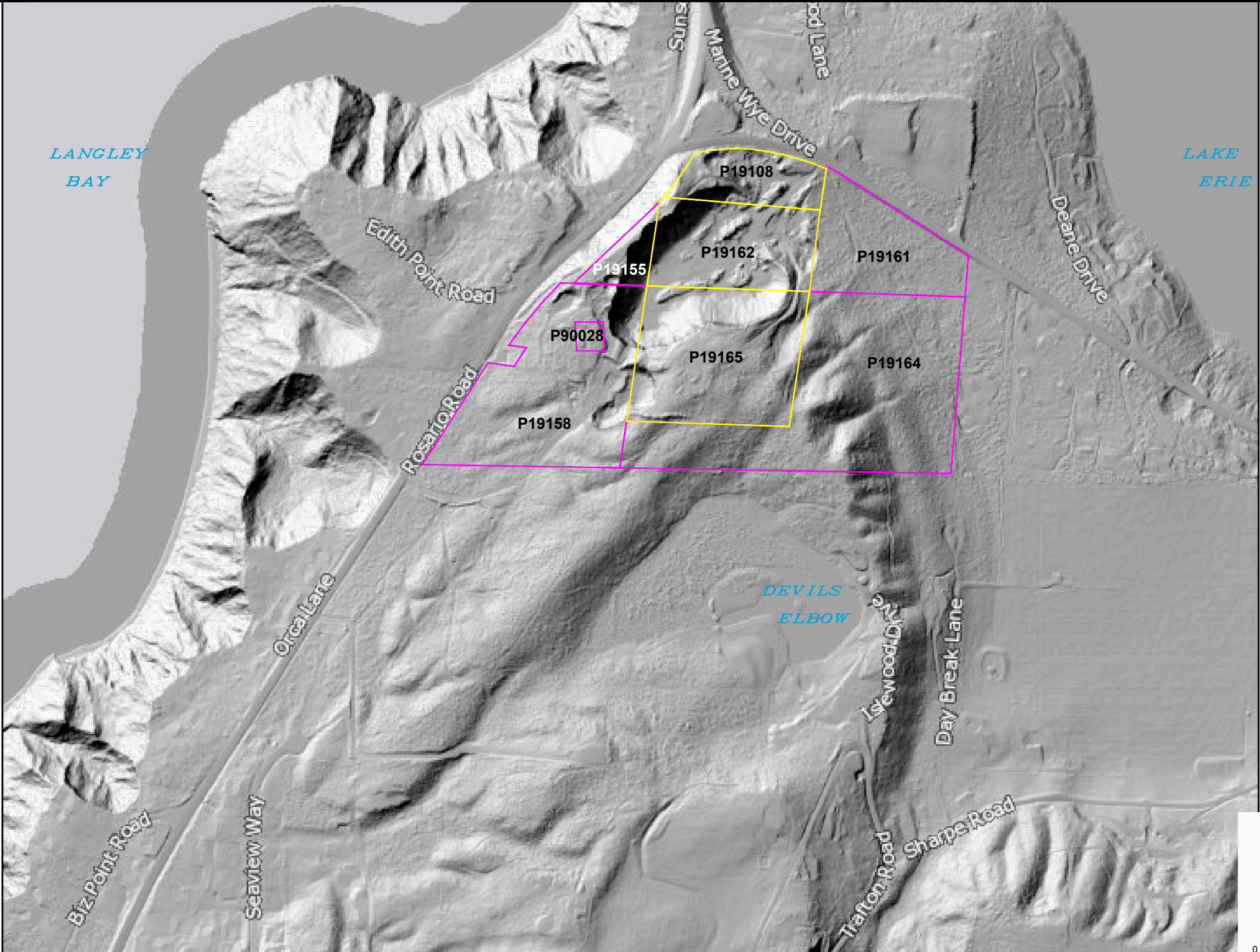
NOTES:

- 100-FT SETBACK TO FINAL RECLAMATION SURFACE IS ONLY APPLICABLE TO PARCEL 19108. ALL OTHER PARCELS WILL MAINTAIN A 50-FT SETBACK TO FINAL RECLAMATION SURFACE.
- MINE TO 10 FEET ABOVE WATER TABLE
- MINE FLOOR RAISED TO 300 FEET WITH 85% COMPACTION
- MSL = MEAN SEA LEVEL
- CY = CUBIC YARDS

SOURCE:
HYDROGEOLOGIC SITE
ASSESSMENT REPORT



CLIENT	LAKE ERIE TRUCKING, LLC		PROJECT LAKE ERIE PIT PIT 1 EXPANSION Anacortes, Washington	DATE MAY 2022
				SCALE AS SHOWN
	Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033		TITLE SOUTH SLOPE CROSS SECTION B-B'	PROJECT NO. PS22-20529-0
				FIGURE 5



LEGEND

- Current Permitted Parcels
- Expansion Parcels

SOURCE:
SKAGIT COUNTY
LIDAR 2016 HILL SHADE.

CLIENT		PROJECT	LAKE ERIE PIT PIT 1 EXPANSION Anacortes, Washington	DATE	MAY 2022
		TITLE	LIDAR MAP	SCALE	AS SHOWN
				PROJECT NO.	PS22-20529-0
				FIGURE	6
Wood Environment & Infrastructure Solutions, Inc. 4020 Lake Washington Blvd NE, Suite 200 Kirkland, Washington 98033					



wood.

