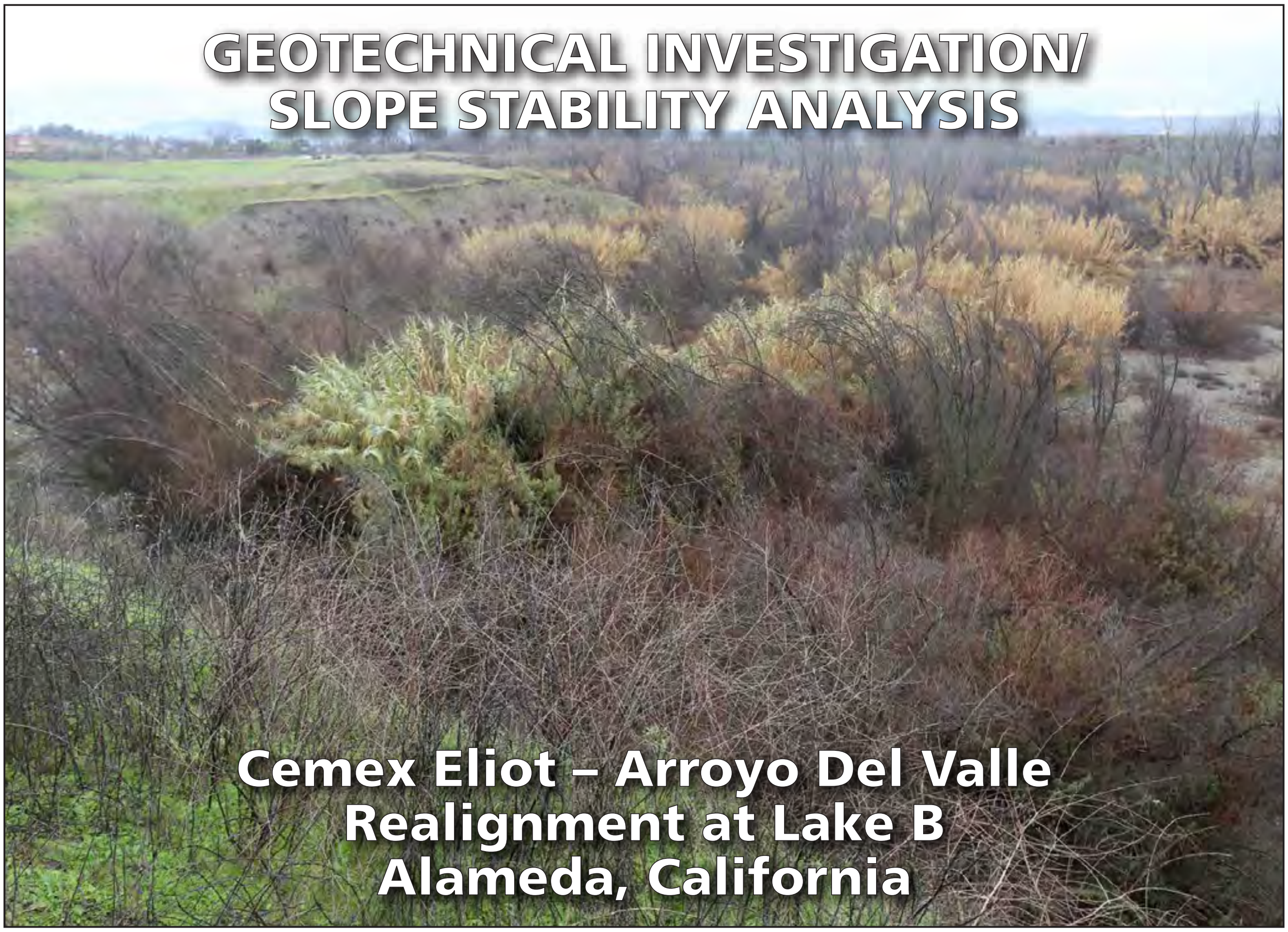
APPENDIX E-2

GEOTECHNICAL INVESTIGATION/SLOPE STABILITY REPORT FOR ADV

GEOTECHNICAL INVESTIGATION/ SLOPE STABILITY ANALYSIS



Cemex Eliot – Arroyo Del Valle Realignment at Lake B
Alameda, California

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

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Subject: GEOTECHNICAL INVESTIGATION / SLOPE STABILITY ANALYSIS
CEMEX ELIOT – ARROYO DEL VALLE REALIGNMENT AT LAKE B
ALAMEDA COUNTY, CALIFORNIA

Ms. Turnbull:

In accordance with your authorization of our proposal (Geocon Proposal No. LS-16-275, dated November 17, 2016) and peer review comments by Questa Engineering (dated April 25, 2019), we have updated our geotechnical evaluation for the proposed realignment of a portion of the Arroyo del Valle (the Arroyo) at the CEMEX Eliot Quarry in Alameda County, California.

The accompanying report presents our findings, conclusions, and recommendations regarding geotechnical aspects of slope construction as presently proposed. Based on the results of our study, the proposed project is feasible from a geotechnical viewpoint provided, the recommendations of this report are incorporated into the design and construction of the project.

Please contact us if you have any questions regarding this report or if we may be of further service.

Respectfully Submitted,

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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed realignment of a portion of the Arroyo del Valle (ADV) at the CEMEX Eliot Quarry in Alameda County, California. The approximate site location is shown on the Vicinity Map, Figure 1.

The purpose of our study was to evaluate subsurface conditions at the site based on literature review, targeted subsurface exploration, and laboratory testing. In addition, the study evaluated the stability of slopes along the proposed realignment of the ADV channel adjacent to the Lake B mining pit under static and dynamic (seismic) conditions. The results of this evaluation will be used in developing an amended *Reclamation Plan* and other required regulatory permits for the project. *This report has been revised to address peer review comments prepared by Questa Engineering Corporation (dated April 25, 2019).*

To prepare this report, Geocon performed the following scope of services:

- Reviewed published geologic maps, geotechnical reports, and other pertinent literature pertaining to the site. A list of referenced materials is presented in Section 11.0 of this report.
- Attended a kickoff meeting at the site with the project team on December 20, 2016. The purpose of the meeting was to discuss project specifics and develop a geotechnical exploration plan for the project. Another purpose of the meeting was to review project limits and determine equipment access.
- Marked out exploratory excavation locations for subsequent utility clearance and notified subscribing utility companies via Underground Service Alert (USA) a minimum of 48 hours prior to performing exploratory excavations at the site.
- Performed detailed geologic mapping throughout the ADV realignment area by a California Certified Engineering Geologist (CEG).
- Performed ten exploratory test pits (T1 through T10) using track-mounted Komatsu 240 and Caterpillar 325 excavators equipped with 36-inch wide buckets. Test pit depths ranged from approximately 6½ to 20 feet.
- Obtained representative soil samples from the test pits.
- Logged the test pits in accordance with the Unified Soil Classification System (USCS).
- Upon completion, backfilled the test pits with the excavated material.
- Remolded (fabricated) soil samples in our laboratory and performed testing to evaluate index properties, shear strength, and permeability characteristics.
- Analyzed the field and laboratory testing data, performed numerical slope stability analyses, and prepared this report with our findings, conclusions, and recommendations. This report also includes recommended embankment geometry, fill/embankment material specifications, and earthwork recommendations for the project.

Details of our field exploration program, including test pit logs, are presented in Appendix A. A general overview of the proposed project is shown on Figure 2 and approximate locations of subsurface explorations (current and previous) are presented on the Site Plan, Figure 3. A generalized subsurface cross-section (Cross-Section A-A') is presented as Figure 4. Site photographs are presented as Photos 1 through 13. Details of our laboratory testing program and test results are summarized in Appendix B. Details of our slope stability analyses are summarized in Appendix C.

2.0 SITE AND PROJECT INFORMATION

CEMEX Construction Materials Pacific, LLC (CEMEX) owns and operates the Eliot Facility, a sand and gravel mining operation located between the cities of Pleasanton and Livermore within the unincorporated area of Alameda County, California (Vicinity Map, Figure 1). CEMEX is seeking approval to amend its existing *Reclamation Plan*, which was originally approved in 1987 under *Surface Mining Permit 23* (SMP-23). In December 2016, an updated application for SMP-23 was submitted to the Alameda County Community Development Agency. The *Amendment* presents options for mining Lake B to an elevation of 150 feet above mean sea level (MSL), which is approximately 100 feet deeper than the currently mined elevation. Under the preferred option outlined in the *Amendment*, CEMEX proposes to move ADV south along a new alignment parallel to Vineyard Avenue to allow for the southerly progression of mining at Lake B. As part of the project, the ADV corridor in this area will be restored and enhanced by creating aquatic habitat and native plant species. An overview of the proposed project is presented as Figure 2.

Sheet C-101 of the *95% Improvement Plans* by Brown & Caldwell (B&C, 2018) provides conceptual details for the proposed realignment of the ADV. Based on our review, the proposed realigned ADV channel will extend through previously-mined areas, quarry ponds, and currently undisturbed (un-mined) areas. The ADV realignment will require cuts and fills along various portions of the new channel. The existing ADV alignment, proposed ADV realignment, and approximate locations of cuts and fills required for the project are shown on the Site Plan, Figure 3. A typical profile view (cross-section) of the current and proposed conditions is presented as Cross-Section A-A', Figure 4. Photographs of the site are presented as Photos 1 through 13.

As shown on the Site Plan, the ADV realignment corridor is approximately 5,800 feet long. The channel invert elevation at the upstream and downstream ends of the corridor is approximately 390 feet and 360 feet MSL, respectively. The resulting average slope is approximately 0.56 percent. In general, cut and fill slopes associated with the channel realignment will be 2:1[1] or flatter. The approximate elevation of Vineyard Avenue adjacent to the project is 430 feet MSL. The existing ADV (Photo 5) is located between the Quarry Ponds (Photos 7 and 8) and Lake B (Photo 9). The ADV is separated from Lake B by an irregular-shaped, minor embankment with a top elevation of approximately 390 feet MSL.

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[1] All slope ratios presented in this report are horizontal: vertical.

Fill for the realigned ADV channel embankment (where needed) will be derived from cut areas along the channel alignment, as well as local borrow sources. At this time, two borrow areas outside of the ADV realignment area have been identified. Borrow Area #1 primarily consists of the intact (native) lean clay deposit exposed in the current bottom of the Lake B mining pit. Borrow Area #2 is located north of Lake B and primarily consists of "silt" materials derived from onsite aggregate processing.

After the ADV is realigned, the Lake B mining pit will be deepened and extended adjacent to the channel. The slope adjacent to the channel will be inclined at 2:1 or flatter to an overall depth of approximately 220 feet (maximum bottom elevation approximately +150 feet MSL). The mining/reclamation slope may contain a 40-foot-wide, mid-slope maintenance bench in the final configuration.

A previous *Slope Stability Evaluation* (KANE GeoTech, Inc. 2015) included subsurface exploration (exploratory borings), laboratory testing, and stability analyses of excavated (cut) mining slopes of Lake B. The 2015 KANE evaluation analyzed the stability of mining slopes under normal and dry hydrologic conditions under both static and seismic conditions. The evaluation also considered an unlikely rapid-drawdown condition. The results of the evaluation concluded that mining slopes inclined at 2:1 or flatter are globally stable under static and seismic conditions under each of the various operational conditions. Geocon prepared a *Geotechnical Investigation* report for the *SMP 23 Reclamation Plan Amendment* for the overall Eliot quarry (2019 Geocon report). This investigation included two additional exploratory borings within/near Lake B and associated laboratory testing.

The purpose of our study was to evaluate subsurface conditions along the proposed ADV realignment (based on a review of existing data and targeted acquisition of new data), to determine pertinent geotechnical parameters, and to evaluate slope stability and seepage conditions for the channel realignment as presently proposed. Our study focuses on developing fill/embankment material specifications, placement zones, embankment geometry, and earthwork recommendations for the project.

3.0 SOIL AND GEOLOGIC CONDITIONS

We identified soil and geologic conditions at the site by observing exploratory excavations, performing a geologic reconnaissance, and reviewing various geotechnical, geological, and hydrogeological reports and documents prepared for the site and site vicinity (referenced in Section 11.0). Soil descriptions provided below include the USCS symbol where applicable. A general subsurface cross-section showing site geology is presented as Figure 4. Photos of typical soil conditions are presented as Photos 1 through 13.

3.1 Regional and Site Geology

The site is located near the center of the east-west trending Livermore-Amador Valley at the approximate basin axis. The Livermore-Amador Valley is a tilt-block basin bounded on the south side by the Verona Thrust Fault and the Las Positas Fault system. The valley was filled with late Tertiary and Quaternary alluvial deposits. The Livermore-Amador Valley is partially filled with alluvial fan, stream, and lake deposits, collectively referred to as alluvium which consists of interbedded/intermixed gravel, sand, silt, and clay. At the site, coarse alluvial fan deposits were formed by the ancestral and present ADV and Arroyo Mocho. The coarse alluvial fan deposits are the target of extensive aggregate mining in the area.

The alluvium in the area includes the following three major units, listed from youngest to oldest (top to bottom): Quaternary alluvium, Upper Livermore Gravels, and Lower Livermore Gravels (Barlock 1989). The characteristics of the individual units are similar (mixtures and layers of sand, silt, clay, gravel, and small cobble). The division between individual units is not distinct and generally coincides with gradual grain size transitions. For the purposes of this report, the natural deposits at the site are collectively termed “alluvium.”

3.2 Subsurface Explorations

To evaluate subsurface conditions pertinent to the ADV realignment and adjacent Lake B mining pit, we reviewed selected exploratory borings performed as part of the 2015 KANE *Slope Stability Evaluation.* The borings were performed in April 2013 using a Becker Hammer drill rig. Table 3.2A summarizes the details of the borings.

TABLE 3.2A
SUMMARY OF PREVIOUS EXPLORATIONS (KANE 2013)

Boring ID	Date	Boring Depth (feet)	Approximate Boring Elevations (feet MSL)		Groundwater	
			Top	Bottom	Depth (feet)	Elevation (feet MSL)
BH2013-01	4/12/2013	280	416	136	230	186
BH2013-07	4/6/2013	300	392	92	65	327
BH2013-08	4/4/2013	300	401	101	70	331
BH2013-09	4/2/2013	200	300	100	50	250
BH2013-10A	4/14/2013	50	304	254	2	302
BH2013-10B	4/14/2013	50	304	254	4	300
BH2013-11	4/5/2013	220	320	100	5	315
BH2013-12	4/9/2013	280	376	96	5	371
BH2013-13	4/11/2013	300	412	112	60	352

To supplement this subsurface information, we excavated ten exploratory test pits (TP1 through TP10) on December 22, 2016 using Komatsu 240 and Caterpillar 325 excavators equipped with 36-inch-wide buckets. We also performed a detailed site reconnaissance on December 22 and 23, 2016. In addition, we performed two borings (Borings B3 and B4) as part of our 2019 geotechnical investigation for the *SMP 23 Reclamation Plan Amendment* project. Details of our test pits and borings are summarized in Table 3.2B.

TABLE 3.2B
SUMMARY OF TEST PITS AND BORINGS (GEOCON 2016 AND 2019)

Test Pit ID	General Area	Test Pit / Boring Depth (feet)	Approximate Test Pit / Boring Elevations (feet MSL)		Groundwater	
			Top	Bottom	Depth (feet)	Elevation (feet MSL)
TP1	Borrow Area #2 (“Silt” Area)	20	382	362	---	---
TP2	Borrow Area #2 (“Silt” Area)	20	382	362	---	---
TP3	Borrow Area #2 (“Silt” Area)	20	382	362	---	---
TP4	Borrow Area #1 (“Clay” Area)	20	304	284	18	286
TP5	Borrow Area #1 (“Clay” Area)	6.5	294	287.5	---	---
TP6	ADV Realignment – Cut Area	8	410	402	---	---
TP7	ADV Realignment – Cut Area	12	422	410	---	---
TP8	ADV Realignment – Cut Area	9	422	413	---	---
TP9	ADV Realignment – Cut Area	12	400	388	---	---
TP10	ADV Realignment – Cut Area	10	372	362	6	366
B3	Lake B (current bottom)	150.5	300	150	30	270
B4	Near Northwest Quarry Pond	101.5	380	278.5	30	350

Approximate locations of the borings and test pits are shown on the Site Plan, Figure 3. Logs of the explorations are presented in Appendix A.

3.3 Fill

We encountered fill within TP1 through TP3 performed within Borrow Area #2 containing “silt” deposits resulting from onsite aggregate processing (Photos 10 and 11). Based on our test pits, the fill generally consists of a heterogeneous mixture of sandy lean clay (CL) with gravel and some small cobble (Photo 10). Gravel and small cobble is typically rounded and consists of maximum particle sizes of approximately 4 inches or less. The fractions of sand, silt, clay, and gravel vary significantly throughout the deposit. Based on laboratory tests performed on a composite sample, the fractions were approximately 55% fines (clay/silt), 25% sand, and 20% gravel.

3.4 Alluvium

We encountered alluvium in Test Pits TP4 through TP10. The alluvium generally consisted of “gravel” deposits and “clay” deposits.

Gravel Deposits: These deposits generally consist of subrounded to rounded gravel and small cobble (generally 4 inches or smaller in maximum dimension) in sand, silt, and clay matrix (Photos 3 and 4). The fractions of sand, silt, and clay vary throughout the gravel deposits (Photo 13). USCS classifications for this material include, but are not limited to, the following: clayey gravel (GC), well-graded gravel with silt, clay, and sand (GW-GC), clayey sand with gravel (SC), and well-graded sand with gravel (SW-SM). Some of the intact gravel deposits are weakly- to moderately-cemented, as evidenced by near-vertical gravel exposures throughout the project area (Photos 1, 2, 3, and 6).

Clay Deposits: These deposits generally consist of sandy lean clay (CL) with little gravel (Photo 12). Gravel within the clay is typically subrounded to rounded and generally 1½ inches or smaller in maximum dimension. This material exhibits low to moderate plasticity and stiff to very stiff consistency.

Subsurface conditions described in the previous paragraphs are generalized. The exploration logs included in Appendix A detail soil type, color, moisture, consistency/relative density, and USCS classification of the materials encountered at specific locations and elevations.

4.0 GROUNDWATER

As shown in Tables 3.2A and 3.2B, groundwater was encountered at various depths within the borings and test pits. A detailed discussion of hydrogeologic (groundwater) conditions in the project area is provided in the *Technical Memorandum – Updated Analysis of Lake A and B Water Levels, Cemex Eliot Facility*, prepared by EMKO Environmental, Inc., August 28, 2018 (*EMKO Technical Memorandum*) and the *Groundwater Hydrology and Water Quality Analysis Report for the Cemex Eliot Quarry SMP-23 Reclamation Plan Amendment Project, Alameda County, California*, prepared by EMKO Environmental, Inc., February 2019 (EMKO *Hydrology and Water Quality Analysis Report).*

In general, groundwater levels (depths/elevations) in the project area are strongly influenced by the water level in the ADV, which recharges groundwater in the local area. However, groundwater levels are also altered by dewatering/pumping operations associated with active mining in the area. As outlined in the referenced EMKO *Hydrology and Water Quality Analysis Report*, the long-term water-level cycles are related to climatic changes such as wet periods and drought periods. Annual cycles are due to recharge during the wet season and extraction during the dry season. Peak water levels generally occur between March and May and minimum water levels generally occur in August or September. The long term climatic cycles can result in water-level changes of up to 100 feet. The annual cycles typically range in magnitude from approximately 15 feet to 40 feet.

Based on information from the EMKO *Technical Memorandum*, at the central portion of the ADV realignment area (approximate channel invert elevation of 380 feet MSL), seasonal high groundwater elevation is expected to be approximately coincident with the ADV channel invert elevation of 380 feet MSL and seasonal low groundwater elevation is expected to be approximately 373 feet MSL.

We note that fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and other factors. Depth to groundwater can also vary significantly due to local pumping, irrigation practices, and seasonal fluctuations in ADV.

5.0 SEISMICITY

Based on our research, analyses, and observations, the site is not located on any known “active” earthquake fault trace. In addition, the site is not contained within an Alquist-Priolo Earthquake Fault Zone. Therefore, we consider the potential for ground rupture due to onsite active faulting to be low.

Table 5.0 presents approximate distances to active faults within 20 miles of the site based on mapping by the California Geological Survey (CGS), as presented in an online fault database maintained by Caltrans.

TABLE 5.0
REGIONAL ACTIVE FAULTS

Fault Name	Approximate Distance to Site (miles)	Maximum Moment Magnitude, M_w
Las Positas	3	6.4
Pleasanton	3 ¼	6.6
Mt. Diablo Thrust	4 ¾	6.6
Calaveras (North)	5	6.9
Greenville	7 ¼	6.9
Hayward (South)	11	7.3
Clayton	13 ¾	6.9
Calaveras (Central)	14	6.9
Hayward (Southern Extension)	14 ¼	6.7
Silver Creek	15 ½	6.9
Great Valley 7	16 ¾	6.7
Great Valley 6	17	6.8
Hayward (North)	18 ¾	7.3
Concord	19	6.6

We used the United States Geological Survey (USGS) web-based application *2008 Interactive Deaggregations* to estimate the peak ground acceleration (PGA) and modal (most probable) magnitude associated with a 475-year return period (typical design-level earthquake event). This return period corresponds to an event with 10% chance of exceedance in a 50-year period. The USGS-estimated PGA is 0.49g and the modal magnitude is 6.6 for Seismic Site Class D (stiff soil profile). While listing PGA is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and soil conditions underlying the site.