Appendix A



Appendix A Site Photographs



Photograph 1. Lake Erie Pit looking east



Photograph 2. Lake Erie Pit looking south



Photograph 3. Lake Erie Pit looking southwest



Photograph 4. New well looking east



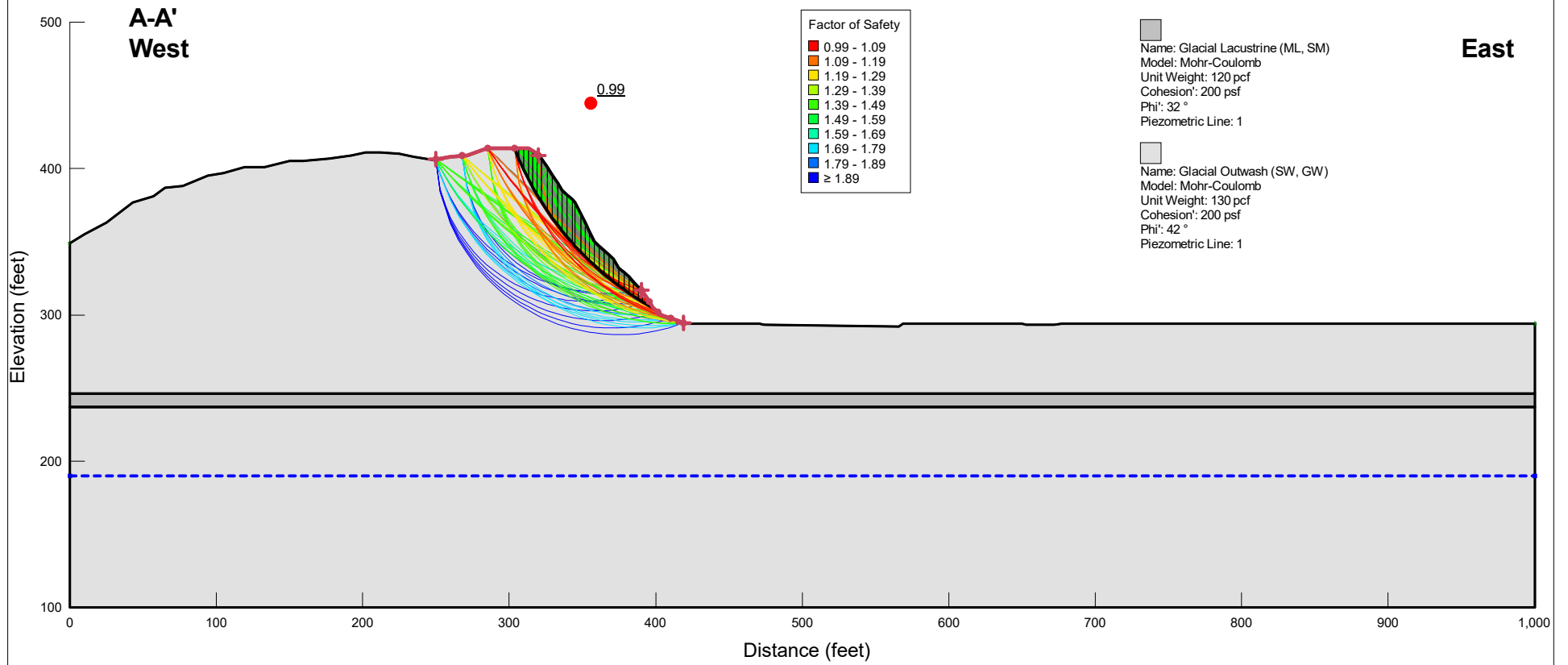
wood.

Appendix B



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

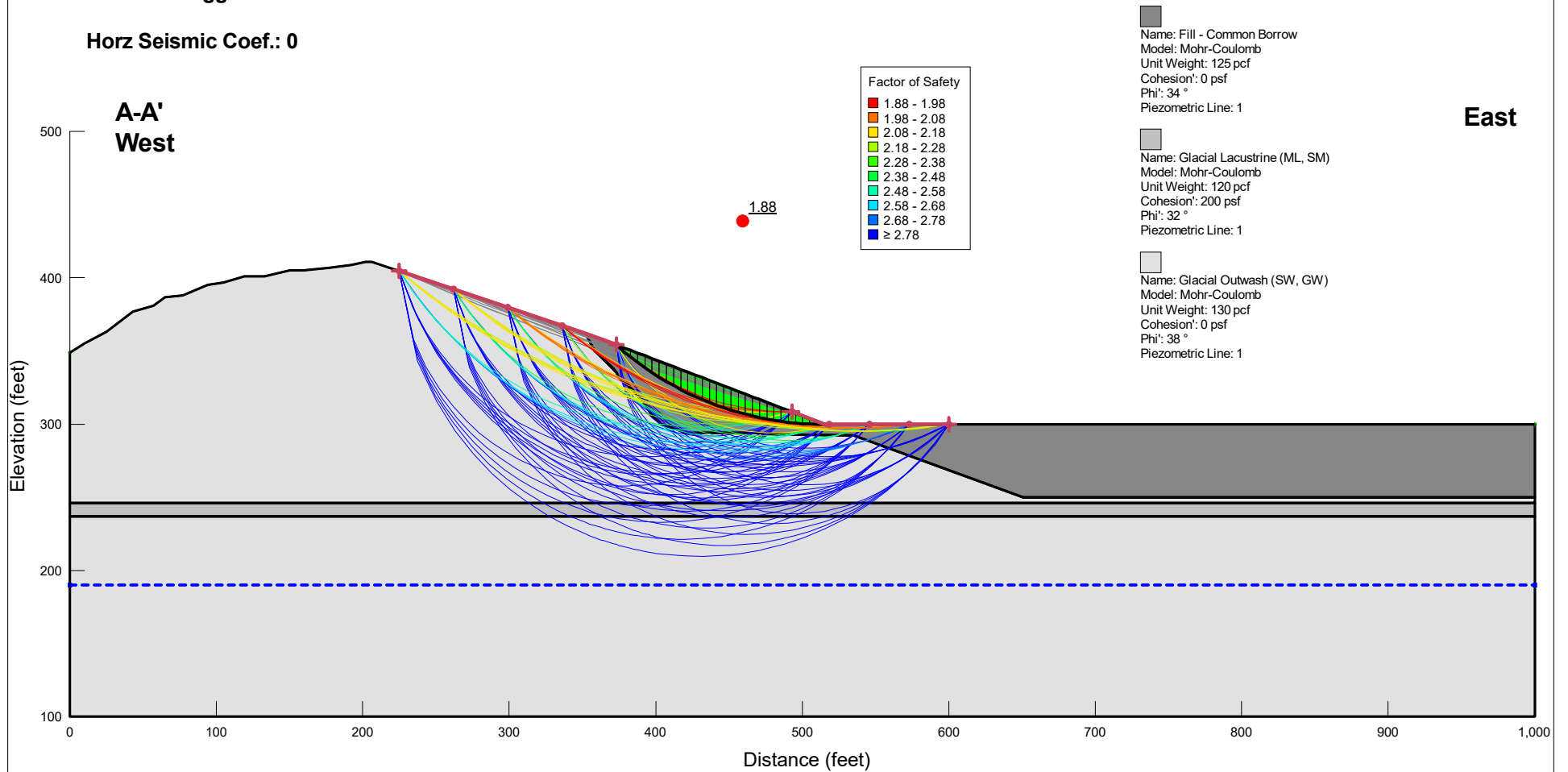
Current Slope Condition
Name: A-A' West to East - 1H:1V Current
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed West Slope Condition
Name: A-A' West to East - 2H:1V Cut/Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

Horz Seismic Coef.: 0



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed West Slope Condition - Broad Range

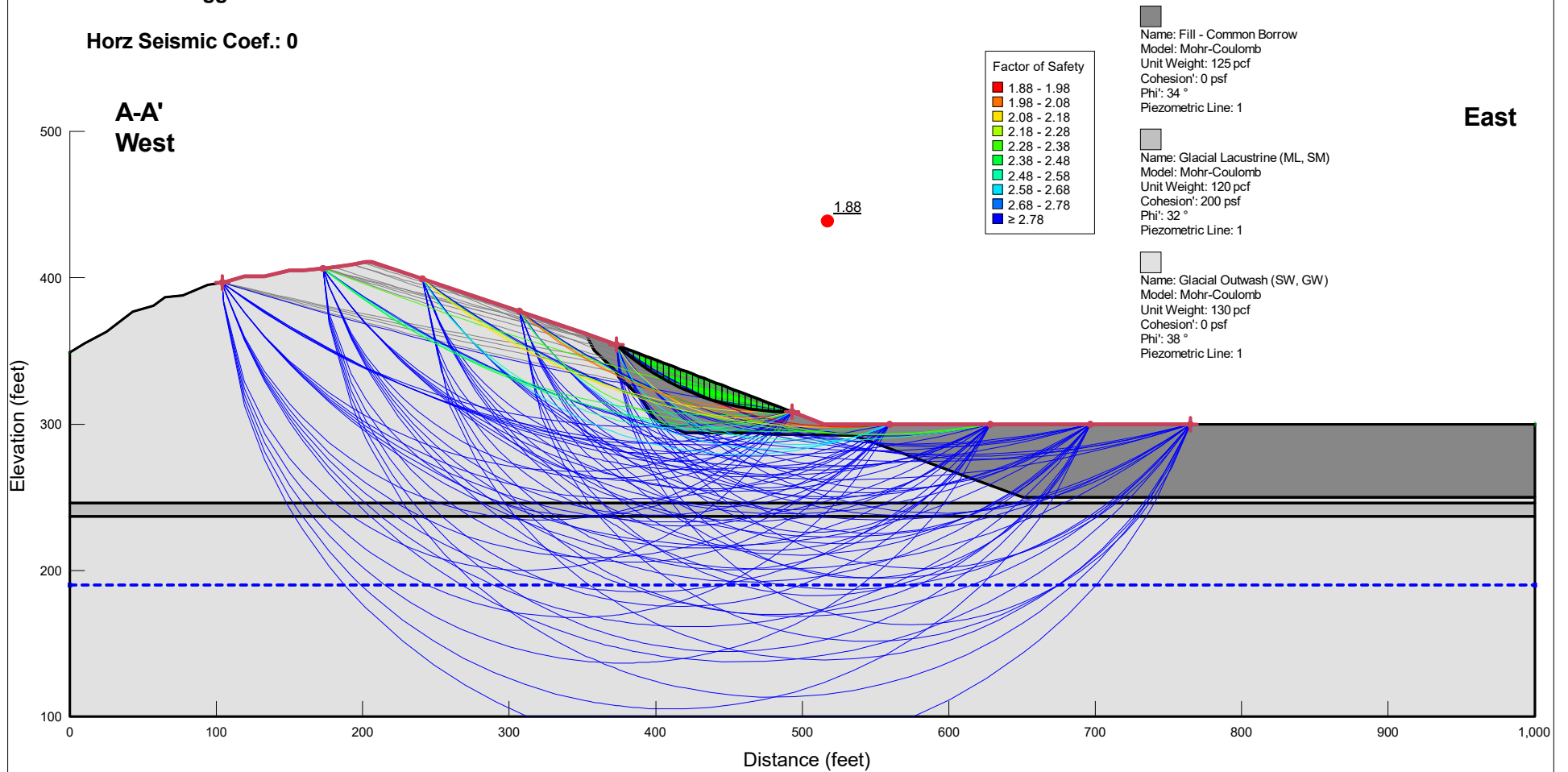
Name: A-A' West to East - 2H:1V Cut/Fill