6.0 SEEPAGE AND SLOPE STABILITY ANALYSES

We evaluated the stability of the proposed ADV realignment embankment fill and adjacent Lake B mining slopes based on infiltration/hydraulic conductivity assessments, derived soil strength parameters, and the proposed slope configurations presented on the conceptual design plans. The following sections provide details for the derivation of parameters used in our analyses.

Slope stability analyses evaluate the ratio of the resisting forces (predominantly soil shear strength) to the driving forces that would cause a slope failure (predominantly gravity, soil unit weight, and slope/strata geometry). The ratio of the summation of driving forces divided by the summation of resisting forces is termed Factor of Safety (FS). FS of 1.0 indicates that the driving and resisting forces are equal and the slope is in a state of impending failure/movement. FS greater than 1.0 indicates the presence of reserve strength; however, this does not guarantee that failure will not occur. Rather, the probability of failure generally decreases as the FS increases. Typical minimum required FS for slope stability analyses are summarized in Table 6.0.

TABLE 6.0
MINIMUM REQUIRED FACTORS OF SAFETY – SLOPE STABILITY ANALYSES

Analysis Condition	Typical Minimum Factor of Safety (FS)
End of Construction / Temporary Conditions[1]	1.3[2]
Permanent, Long-Term (Steady Seepage)	1.5[2]
Seismic / Earthquake	1.0 to 1.2[3]

1. *Temporary conditions include mining and/or maintenance.*
2. *Minimum FS per EM 1110-2-1902 "Engineering and Design – Slope Stability," US Army Corps of Engineers, October 2003. We note that a minimum acceptable seismic FS of 1.0 was used for previous slope stability evaluations at the site.*
3. *Typical minimum FS range per commonly accepted engineering practice.*

6.1 Current Conditions / Previous Stability Analyses

Currently, the ADV borders the existing south mining slope of Lake B. The ADV and the mining pit are separated by an irregular-shaped minor embankment with a top elevation of approximately 390 feet MSL. The current ADV natural channel is underlain by braided, coarse alluvial sediments primarily composed of sand and gravel. Based on the geologic cross-sections and information contained in the referenced EMKO *Hydrology and Water Quality Analysis Report* and the *3D Clay Bed Geologic Model and Lack of Evidence for the Presence of Aquitards, Eliot Quarry – CEMEX*

Aggregates, Alameda County, California report, prepared by Jeff Light Geologic Consulting (November 12, 2019), clay layers in the area are relatively thin, laterally discontinuous, and do not function as aquitards. Therefore, there is direct hydraulic communication between the surface water in the ADV and groundwater in the immediate area. As such, in the absence of dewatering and pumping, at any given location along the project alignment, the water level in Lake B would be nearly consistent with the surface water level in the ADV.

The previous KANE *Slope Stability Evaluation* analyzed global slope stability under static and seismic conditions, including the proposed Lake B mining slope adjacent to the current ADV (KANE's Profile 4). KANE's stability analyses were performed using a typical 2:1 cut slope inclination to a maximum mining depth of 150 feet MSL. The stability analyses considered both high and low groundwater and lake water conditions, as well as a rapid-drawdown condition in Lake B. The stability analyses were performed using the GeoStrucural Analysis slope stability software (Version 5.17.10.0, Fine Civil Engineering Software). The results of the evaluation concluded that mining slopes inclined at 2:1 or flatter are globally stable under static and seismic conditions under each of the various operational conditions. Because the previous project did not include significant fill embankments, the investigation did not evaluate potential fill slopes/constructed embankments at the site.

For this study, we evaluated slope stability using the computer program SLOPE/W (Version 7.23 by Geo-Slope International). Our analysis for the slope adjacent to the realigned ADV considered circular failure modes, which were determined in previous studies to be the most critical slope failure mode (versus polygonal or wedge failures) under static and seismic conditions. We also analyzed the stability of block failure modes for the Lake B Southeast slope adjacent to Isabel Avenue (State Route 84). Our analysis was performed in general accordance with California Geological Survey (CGS) *Special Publication 117A* and an earlier, related guidance document published by the Southern California Earthquake Center (SCEC). Per the procedures recommended by SCEC, our analysis used Spencer's Method. Spencer's Method satisfies both force and moment equilibrium conditions and SCEC recommends it be used for the analysis of failure surfaces of any shape.

Because the previous slope stability analyses for Lake B were performed using different software, we re-analyzed "Profile 4" (southeast slope of Lake B adjacent to the current ADV) that was previously performed by KANE in order to calibrate the two studies so that meaningful comparisons could be made. Table 6.1 summarizes the results.

TABLE 6.1
SLOPE STABILITY ANALYSIS CONFIRMATION – LAKE B "PROFILE 4"

Condition	Analyst	Calculated Minimum Factor of Safety	
		Static	**Seismic**
Circular Failure, SE Slope, Mined to 150 feet MSL, Average Groundwater/Lake Water Conditions	KANE GeoTech, Inc.	1.8	1.2
	Geocon Consultants, Inc.	1.9	1.2
As shown in Table 6.1, our stability analysis results are essentially the same as the previous KANE analysis. Therefore, we consider our analytical methods to be substantially equivalent to the previous analyses.			

6.2 Geometry for Stability Analyses

Our stability analyses were performed using the geometry at Cross-Section A-A' (Figure 4) located within the central portion of the project alignment and a representative section located at the southeast end of Lake B ("Lake B Southeast Slope Analysis Section"), as shown on the Site Plan, Figure 3. The slope configurations and geometry at Cross-Section A-A' are based on existing and proposed topography shown on the Reclamation Plans by Spinardi Associates, January 2019. Cross-Section A-A' is considered to be representative of the "worst case" slope conditions along the project alignment because it includes the most significant fills (Topcon ponds) and the new embankment fill on the north side of the new ADV channel adjacent to the Lake B mining pit, as well as representing a location with a minimal setback between the realigned ADV and adjacent mining slope. Most other locations along the ADV realignment will be formed either at-grade or by cuts/excavations in intact, native materials, which represents less adverse slope conditions.

We originally modeled the mining/reclamation slopes with an inclination of 2:1 – the full height of the slope. However, our updated analysis considers a higher pseudostatic seismic coefficient than originally modeled (0.21 vs. 0.16, see Section 6.5). This higher seismic loading resulted in an FS of less than 1.0 for the seismic case analyses. Therefore, our updated analysis reflects two alternative configurations for the cut slope below the realigned ADV – one with a 2¼:1 slope and another with a mid-slope, 40-foot horizontal bench within a 2:1 slope.

Lithology at the analysis section (Cross-Section A-A') was based on conditions encountered in our borings, previous explorations by others, and observed subsurface conditions on existing cut slopes at the site. We modeled clay or silt layers as horizontal and conservatively assumed to extend infinitely behind the proposed slope faces, even though these layers have been shown to be discontinuous (Jeff Light Geologic Consulting, 2019).

6.3 Seepage / Groundwater / Surface Water Conditions

As discussed previously, there is direct hydraulic communication between the surface water in ADV and groundwater in the immediate area. As such, in the absence of dewatering and pumping, the water level in Lake B would be consistent with the surface water level in the ADV. At the design profile for the project (Cross-Section A-A'), seasonal high groundwater elevation is expected to be approximately coincident with the ADV channel invert elevation of 380 feet MSL. Seasonal low groundwater elevation is expected to be approximately 373 feet MSL.

To gain an understanding of general groundwater flow (seepage) conditions in the project area, we reviewed results of field infiltration testing performed at the site by Balance Hydrologics and EMKO. Details and results of the testing are summarized in the *Memo – Infiltration Tests of Native and Spoil Soil along Reach B, Arroyo del Valle, CEMEX Eliot Facility* prepared by Balance Hydrologics, Inc. and EMKO Environmental Inc. (May 13, 2016). The goal of the infiltration testing was to evaluate the infiltration rates of native soil and spoil material in terms of their suitability for use as construction materials for the reconstructed ADV channel. A secondary objective was to provide a quantitative assessment of the potential change in the rate of percolation from the existing stream bed compared to the realigned stream bed, and the qualitative implications for seepage and slope stability along the south slope of the Lake B mining pit. Field infiltration tests were performed using a double-ring infiltrometer apparatus following methods outlined by the USGS (1963). Infiltration tests were performed at four locations – two in native soil material (N1 and N2) along the riparian corridor of Reach-B and two on spoil soil material (S1 and S2). Approximate test locations are shown on the Site Plan, Figure 3. Field infiltration test results are summarized in Table 6.3A.

TABLE 6.3A
INFILTRATION RATES

Test Location	Surface Infiltration Rates (min/inch)			
	20 Minutes	30 Minutes	1 Hour	12 Hours
N1	13.47	11.40	8.58	3.09
N2	3.43	3.11	2.62	1.43
S1	0.59	0.46	0.31	0.07
S2	1.91	1.61	1.20	0.42

The field infiltration test results generally indicated that infiltration rates for the spoil soil material were less (slower) then those observed in native soil materials. Balance/EMKO concluded that infiltration rates following the ADV channel reconstruction should be similar to or slower than current rates. Therefore, infiltration of water through the realigned ADV channel would not steepen the groundwater gradient toward the south edge of Lake B, would not increase the groundwater elevation at the south edge of Lake B, and would not increase the rate of seepage into the south face of Lake B.

Surface infiltration testing generally evaluates vertical movement of water through an unsaturated medium. To further assess seepage conditions, we reviewed previous testing/analyses to evaluate vertical and horizontal saturated hydraulic conductivity. Table 6.3B summarizes saturated hydraulic conductivity values for the native gravels at the site.

TABLE 6.3B
SATURATED HYDRAULIC CONDUCTIVITY

Material	**Saturated Hydraulic Conductivity**		
	Vertical (k_y)	**Horizontal (k_x)**	**K_y/k_x**
Native Gravels	3.2 x 10^{-4} cm/sec	4.3 x 10^{-3} cm/sec	0.07

Vertical saturated hydraulic conductivity (k_y) of the native gravels is based on in-situ field testing (pump tests, slug tests) as outlined in the *Technical Memorandum #2 – Hydraulic Conductivity of Upper and Lower Gravels,* prepared by Tim Sneddon, December 10, 2004. The average horizontal hydraulic conductivity (k_x) of the native gravels is based on information obtained from the *EMKO Hydrology and Water Quality Analysis Report*. The calculated ratio of vertical to horizontal hydraulic conductivity (k_y/k_x) is approximately 0.07, which is generally consistent with the typical value of 0.1 for this type of alluvial material and compacted engineered fill.