Method: Morgenstern-Price

Date: 4/8/2022

Vertical Exaggeration: 1

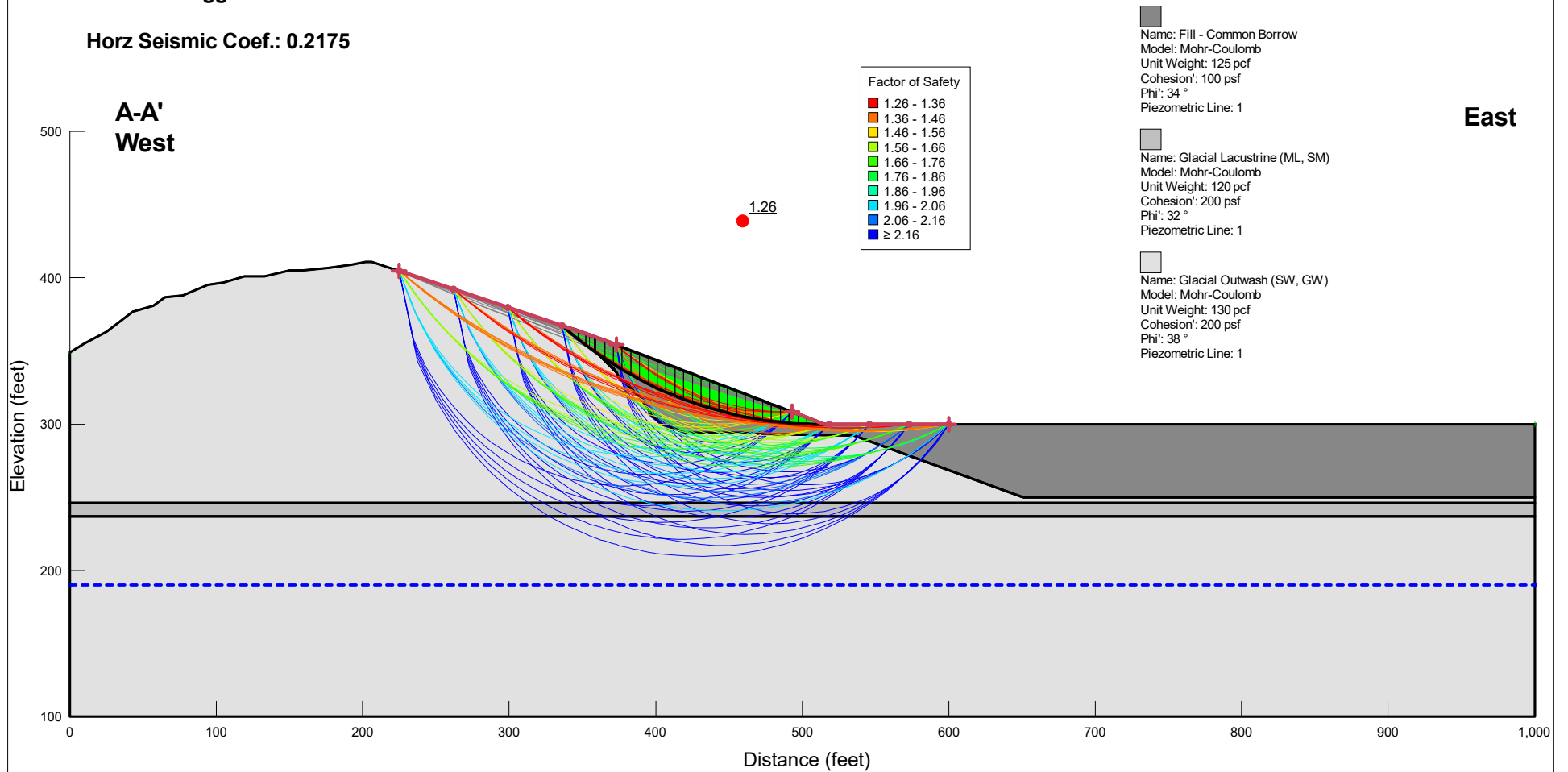
Horz Seismic Coef.: 0



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed West Slope Condition
Name: A-A' West to East - 2H:1V Cut/Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

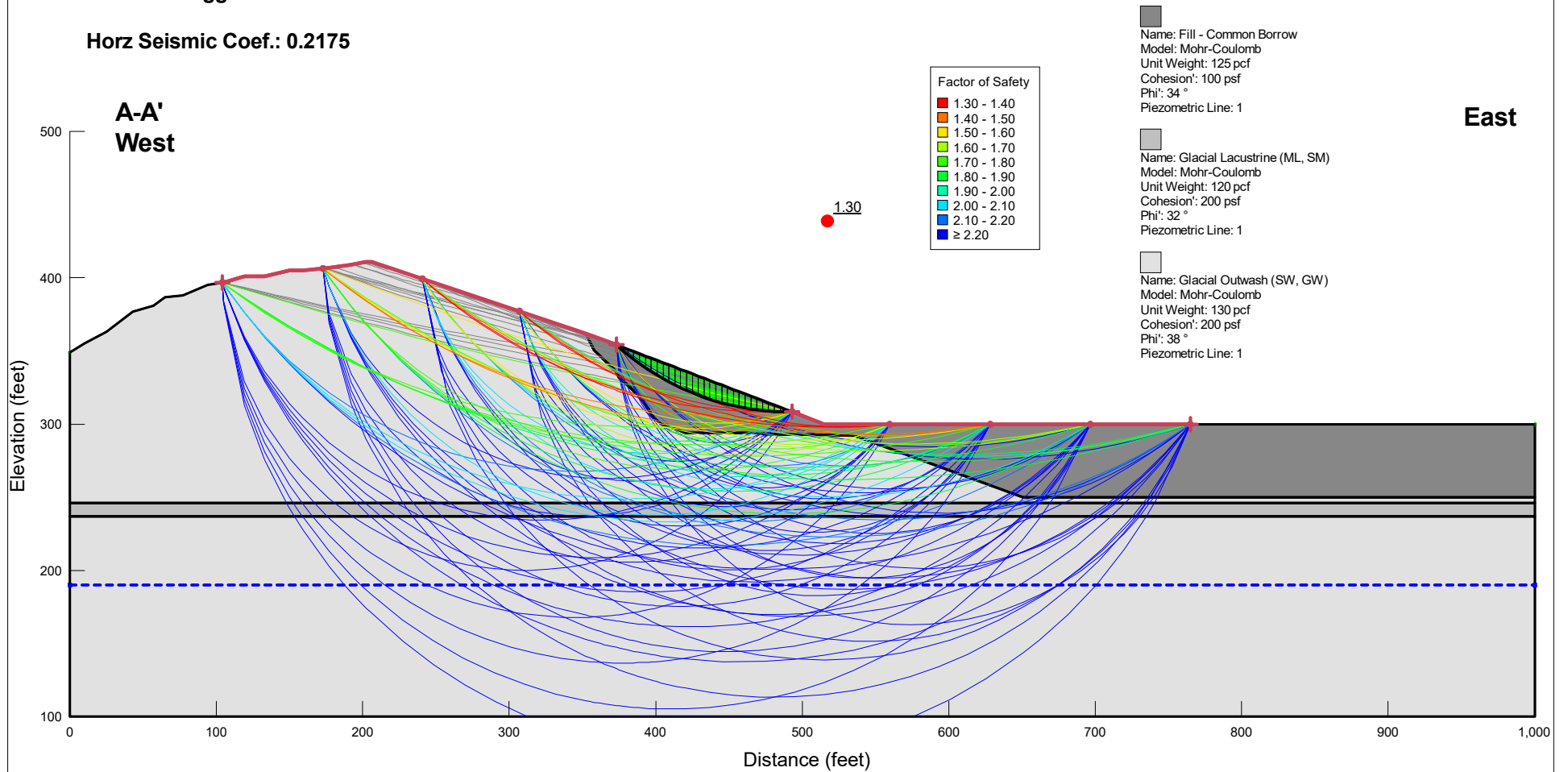
Horz Seismic Coef.: 0.2175



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed West Slope Condition
Name: A-A' West to East - 2H:1V Cut/Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