We performed laboratory hydraulic conductivity testing on remolded soil samples to evaluate hydraulic conductivity properties of soil in a compacted state. We fabricated samples of the clay and gravels (the likely source of fill for the ADV realignment) and performed laboratory hydraulic conductivity testing in accordance with ASTM D5084. Test results are summarized in Table 6.3C.

TABLE 6.3C
SATURATED HYDRAULIC CONDUCTIVITY

Material	**Saturated Hydraulic Conductivity**		
	Vertical[1] (k_y)	**Horizontal[2] (k_x)**	**K_y/k_x**
Proposed Fill - Clay (remolded)	5.1 x 10^{-6} cm/sec	5.1 x 10^{-5} cm/sec	0.1
Proposed Fill - Gravel (remolded)	4.3 x 10^{-6} cm/sec	4.3 x 10^{-5} cm/sec	0.1

1. *Based on laboratory hydraulic conductivity testing performed on remolded samples in accordance with ASTM D5084. Samples were remolded to approximately 90% relative compaction near optimum moisture content per ASTM D1557.*
2. *Horizontal hydraulic conductivity estimated based using a Ky/Kx ratio of 0.1.*

A comparison of the hydraulic conductivity values presented in Tables 6.3B and 6.3C show that the remolded clay and gravel samples have lower (slower) hydraulic conductivity than the native gravel deposits. This further substantiates the conclusion that infiltration of water through the realigned ADV channel would not steepen the groundwater gradient toward the south edge of Lake B, would not increase the groundwater elevation at the south edge of Lake B, and would not increase the rate of seepage into the south face of Lake B to cause an adverse seepage and slope stability condition. Based on the above discussion and consultation with EMKO Environmental, Table 6.3D summarizes the surface water and groundwater elevations used in our analyses.

TABLE 6.3D
SURFACE WATER AND GROUNDWATER ELEVATIONS FOR ANALYSIS[1]
CROSS-SECTION A-A' (APPROXIMATE STA. 25+50)

Case	Condition	Water Elevation in ADV (Feet)[1]	Groundwater Elevation at Lake B Slope Face (Feet)	Lake B Water Elevation (Feet)
Temporary Operational Conditions[2]				
T-1	100-Year Flow	387.0	At Toe (150.0)	150.0 (Dewatered)[3]
T-2	Typical Flow	381.5	At Toe (150.0)	150.0 (Dewatered)[3]
T-3	Low Flow	380.5	At Toe (150.0)	150.0 (Dewatered)[3]
Permanent Operational Conditions[4]				
P-1	100-Year Flow	387.0	369.0	369.0
P-2	Typical Flow	381.5	369.0	369.0
P-3	Low Flow	380.5	369.0	369.0

1. *Information per Brown & Caldwell Hydraulic Modeling of Arroyo del Valle [DRAFT October 17, 2019].*
2. *Temporary Operational Conditions = Expected conditions during active mining.*
3. *Dewatering drawdown assumed to occur at a rate such that the adjacent groundwater level draws down consistent with the Lake B pool (e.g., no rapid drawdown condition resulting in undrained slopes).*
4. *Permanent Operational Conditions = Expected reclamation conditions (no dewatering). Groundwater elevation at the slope and Lake B water elevations are coincident at the Lake B spillway elevation of 369 feet for all flow conditions.*

We note that other surface water/groundwater elevation conditions are possible; however, the conditions listed in Table 6.3D effectively capture the likely range of critical temporary and permanent (long-term) operational conditions for the project. For the purposes of this report, Cases T-1, T-2, and T-3 represent temporary operational conditions, such as during mining and/or maintenance. Cases P-1, P-2, and P-3 represent permanent (long-term) operational conditions. For the "Lake B Southeast" slope stability analysis, we considered a typical groundwater elevation of 370 feet. In our analyses, we assumed a "straight line" groundwater gradient between the surface water elevation in ADV and the Lake B water elevation. This assumption is reasonable considering that the true gradient surface would be slightly curved, although relatively flat based on the k_y/k_x ratio.

6.4 Material Parameters for Stability Analyses

We selected material parameters for our slope stability analyses based on our review of the referenced previous geotechnical studies at the site, as well as results of our test pits, laboratory testing, published correlations, engineering judgment, and experience.

At this time, we anticipate that the borrow material to be used for fill along the project alignment will consist of (1) "Gravels" derived from cut areas along the ADV realignment, (2) "Clay" excavated from the current bottom of Lake B (Borrow Area #1), and/or (3) "Silt" materials derived from onsite aggregate processing and stockpiled north of Lake B. Table 6.4A provides a summary of soil properties for each of these materials based on our laboratory testing program. Complete laboratory test results are presented in Appendix B.

TABLE 6.4A
SOIL PROPERTIES – PROPOSED FILL MATERIALS (REMOLDED)

Property / Parameter		"Gravels"	"Clay"	"Silt"
Percent Gravel (larger than No. 4 Sieve)		17.7% to 58.5%	11.6%	18.3%
Percent Sand (between No. 4 and No. 200 Sieves)		34.6% to 43.2%	33.5%	26.5%
Percent Fines (Silt/Clay) (Finer than No. 200 Sieve)		6.9% to 39.1%	54.8%	55.2%
Liquid Limit		---	31%	31%
Plastic Limit		---	14%	13%
Plasticity Index		---	17%	18%
USCS Soil Classification		(SC/SM) to (GC/GM)	CL	CL
Total Unit Weight (at 90% relative compaction)		134 pcf	126 pcf	---
Optimum Moisture Content		8.5%	10%	---
Total Cohesion, C	Unsaturated Conditions	---	2,550 pcf	---
Total Friction Angle, ϕ		---	25º	---
Effective Cohesion, C	Saturated Conditions	40 to 160 pcf	150 pcf	---
Effective Friction Angle, ϕ		23º to 37º	32º	---
Saturated Hydraulic Conductivity		3×10^{-5} to 4.3×10^{-6} cm/sec	5.1×10^{-6} cm/sec	---

Shear strength parameters for the gravels were determined by performing large box (12-inch square) direct shear testing on selected saturated, remolded specimens. The specimens tested were obtained from the recent alluvium in the proposed ADV realignment and are considered representative of the "worst case" gravel material because the specimens contained nearly 40% fines (silt and clay). The test results represented the lower-bound shear strength parameters presented in Table A. Based on conditions encountered in our test pits, we expect that the majority of the gravel materials will contain less fines and will therefore have higher shear strength parameters. The upper-range shear strength parameters are based on direct shear testing performed by Berlogar Stevens & Associates on gravels obtained from the Lake B slope in 2012. The lower-bound (slower) hydraulic conductivity of the gravels is based on laboratory hydraulic conductivity testing performed by Geo-Logic Associates in accordance with ASTM D5084. We estimated the upper bound (faster) hydraulic conductivity of the gravel deposit using correlations developed by Alyamani and Sen (1993). This estimated value is approximately one order of magnitude slower than the hydraulic conductivity of the natural gravel deposits presented in Table 6.3B.

Total and effective shear strength parameters and hydraulic conductivity of the "clay" to be potentially used as fill are based on the results of laboratory triaxial shear strength testing and hydraulic conductivity testing on remolded test specimens. Material sample specimens were remolded in the laboratory to approximately 90% relative compaction and at least 2% above optimum moisture content per ASTM D1557. As shown in Table 6.4A, the physical properties for the "clay" and "silt" materials are very similar; therefore, we assume that the shear strength parameters would also be similar.

Based on the above discussion, Table 6.4B provides a summary of the shear strength parameters used in our stability analyses for both fill and native soils.

TABLE 6.4B
SOIL PARAMETERS FOR STABILITY ANALYSES

Material	Total Unit Weight (pcf)	Cohesion, C (psf)	Friction Angle, ϕ (degrees)
Fill	125	160	23
Native Gravel	134	200	45
Native Clay	125	1,400	24

For the fill material, we assigned the lower-bound shear strength parameters for the remolded “gravel” material, which is expected to be very conservative for the fill material likely to be used on the project. This is further substantiated by the higher shear strength parameters measured for the remolded clay material.

We note that the 2019 Geocon *SMP 23 Reclamation Plan Amendment* report utilized standardized soil shear strength parameters that are slightly different from the parameters used in this study. As a sensitivity check, and in response to Alameda County review comments (Questa Engineering, April 2019), we applied the standardized soil shear strength parameters from the 2019 Geocon *SMP 23 Reclamation Plan Amendment* report to these analyses and found a negligible difference in the results (e.g., FS values changed by 0.005 or less).

6.5 Seismic Forces for Dynamic (Seismic) Slope Stability Analysis

We analyzed dynamic (seismic) slope stability using a pseudo-static approach in which the earthquake load is simulated by “equivalent” static horizontal acceleration acting on the mass of the slope. This methodology is generally considered to be conservative and is most often used in current practice.

We understand that the adopted pseudostatic seismic coefficient (k_h) for the project area at Lake B is 0.16. This value has been reviewed and accepted by Alameda County and their geotechnical review consultant and is applicable to the west and north slopes of Lake B due to the lack of adjacent residential development and/or public infrastructure. We understand that a higher pseudostatic coefficient ($k_h = 0.21$) is applicable to the east slope of Lake B due to the proximity of improvements associated with Isabel Avenue (State Route 84). In addition, based on Alameda County’s review comments (Questa Engineering, April 2019), the higher pseudo-static coefficient of 0.21 should also apply to the south slope of Lake B adjacent to the ADV. Therefore, we have applied a pseudostatic coefficient of 0.21 to all of the seismic case analyses in this study.

6.6 Slope Stability Analyses and Results

At Cross-Section A-A’, we analyzed slope stability conditions within the “ADV embankment” and the adjacent Lake B slope. For the purposes of this report, the ADV embankment is defined as the new embankment fill separating the realigned ADV channel with the Lake B mining slope. “Global” failures for the Lake B mining slope are considered deep-seated failure surfaces that would extend into the ADV realigned channel. We analyzed slope stability under both temporary and permanent operations conditions, as outlined in Section 6.3.

As discussed previously, we originally modeled the mining/reclamation slopes with an inclination of 2:1 – the full height of the slope. However, our updated analysis considers a higher pseudostatic seismic coefficient than originally modeled (0.21 vs. 0.16, see Section 6.5). This higher seismic loading resulted in an FS of less than 1.0 for the seismic case analyses. Therefore, our updated analysis reflects two alternative configurations for the cut slope below the realigned ADV – one with a 2¼:1 slope and another with a mid-slope, 40-foot horizontal bench within a 2:1 slope.

Tabulated results of our slope stability analysis (FS against failure) for both ADV embankment and global (deep-seated) failures for temporary and permanent operational conditions at Cross-Section A-A’ are summarized in Tables 6.6A through 6.6D. Tabulated results of our slope stability analysis for the Lake B southeast section for both circular and block failures are summarized in Table 6.6E. Graphical representations of the potential critical failure surfaces and parameters used for each stability analysis are presented in Appendix C.

TABLE 6.6A
SLOPE STABILITY ANALYSIS RESULTS – TEMPORARY CONDITIONS (2¼:1 SLOPE)

Case	Temporary Operational Condition	Calculated Minimum Factor of Safety			
		ADV Embankment		Global (Deep-Seated)	
		Static	Seismic	Static	Seismic
T-1	100-Year Flow in ADV, Lake B Fully Dewatered	2.0	1.3	1.5	1.0
T-2	Typical Flow in ADV, Lake B Fully Dewatered	2.0	1.3	1.6	1.0
T-3	Low Flow in ADV, Lake B Fully Dewatered	2.0	1.2	1.6	1.0

TABLE 6.6B
SLOPE STABILITY ANALYSIS RESULTS – TEMPORARY CONDITIONS
(2:1 SLOPE WITH BENCH)

Case	Temporary Operational Condition	Calculated Minimum Factor of Safety			
		ADV Embankment		Global (Deep-Seated)	
		Static	Seismic	Static	Seismic
T-1	100-Year Flow in ADV, Lake B Fully Dewatered	1.8	1.2	1.5	1.0
T-2	Typical Flow in ADV, Lake B Fully Dewatered	1.8	1.2	1.6	1.0
T-3	Low Flow in ADV, Lake B Fully Dewatered	1.8	1.1	1.7	1.0

TABLE 6.6C
SLOPE STABILITY ANALYSIS RESULTS – PERMANENT OPERATIONAL CONDITIONS
(2¼:1 SLOPE)

Case	Permanent Operational Condition	Calculated Minimum Factor of Safety			
		ADV Embankment		Global (Deep-Seated)	
		Static	Seismic	Static	Seismic
P-1	100-Year Flow in ADV	2.1	1.2	2.5	1.2
P-2	Typical Flow in ADV	1.9	1.2	2.5	1.2
P-3	Low Flow in ADV	2.0	1.3	2.5	1.2

TABLE 6.6D
SLOPE STABILITY ANALYSIS RESULTS – PERMANENT OPERATIONAL CONDITIONS
(2:1 SLOPE WITH BENCH)

Case	Permanent Operational Condition	Calculated Minimum Factor of Safety			
		ADV Embankment		Global (Deep-Seated)	
		Static	Seismic	Static	Seismic
P-1	100-Year Flow in ADV	2.0	1.3	2.5	1.2
P-2	Typical Flow in ADV	1.7	1.1	2.5	1.2
P-3	Low Flow in ADV	1.8	1.2	2.5	1.2

TABLE 6.6E
SLOPE STABILITY ANALYSIS RESULTS – LAKE B SOUTHEAST MINED CONDITION – 2:1 SLOPE

Location	Calculated Minimum Factor of Safety			
	Circular Failure Mode		Block Failure Mode	
	Static	Seismic	Static	Seismic
Lake B Southeast	1.5	1.0	1.6	1.0

7.0 CONCLUSIONS

Based on the results of our study, the realignment of ADV as presently proposed is geotechnically feasible, provided the recommendations presented in this report are incorporated into the design and construction of the project.

Conclusions and recommendations provided in this report are based on review of referenced literature, analysis of data obtained from our field exploration, the results of our laboratory testing program, and our understanding of the project at this time.

7.1 Seepage

Given that the proposed fill materials will exhibit lower (slower) hydraulic conductivity, infiltration through the realigned ADV channel should not steepen the groundwater gradient toward the south edge of Lake B, should not increase the groundwater elevation at the south edge of Lake B, and should not increase the rate of seepage into the south face of Lake B. Therefore, adverse seepage conditions are not expected.

7.2 Settlement

Generally, the proposed project includes placing fill in areas that were previously excavated and will not result in a significant increase in effective overburden pressure over the preexisting condition. Therefore, we do not expect significant post-construction, time-dependent settlement that would compromise the stability or performance of the embankments adjacent to the ADV.

7.3 Slope Stability

As outlined in Section 6.6, the calculated FS against failure for the ADV embankment and global (deep-seated) failures of the Lake B slope meets or exceeds the minimum acceptable FS outlined in Table 6.0 for static and seismic conditions for both temporary and permanent operational conditions. Based on the results of our study, the proposed ADV embankment and Lake B mining slopes are considered adequately stable for static and seismic conditions under the anticipated temporary and permanent operational conditions.

7.4 Pit Capture Potential

In off-channel mining operations, “pit capture” is a term to describe the process where the earthen material separating the mining pit from an adjacent watercourse is breached or overtopped by floodwaters, streambank erosion, and/or channel migration. Provided the embankment is not overtopped by floodwaters in the ADV and given the low potential for adverse seepage and slope instability, the potential for pit capture is low.

8.0 RECOMMENDATIONS

8.1 Slope Geometry

Based on our stability analyses, particularly the seismic case analysis for Cross-Section A-A', final maximum slope inclinations adjacent to the ADV are as follows:

- 2¼ :1 for the full height of the slope; and
- 2:1 for the full height of the slope provided a 40-foot-wide maintenance bench is constructed mid-slope.

Based on our stability analyses for the Lake B Southeast section, the maximum slope inclination of the full height of the slope may be 2:1 without a mid-slope maintenance for the portions of the south slope east of (upstream of) Sta. 20+00. The slope in this area has a lower overall height.

8.2 Materials for Fill

In general, excavated soils generated from cut operations along the ADV realignment are suitable for use as engineered fill/embankment construction, provided they do not contain deleterious matter, organic material, or rock/cementations larger than 6 inches in maximum dimension. We anticipate that the majority of these materials will consist of gravel deposits. Based on the results of our investigation, the identified borrow materials ("clay" and "silt") are also acceptable for use as fill. However, we expect some variability in soil conditions throughout the area, particularly in the "silt" material (Borrow Area #2). Therefore, periodic sampling and laboratory testing should be performed to verify that the following properties outlined in Table 8.2 are met.

TABLE 8.2
RECOMMENDED PROPERTIES FOR FILL

Property / Parameter		Requirement
Percent Gravel (lager than No. 4 Sieve)		---
Percent Sand (between No. 4 and No. 200 Sieves)		25% Minimum
Percent Fines (Silt/Clay) (Finer than No. 200 Sieve)		10% Minimum
Liquid Limit		50 Maximum
Plasticity Index		7 Minimum, 25 Maximum
Acceptable USCS Soil Classifications		CL, SC, SC-SM, GC, GW-GC
Total Unit Weight (at 90% relative compaction)		120 pcf Minimum
Effective Cohesion, C	Saturated Conditions	150 pcf
Effective Friction Angle, ϕ		23º
Saturated Hydraulic Conductivity		1 x 10^{-4} cm/sec (or slower)

8.3 Wet Weather Grading Conditions

If grading occurs in winter or spring, surface soils will likely be wet. The contractor should be aware of the moisture sensitivity of clayey and fine-grained soils and potential compaction/workability difficulties.

Earthwork operations in wet weather conditions will likely be difficult with low productivity. Often, a period of at least one month of warm and dry weather is necessary to allow the site to dry sufficiently so that heavy grading equipment can operate effectively. Conversely, during dry summer and fall months, dry clay soils may require additional grading effort (discing or other means) to attain proper moisture conditioning.

In-situ moisture content of the “clay” and “silt” soil is significantly higher than optimum moisture content. Due to the fine-grained nature of the soils and in-situ moisture contents well above optimum, additional drying effort to attain moisture contents suitable for compaction should be anticipated regardless of the time of year.

8.4 Grading/Embankments/Slopes

8.4.1 All earthwork operations should be observed and all fills tested for recommended compaction and moisture content by a representative of our firm. References to relative compaction and optimum moisture content in this report are based on the American Society for Testing and Materials (ASTM) D1557 Test Procedure, latest edition.

8.4.2 Prior to commencing grading, a pre-construction conference with representatives from CEMEX, the grading contractor, and Geocon should be held at the site. Site preparation, soil handling, and/or the grading plans should be discussed at the pre-construction conference.

8.4.3 Prior to commencing grading within embankment and slope areas, surface vegetation should be removed by stripping to a sufficient depth to remove roots and organic-rich topsoil. We estimate stripping depth will be on the order of 2 to 4 inches. Material generated during stripping is not suitable for use as embankment or reclamation slope fill but may be stockpiled for future use as topsoil. Any existing trees and associated root systems should be removed. Roots larger than 1 inch in diameter should be completely removed. Smaller roots may be left in place as conditions warrant and at the discretion of our field representative.

8.4.4 Prior to placing fill in the existing Topcon ponds, the ponds should be dewatered and allowed to dry for some time. We expect that clay soils exposed in the pond bottoms will be wet and unstable, even after dewatering. We recommend placing a bridging layer of rock (local gravel deposits) to stabilize the bottom and to allow access for grading equipment. For planning purposes, placing a 2- to 3-foot layer of gravel should provide adequate stabilization. Geocon should observe conditions exposed at the time of grading and provide specific stabilization recommendations during construction, based on conditions encountered.

8.4.5 To increase stability and to provide a stable foundation for the embankments, the full length of the embankments should be provided with embankment-width keyways. The keyways should have a minimum embedment depth of 3 feet into firm, competent, undisturbed soil. The actual depth of the keyway should be evaluated during construction by a Geocon representative. Keyway backslopes should be no flatter than 1:1.

8.4.6 In general, where fill is placed on sloping ground steeper than 5H:1V, the fill should be benched into the adjacent native materials as the fill is placed. Benches should roughly parallel slope contours and extend at least 2 feet into competent material. In addition, a keyway should be cut into the slope at the base of the fill. In general, keyways should be at least 15 feet wide and extend at least 2 feet into competent material. Bench and keyway criteria may need revision during construction based on the actual materials encountered and grading performed in the field.

8.4.7 Pipe penetrations through the new ADV embankment should be avoided. If pipe penetrations are unavoidable, we recommend providing concrete cut-off collars at the penetration to reduce potential for seepage. Reinforced concrete cut-off collars should completely encircle the pipe and should be sized such that they are 12 to 18 inches larger than the nominal outside diameter of the pipe. Thickness of the cut-off collars should be at least 6 inches. Water-tight filler should be used between collars and pipes.

8.4.8 Bottoms of keyways and areas to receive fill should be scarified 12 inches, uniformly moisture-conditioned at or above optimum moisture content, and compacted to at least 90% relative compaction. Scarification and recompaction operations should be performed in the presence of a Geocon representative to evaluate performance of the subgrade under compaction equipment loading.

8.4.9 Engineered fill consisting of onsite or approved import materials should be compacted in horizontal lifts not exceeding 8 inches (loose thickness) and brought to final subgrade elevations. Each lift should be moisture-conditioned at or above optimum and compacted to at least 90% relative compaction.