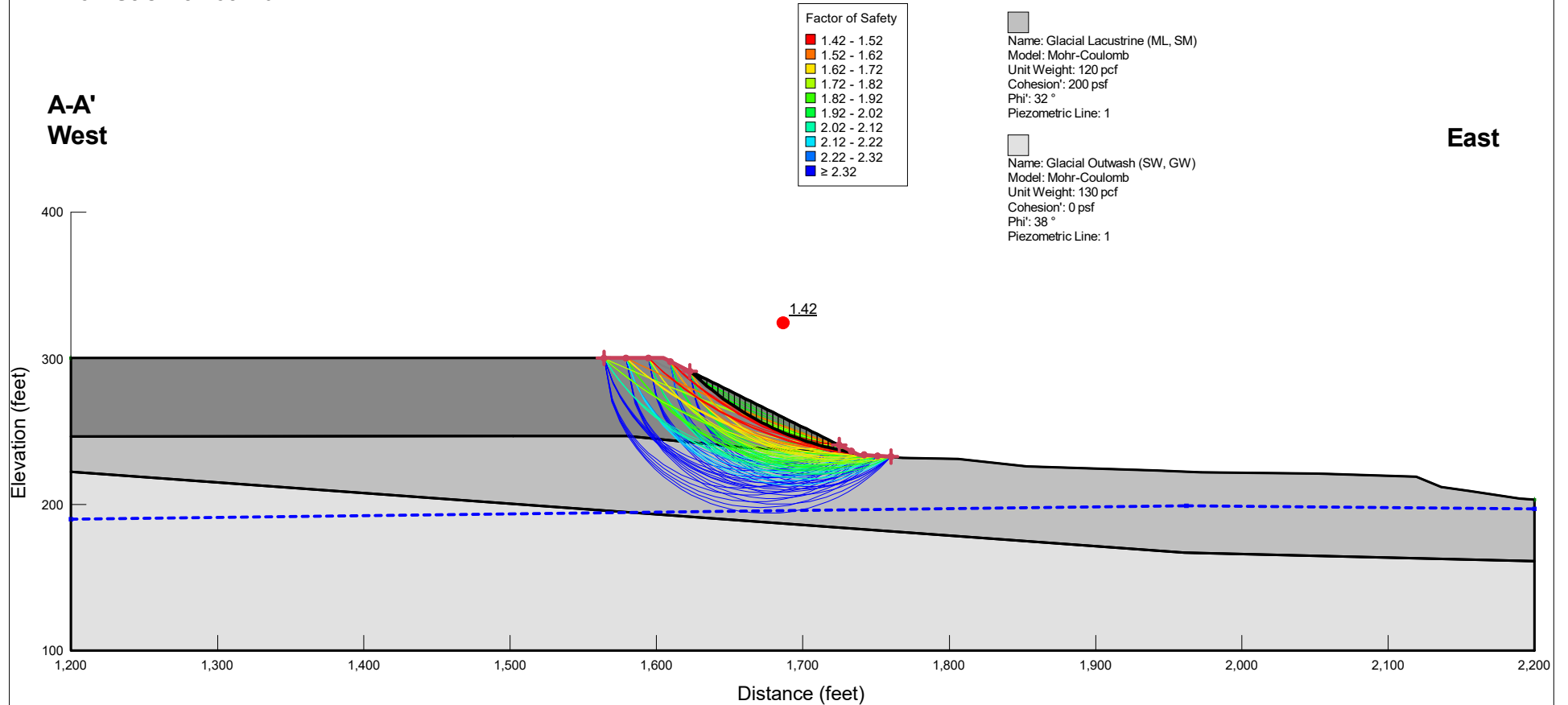
Horz Seismic Coef.: 0.2175



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed East Slope Condition
Name: A-A' West to East - 2H:1V Cut/Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

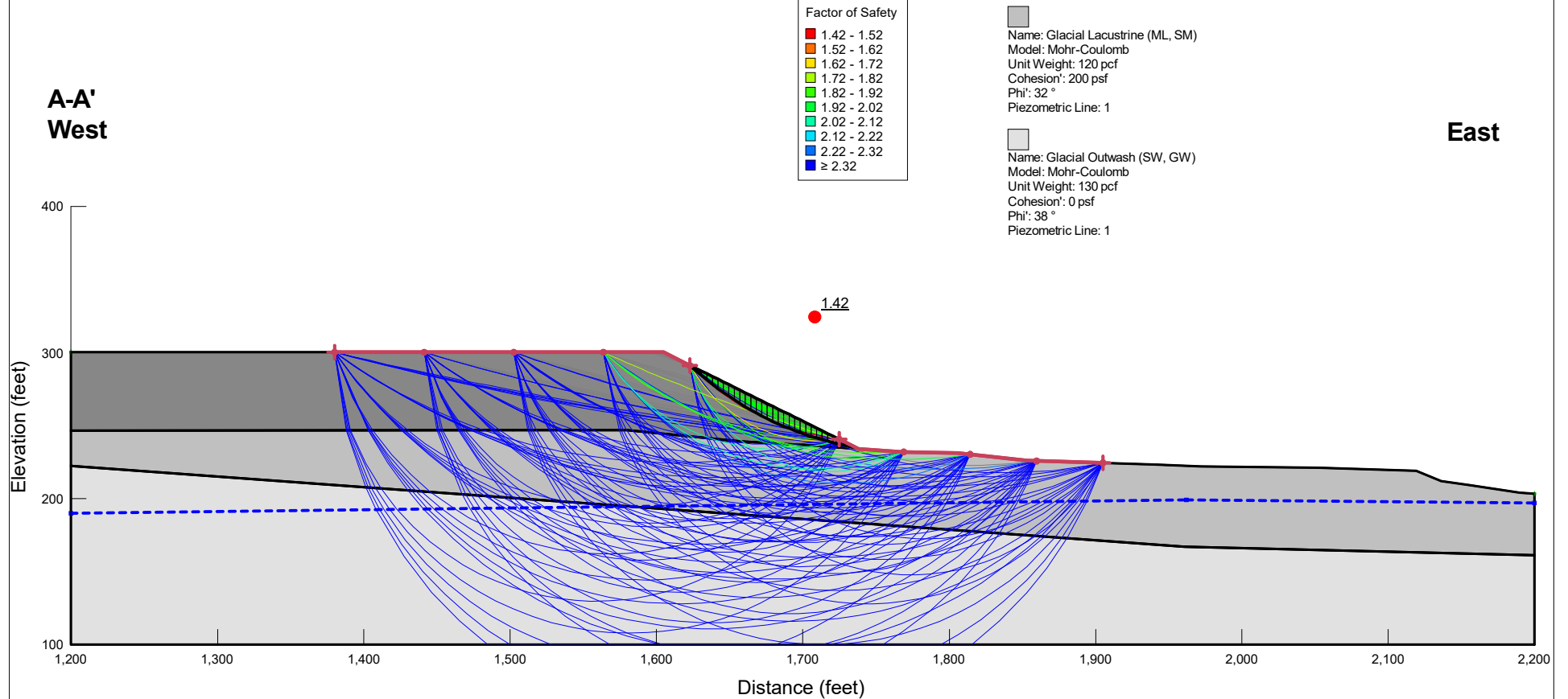
Horz Seismic Coef.: 0



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed East Slope Condition
Name: A-A' West to East - 2H:1V Cut/Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