8.4.10 Fill slopes should be built such that soils are uniformly compacted to at least 90% relative compaction to the finished face of the completed slope. This may require over-building the slopes and cutting them back. Track-walking is typically not an acceptable means of slope zone compaction.

8.5 Slope Maintenance

As with any slope, slopes along the project alignment will be susceptible to erosion and surficial degradation when exposed to rain and surface runoff. Proper surface drainage facilities directing runoff away from slopes, vegetation, erosion control measures, and best management practice (BMP) devices should be maintained to reduce long-term slope degradation from erosion. Periodic inspections should be performed on a regular basis to identify and address maintenance needs.

Geocon should be contacted to observe erosional features and to provide specific maintenance and repair recommendations, as needed. In general, localized slumps deeper than approximately 2 to 3 feet should be excavated/removed and replaced with engineered fill (compacted to at least 90% relative compaction) that is keyed and benched into the existing, intact slope. Significant erosional features such as deep rills and gullies should be re-graded (smoothed, backfilled, and tracked/compacted). Any repaired areas should be re-vegetated as soon as possible.

9.0 FURTHER GEOTECHNICAL SERVICES

9.1 Plan Review

Geocon should review the construction improvement drawings prior to final submittal to assess whether our recommendations have been properly incorporated and to evaluate if additional analysis and/or recommendations are required.

9.2 Testing and Observation Services

The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. It will be critical to verify that the materials used for fill/embankments on this project comply with the minimum recommended material specifications (Table 8.2). If we are not retained for these services, we cannot assume any responsibility for other's interpretation of our recommendations or the future performance of the project.

10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, a licensed geotechnical engineer should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous materials or environmental contamination was not part of the scope of services provided by Geocon.

This report is issued with the understanding that it is the responsibility of the owner or their representative to ensure that the information and recommendations contained herein are brought to the attention of the design team for the project and incorporated into the plans and specifications, and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

The recommendations contained in this report are preliminary until verified during construction by representatives of our firm. Changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. Additionally, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated partially or wholly by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

Our professional services were performed, our findings were obtained, and our recommendations were prepared in accordance with generally accepted geotechnical engineering principles and practices used in this area at this time. No warranty is provided, express or implied.

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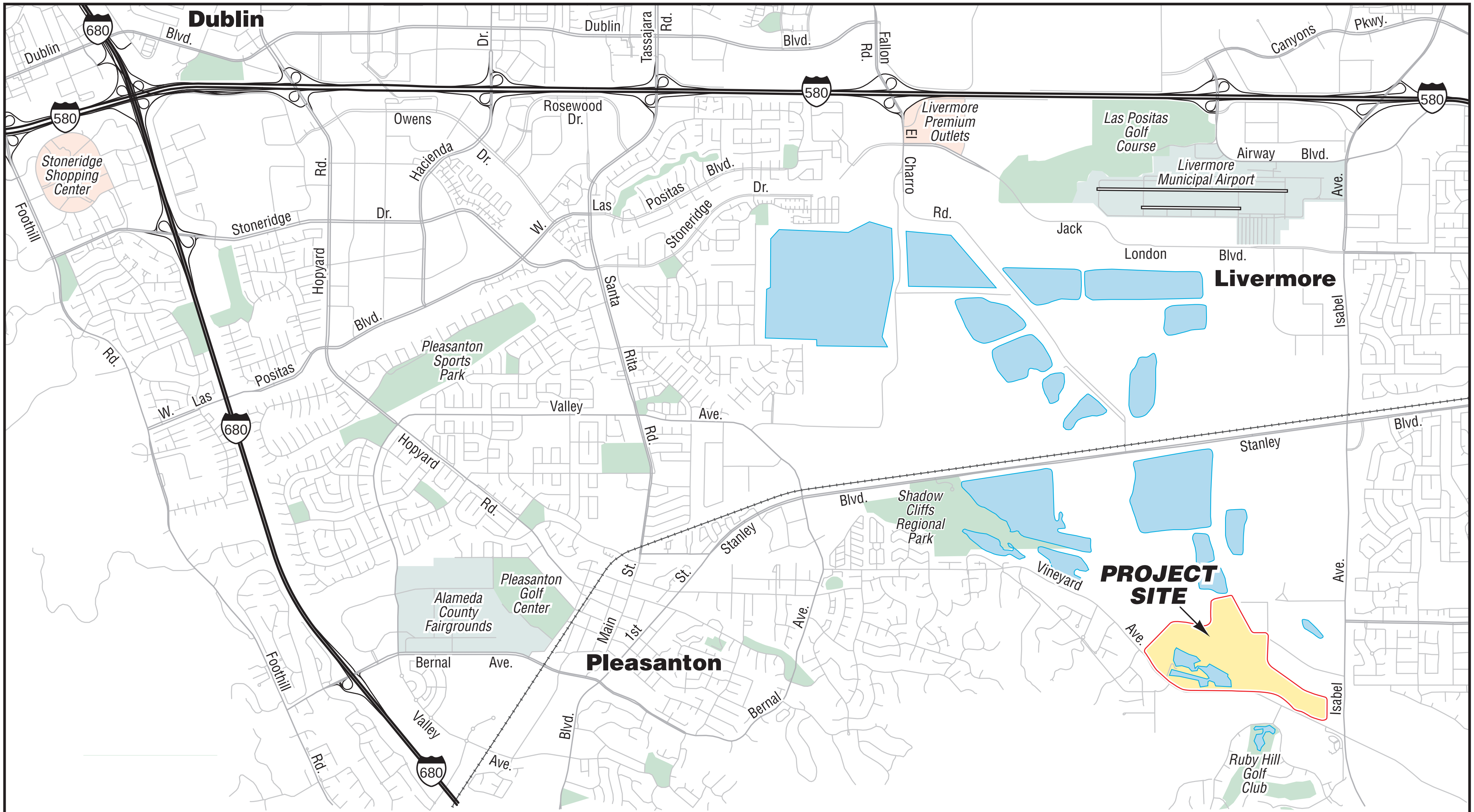

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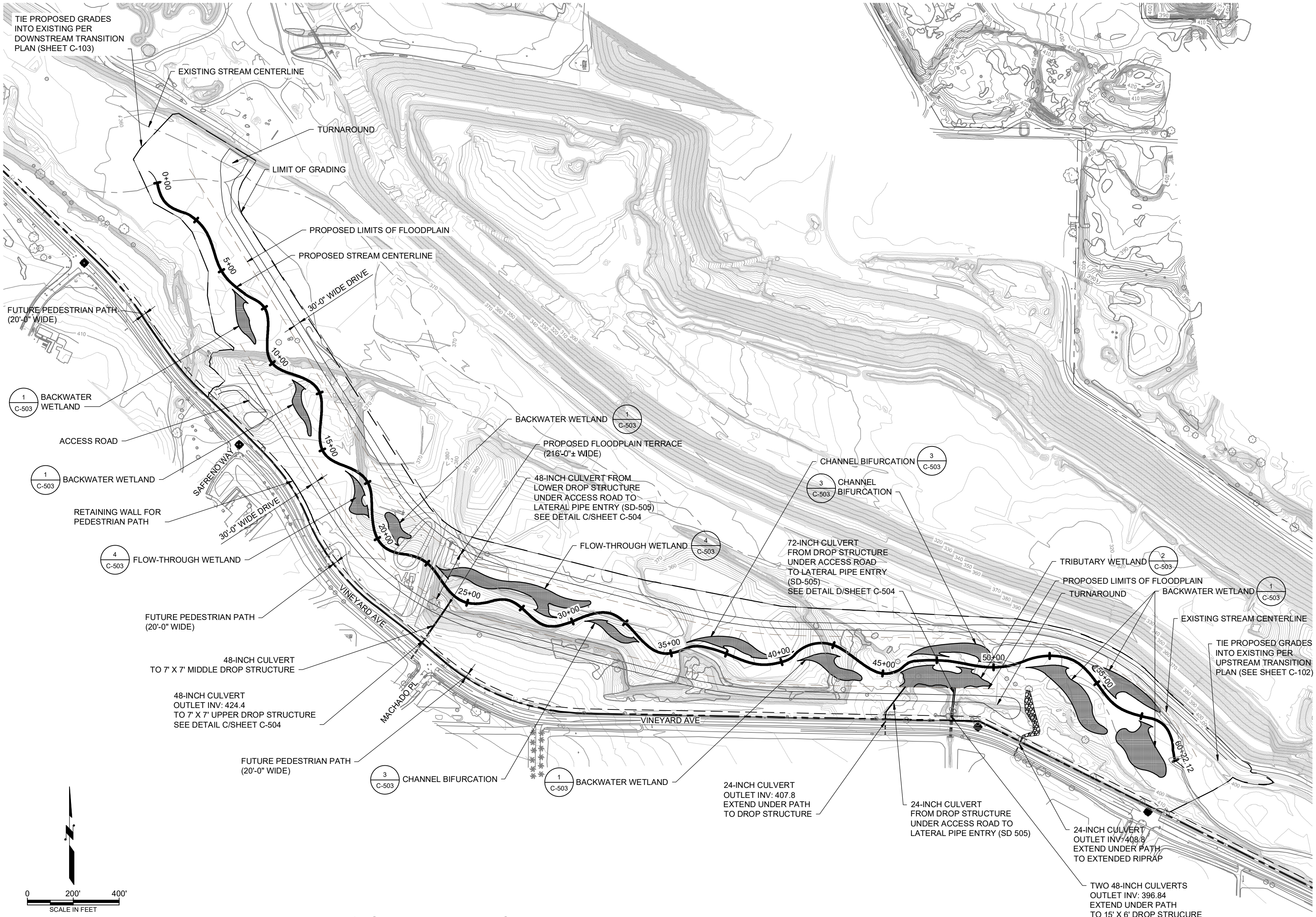
Arroyo Del Valle Realignment

Cemex Eliot Mine
Alameda County, California

VICINITY MAP

S1264-05-01	December 2019	Figure 1



Ref: *Site Plan,* Brown and Caldwell, 8/16/18

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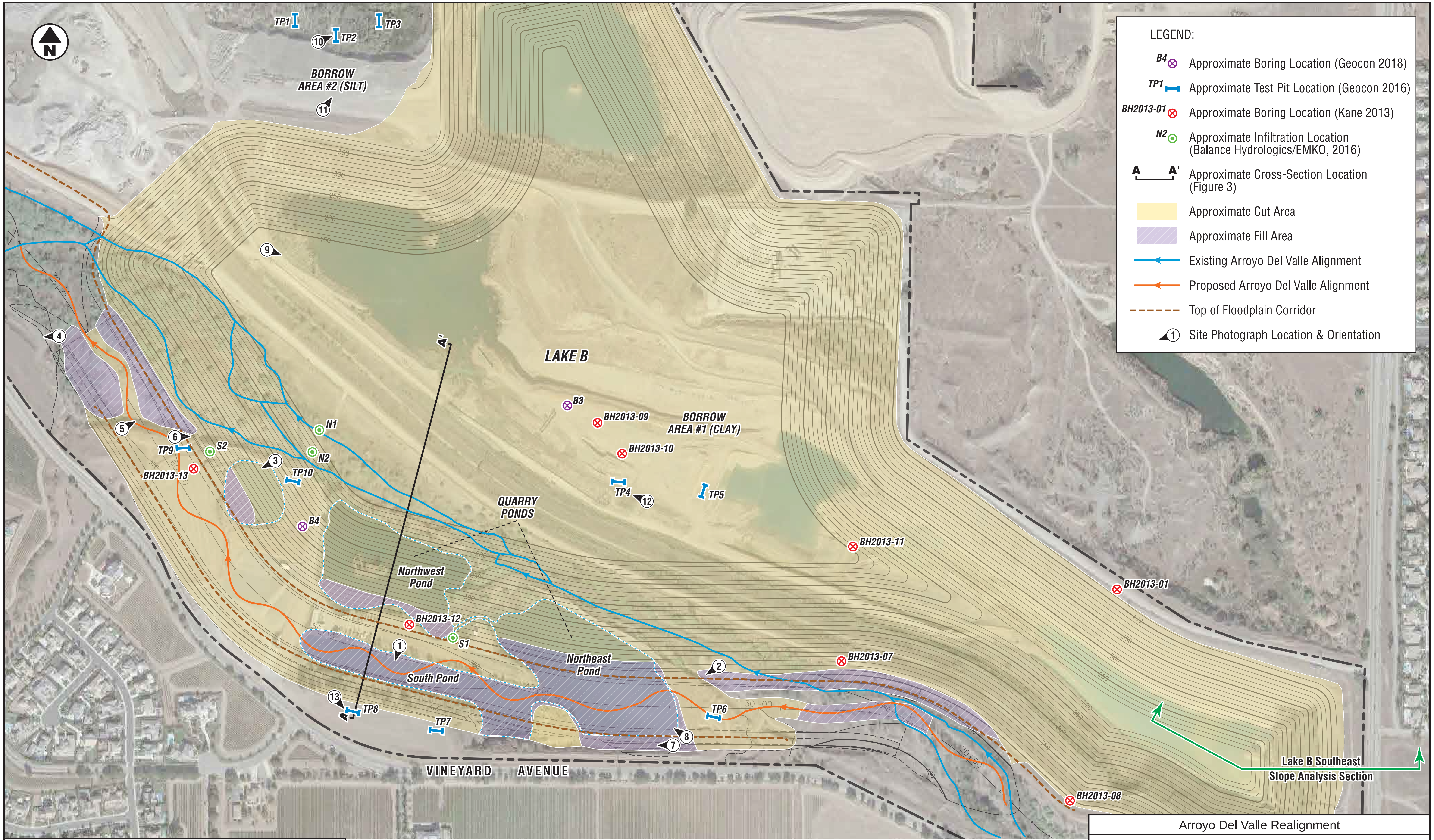
PROPOSED
PROJECT OVERVIEW

Arroyo Del Valle Realignment

Cemex Eliot Mine
Alameda County, California

S1264-05-01	December 2019	Figure 2



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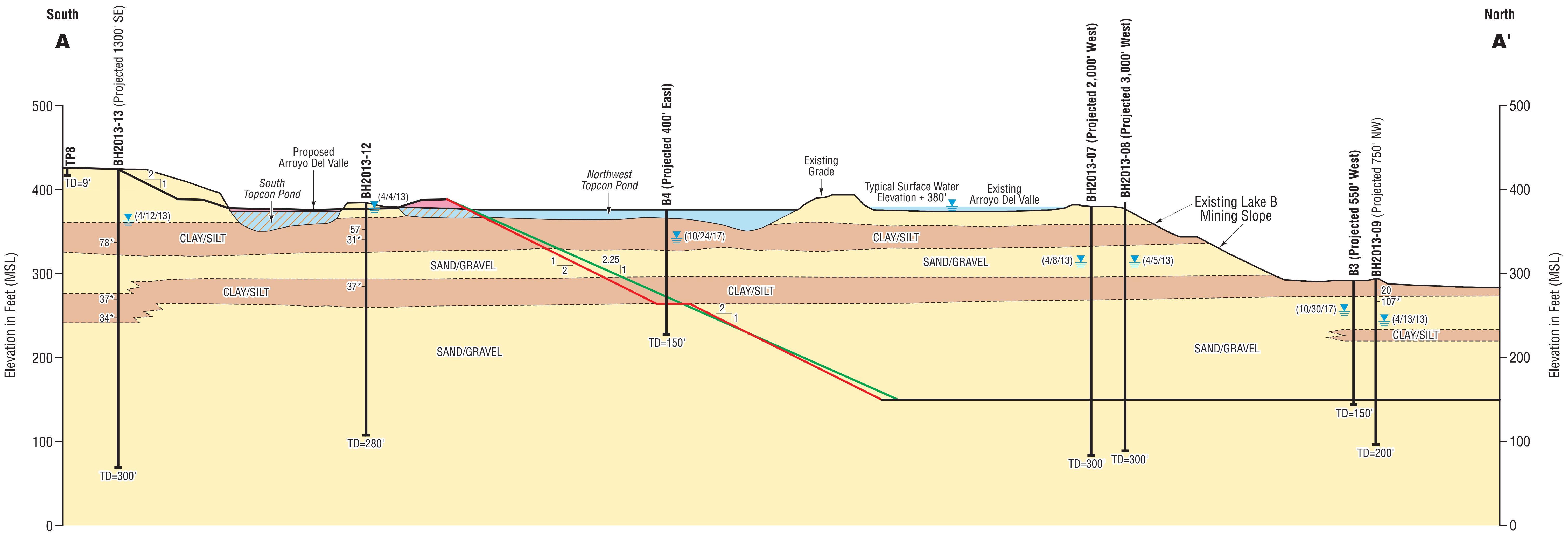
0 400
Scale in Feet

Arroyo Del Valle Realignment

Cemex Eliot Mine
Alameda County, California

SITE PLAN

S1264-05-01	December 2019	Figure 3



BH2013-13

Boring ID

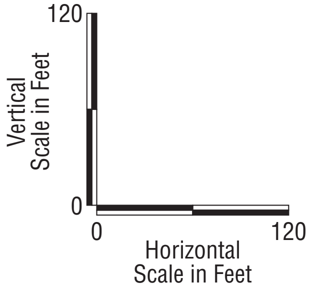
80 Blow Counts (*N-Value)

TD=Total Depth

▬	Proposed Grade
—	Existing Grade
------	Lithologic Contact
▼	Groundwater (Date Measured)
🟥	Mining/Reclamation Slope Option #1 – 2:1 Slope with 40' Wide Bench
🟩	Mining/Reclamation Slope Option #2 – 2.25:1 Slope

🟦	Water Body
🟪	New FILL (Embankment)
▨	New FILL (Water Body)
🟨	SAND/GRAVEL
🟫	CLAY/SILT**

** Although shown as continuous, the silt/clay layers are variable and discontinuous



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Arroyo Del Valle Realignment

Cemex Eliot Mine
Alameda County, California

CROSS-SECTION A – A'

S1264-05-01	December 2019	Figure 4

Photo No. 1 Embankment of Quaternary alluvium on the south side of the South Topcon Pond (December 2016)

Photo No. 2 Quaternary gravel in south side of existing Arroyo del Valle (December 2016)

PHOTOS NO. 1 & 2

Photo No. 3 Ridge of Quaternary gravel between the Pond west of the Topcon facility and Arroyo del Valle (December 2016)

Photo No. 4 Sandy clayey gravel near northwest end of proposed Arroyo del Valle realignment (January 2017)

PHOTOS NO. 3 & 4

Photo No. 5 Existing Arroyo del Valle west of Topcon Ponds (looking northeast) (December 2016)

Photo No. 6 Southwest margin of existing Arroyo del Valle west of Topcon Ponds (looking east) (December 2016)

PHOTOS NO. 5 & 6

Photo No. 7   South embankment above the Northeast Topcon Pond (December 2016)

Photo No. 8   View looking northwest across the Northeast Topcon Pond (December 2016)

PHOTOS NO. 7 & 8

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Photo No. 9 Looking southeast at Lake B. Borrow Area #1 (Clay) at far end of the lake (December 2016)

Photo No. 10 Test Pit TP2 in Borrow Area #2 (Silt) (December 2016)

PHOTOS NO. 9 & 10

Arroyo Del Valle Realignment

Cemex Eliot Mine
Alameda County, California

GEOCON Project No. S1264-05-01 | December 2019

Photo No. 11 Borrow Area #2 (Silt) with soil piles excavated from TP2 (left) and TP3 (right) (December 2016)

Photo No. 12 Test Pit TP4 in Borrow Area #1 (Clay) (December 2016)

PHOTOS NO. 11 & 12

Photo No. 13 Test Pit TP8 in Quaternary alluvium (Silty clayey sand with gravel) south of the South Topcon Pond (December 2016)

PHOTO NO. 13

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Arroyo Del Valle Realignment

Cemex Eliot Mine
Alameda County, California

GEOCON Project No. S1264-05-01 | December 2019

APPENDIX A

APPENDIX A

FIELD EXPLORATION PROGRAM

Our field exploration program was performed on December 22, 2016. The field exploration program consisted of excavating ten exploratory test pits (T1 through T10) with track-mounted excavators (Komatsu 240 and Caterpillar 325 excavators equipped with 36-inch wide buckets) at the approximate locations shown on the Site Plan, Figure 3. Bulk samples were obtained from the test pits. Upon completion, the test pits were backfilled with the excavated material.

Subsurface conditions encountered in the test pits were visually examined, classified, and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488-90). This system uses the USCS for soil designations. The logs depict the soil and geologic conditions encountered and the depths at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, excavation characteristics, and other factors. The transition between the materials may be abrupt or gradual. Where applicable, the field logs were revised based on subsequent laboratory testing. Logs of exploratory test pits are presented herein.

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	**GRAVELS** MORE THAN HALF COARSE FRACTION IS LARGER THAN NO.4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	▨	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP	▨	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	▨	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	▨	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO.4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	▨	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP	▨	POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	▨	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	▨	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	**SILTS AND CLAYS** LIQUID LIMIT 50% OR LESS		ML	▨	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL	▨	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL	▨	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	▨	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	▨	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	▨	ORGANIC CLAYS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
	HIGHLY ORGANIC SOILS		PT	▨	PEAT AND OTHER HIGHLY ORGANIC SOILS

BORING/TRENCH LOG LEGEND

▯ — No Recovery

▥ — Shelby Tube Sample
3" O.D.

▩ — Bulk Sample

◧ — SPT Sample
2" O.D., 1.4" I.D.