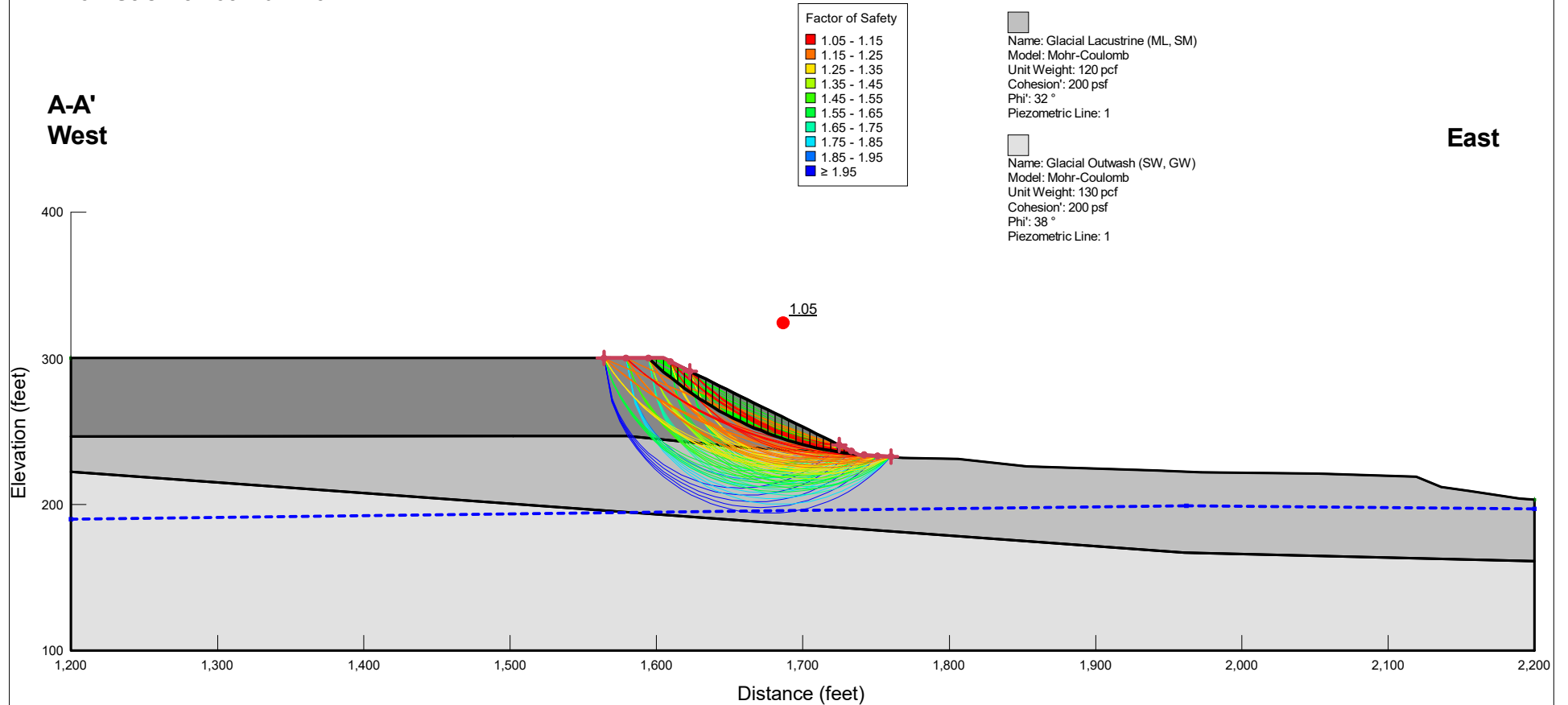
Horz Seismic Coef.: 0



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed East Slope Condition
Name: A-A' West to East - 2H:1V Cut/Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

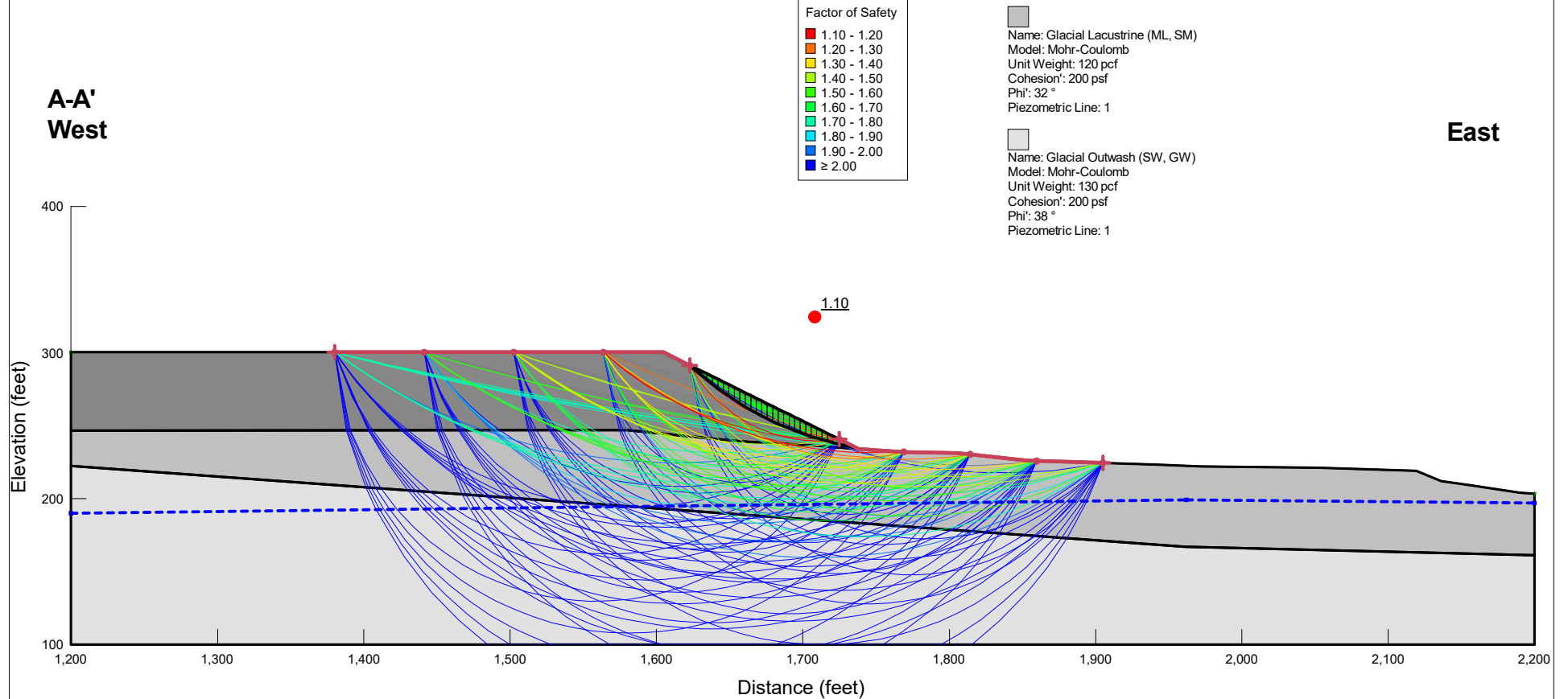
Horz Seismic Coef.: 0.2175



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed East Slope Condition
Name: A-A' West to East - 2H:1V Cut/Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

Horz Seismic Coef.: 0.2175



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

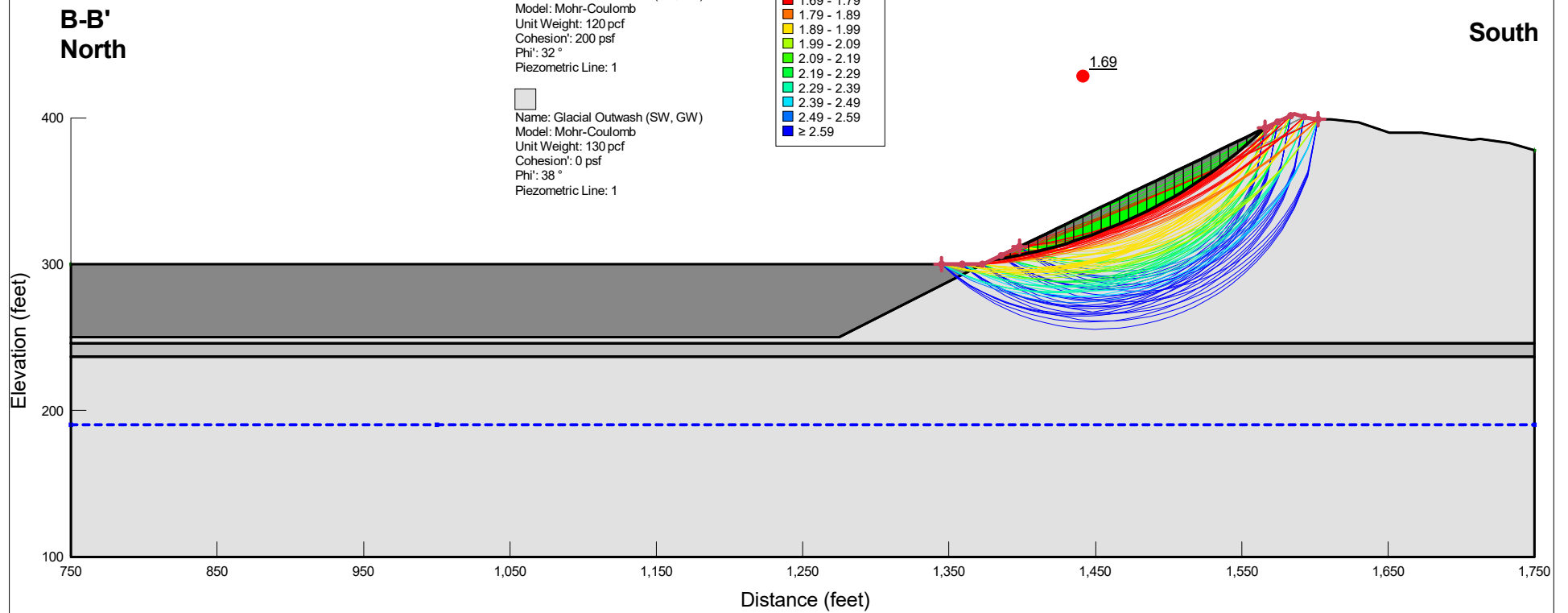
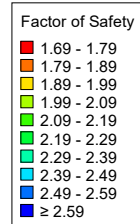
Reclaimed South Slope Condition
Name: B-B' North to South - 2H:1V Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

Horz Seismic Coef.: 0

■
Name: Fill - Common Borrow
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 34 °
Piezometric Line: 1

■
Name: Glacial Lacustrine (ML, SM)
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 32 °
Piezometric Line: 1

■
Name: Glacial Outwash (SW, GW)
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 38 °
Piezometric Line: 1



**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed South Slope Condition
Name: B-B' North to South - 2H:1V Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

Horz Seismic Coef.: 0

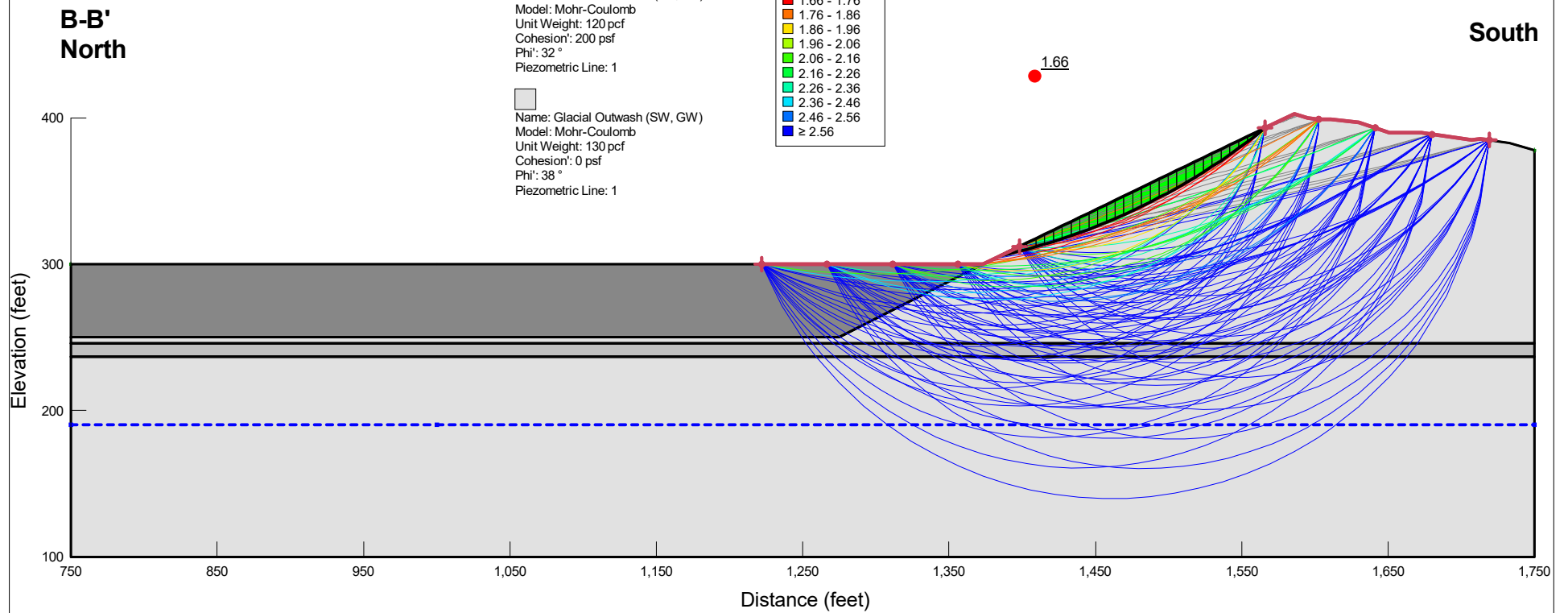
█
Name: Fill - Common Borrow
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 34 °
Piezometric Line: 1

█
Name: Glacial Lacustrine (ML, SM)
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 32 °
Piezometric Line: 1

█
Name: Glacial Outwash (SW, GW)
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 38 °
Piezometric Line: 1

Factor of Safety


1.66 - 1.76
1.76 - 1.86
1.86 - 1.96
1.96 - 2.06
2.06 - 2.16
2.16 - 2.26
2.26 - 2.36
2.36 - 2.46
2.46 - 2.56
≥ 2.56





**Lake Erie Pit 1 Expansion
Anacortes, Washington**

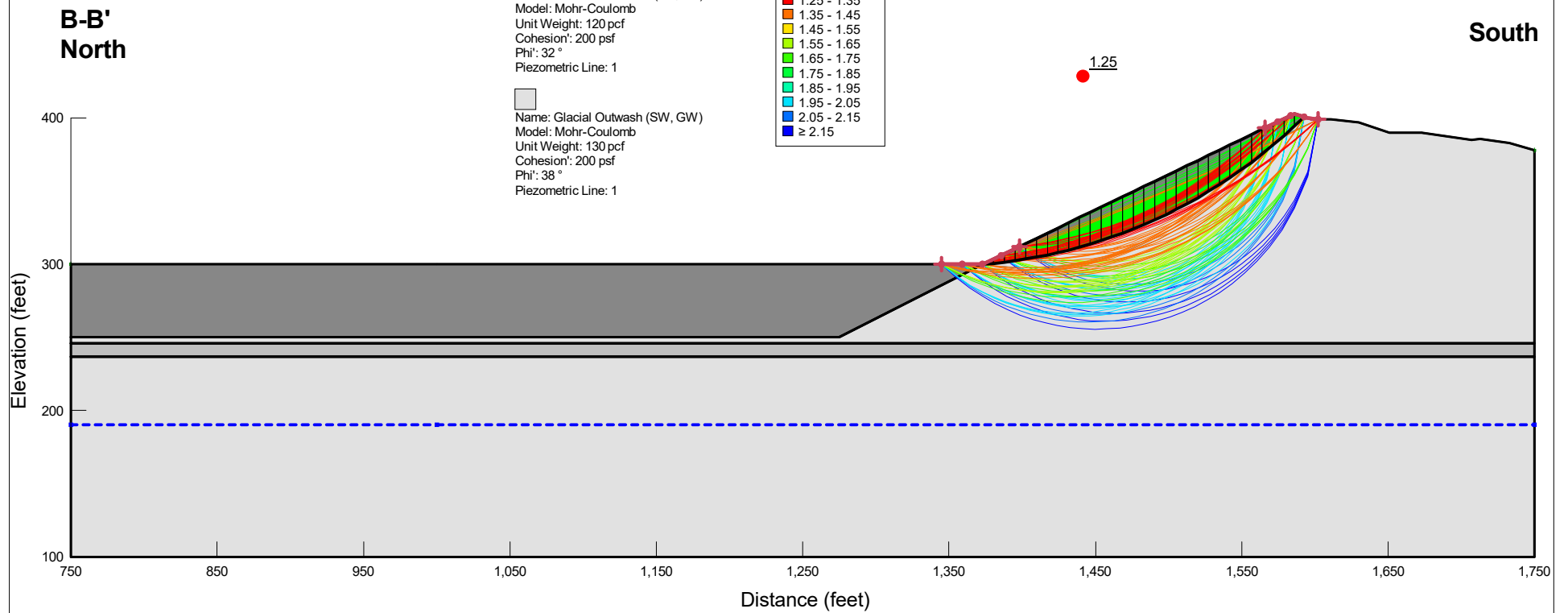
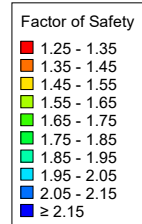
Reclaimed South Slope Condition
Name: B-B' North to South - 2H:1V Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

Horz Seismic Coef.: 0.2175

 Name: Fill - Common Borrow
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 100 psf
Phi: 34 °
Piezometric Line: 1

 Name: Glacial Lacustrine (ML, SM)
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 200 psf
Phi: 32 °
Piezometric Line: 1


 Name: Glacial Outwash (SW, GW)
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 200 psf
Phi: 38 °
Piezometric Line: 1





**Lake Erie Pit 1 Expansion
Anacortes, Washington**

Reclaimed South Slope Condition
Name: B-B' North to South - 2H:1V Fill
Method: Morgenstern-Price
Date: 4/8/2022
Vertical Exaggeration: 1

Horz Seismic Coef.: 0.2175

 Name: Fill - Common Borrow
 Model: Mohr-Coulomb
 Unit Weight: 125 pcf
 Cohesion: 0 psf
 Phi: 34 °
 Piezometric Line: 1

 Name: Glacial Lacustrine (ML, SM)
 Model: Mohr-Coulomb
 Unit Weight: 120 pcf
 Cohesion: 200 psf
 Phi: 32 °
 Piezometric Line: 1

 Name: Glacial Outwash (SW, GW)
 Model: Mohr-Coulomb
 Unit Weight: 130 pcf
 Cohesion: 200 psf
 Phi: 38 °
 Piezometric Line: 1

Factor of Safety

1.25 - 1.35
1.35 - 1.45
1.45 - 1.55
1.55 - 1.65
1.65 - 1.75
1.75 - 1.85
1.85 - 1.95
1.95 - 2.05
2.05 - 2.15
≥ 2.15