■ — Modified California Sample
3" O.D., 2.4" I.D.

▼ — Groundwater Level
(At Completion)

▽ — Groundwater Level
(Seepage)

PENETRATION RESISTANCE

SAND AND GRAVEL			SILT AND CLAY			
RELATIVE DENSITY	BLOWS PER FOOT (SPT)*	BLOWS PER FOOT (MOD-CAL)*	CONSISTENCY	BLOWS PER FOOT (SPT)*	BLOWS PER FOOT (MOD-CAL)*	COMPRESSIVE STRENGTH (tsf)
VERY LOOSE	0 - 4	0 - 6	VERY SOFT	0 - 2	0 - 3	0 - 0.25
LOOSE	5 - 10	7 - 16	SOFT	3 - 4	4 - 6	0.25 - 0.50
MEDIUM DENSE	11 - 30	17 - 48	MEDIUM STIFF	5 - 8	7 - 13	0.50 - 1.0
DENSE	31 - 50	49 - 79	STIFF	9 - 15	14 - 24	1.0 - 2.0
VERY DENSE	OVER 50	OVER 79	VERY STIFF	16 - 30	25 - 48	2.0 - 4.0
			HARD	OVER 30	OVER 48	OVER 4.0

*NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE LAST 12 INCHES OF AN 18-INCH DRIVE

MOISTURE DESCRIPTIONS

FIELD TEST	APPROX. DEGREE OF SATURATION, S (%)	DESCRIPTION
NO INDICATION OF MOISTURE; DRY TO THE TOUCH	S<25	DRY
SLIGHT INDICATION OF MOISTURE	25≤S<50	DAMP
INDICATION OF MOISTURE; NO VISIBLE WATER	50≤S<75	MOIST
MINOR VISIBLE FREE WATER	75≤S<100	WET
VISIBLE FREE WATER	100	SATURATED

QUANTITY DESCRIPTIONS

APPROX. ESTIMATED PERCENT	DESCRIPTION
<5%	TRACE
5 - 10%	FEW
11 - 25%	LITTLE
26 - 50%	SOME
>50%	MOSTLY

GRAVEL/COBBLE/BOULDER DESCRIPTIONS

CRITERIA	DESCRIPTION
PASS THROUGH A 3-INCH SIEVE AND BE RETAINED ON A NO. 4 SIEVE (#4 TO 3")	GRAVEL
PASS A 12-INCH SQUARE OPENING AND BE RETAINED ON A 3-INCH SIEVE (3"-12")	COBBLE
WILL NOT PASS A 12-INCH SQUARE OPENING (>12")	BOULDER

LABORATORY TEST KEY

CP – COMPACTION CURVE (ASTM D1557)
CR – CORROSION ANALYSIS (CTM 422, 643, 417)
DS – DIRECT SHEAR (ASTM D3080)
EI – EXPANSION INDEX (ASTM D4829)
GSA – GRAIN SIZE ANALYSIS (ASTM D422)
MC – MOISTURE CONTENT (ASTM D2216)
PI – PLASTICITY INDEX (ASTM D4318)

R – R-VALUE (CTM 301)
SE – SAND EQUIVALENT (CTM 217)
TXCU – CONSOLIDATED UNDRAINED TRIAXIAL (ASTM D4767)
TXUU – UNCONSOLIDATED UNDRAINED TRIAXIAL (ASTM D2850)
UC – UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

BEDDING SPACING DESCRIPTIONS

THICKNESS/SPACING	DESCRIPTOR
GREATER THAN 10 FEET	MASSIVE
3 TO 10 FEET	VERY THICKLY BEDDED
1 TO 3 FEET	THICKLY BEDDED
3 5/8-INCH TO 1 FOOT	MODERATELY BEDDED
1 1/4-INCH TO 3 5/8-INCH	THINLY BEDDED
3/8-INCH TO 1 1/4-INCH	VERY THINLY BEDDED
LESS THAN 3/8-INCH	LAMINATED

STRUCTURE DESCRIPTIONS

CRITERIA	DESCRIPTION
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS AT LEAST 1/4-INCH THICK	STRATIFIED
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS LESS THAN 1/4-INCH THICK	LAMINATED
BREAKS ALONG DEFINITE PLANES OF FRACTURE WITH LITTLE RESISTANCE TO FRACTURING	FISSURED
FRACTURE PLANES APPEAR POLISHED OR GLOSSY, SOMETIMES STRIATED	SLICKENSIDED
COHESIVE SOIL THAT CAN BE BROKEN DOWN INTO SMALLER ANGULAR LUMPS WHICH RESIST FURTHER BREAKDOWN	BLOCKY
INCLUSION OF SMALL POCKETS OF DIFFERENT SOIL, SUCH AS SMALL LENSES OF SAND SCATTERED THROUGH A MASS OF CLAY	LENSED
SAME COLOR AND MATERIAL THROUGHOUT	HOMOGENOUS

CEMENTATION/INDURATION DESCRIPTIONS

FIELD TEST	DESCRIPTION
CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE	WEAKLY CEMENTED/INDURATED
CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE	MODERATELY CEMENTED/INDURATED
WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE	STRONGLY CEMENTED/INDURATED

IGNEOUS/METAMORPHIC ROCK STRENGTH DESCRIPTIONS

FIELD TEST	DESCRIPTION
MATERIAL CRUMBLES WITH BARE HAND	WEAK
MATERIAL CRUMBLES UNDER BLOWS FROM GEOLOGY HAMMER	MODERATELY WEAK
1/8-INCH INDENTATIONS WITH SHARP END FROM GEOLOGY HAMMER	MODERATELY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **ONE** BLOW FROM GEOLOGY HAMMER	STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **COUPLE** BLOWS FROM GEOLOGY HAMMER	VERY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **MANY** BLOWS FROM GEOLOGY HAMMER	EXTREMELY STRONG

IGNEOUS/METAMORPHIC ROCK WEATHERING DESCRIPTIONS

DEGREE OF DECOMPOSITION	FIELD RECOGNITION	ENGINEERING PROPERTIES
SOIL	DISCOLORED, CHANGED TO SOIL, FABRIC DESTROYED	EASY TO DIG
COMPLETELY WEATHERED	DISCOLORED, CHANGED TO SOIL, FABRIC MAINLY PRESERVED	EXCAVATED BY HAND OR RIPPING (Saprolite)
HIGHLY WEATHERED	DISCOLORED, HIGHLY FRACTURED, FABRIC ALTERED AROUND FRACTURES	EXCAVATED BY HAND OR RIPPING, WITH SLIGHT DIFFICULTY
MODERATELY WEATHERED	DISCOLORED, FRACTURES, INTACT ROCK-NOTICEABLY WEAKER THAN FRESH ROCK	EXCAVATED WITH DIFFICULTY WITHOUT EXPLOSIVES
SLIGHTLY WEATHERED	MAY BE DISCOLORED, SOME FRACTURES, INTACT ROCK-NOT NOTICEABLY WEAKER THAN FRESH ROCK	REQUIRES EXPLOSIVES FOR EXCAVATION, WITH PERMEABLE JOINTS AND FRACTURES
FRESH	NO DISCOLORATION, OR LOSS OF STRENGTH	REQUIRES EXPLOSIVES

IGNEOUS/METAMORPHIC ROCK JOINT/FRACTURE DESCRIPTIONS

FIELD TEST	DESCRIPTION
NO OBSERVED FRACTURES	UNFRACTURED/UNJOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1 TO 3 FOOT INTERVALS	SLIGHTLY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 4-INCH TO 1 FOOT INTERVALS	MODERATELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1-INCH TO 4-INCH INTERVALS WITH SCATTERED FRAGMENTED INTERVALS	INTENSELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT LESS THAN 1-INCH INTERVALS; MOSTLY RECOVERED AS CHIPS AND FRAGMENTS	VERY INTENSELY FRACTURED/JOINTED

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KEY TO LOGS

Figure A1

TEST PIT TP1

ELEV. (MSL.) **~382'**
DATE COMPLETED **12/22/2016**
ENG./GEO. **John C. Pfeiffer**
DRILLER **Independent Construction**
EQUIPMENT **CAT 325 Excavator**
HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0				CL	**FILL** Moist, brown, Sandy lean CLAY with gravel, rounded gravel to 4 inches maximum dimension				
1									
2									
3									
4									
5	TP1-5 ☒								GSA, PI
6									
7									
8									
9									
10	TP1-10 ☒								
11									
12									
13									
14									
15	TP1-15 ☒								
16									
17					- increased gravel below approximately 17 feet				
18									
19									
20					TEST PIT TERMINATED AT 20 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A2, Log of Test Pit, page 1 of 1

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP2

ELEV. (MSL.) **~382'**

DATE COMPLETED **12/22/2016**

ENG./GEO. **John C. Pfeiffer**

DRILLER **Independent Construction**

EQUIPMENT **CAT 325 Excavator**

HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0				CL	**FILL** Moist, brown, Sandy lean CLAY with gravel, rounded gravel to 4 inches maximum dimension				
1									
2									
3									
4									
5	TP2-5 ☒								
6									
7									
8									
9									
10	TP2-10 ☒								
11									
12									
13									
14									
15	TP2-15 ☒								
16									
17					- increased gravel below approximately 17 feet				
18									
19									
20					TEST PIT TERMINATED AT 20 FEET GROUNDWATER NOT ENCOUNTERED				

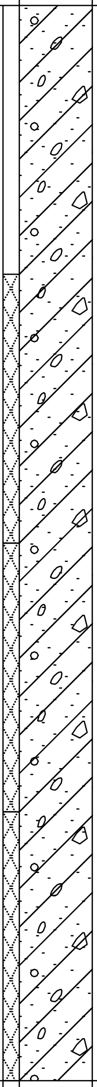


Figure A3, Log of Test Pit, page 1 of 1

IN PROGRESS S1264-05-01 CEMEX ELIOT.GPJ 01/27/17

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

☒ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP3

ELEV. (MSL.) **~382'**
DATE COMPLETED **12/22/2016**
ENG./GEO. **John C. Pfeiffer**
DRILLER **Independent Construction**
EQUIPMENT **CAT 325 Excavator**
HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0				CL	**FILL** Moist, brown, Sandy lean CLAY with gravel, rounded gravel to 4 inches maximum dimension				
1									
2									
3									
4									
5	TP1-5 ☒								
6									
7									
8									
9									
10	TP3-10 ☒								
11									
12									
13									
14									
15	TP3-15 ☒								
16									
17					- increased gravel below approximately 17 feet				
18									
19									
20					TEST PIT TERMINATED AT 20 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A4, Log of Test Pit, page 1 of 1

IN PROGRESS S1264-05-01 CEMEX ELIOT.GPJ 01/27/17

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP4

ELEV. (MSL.) **~304'**
DATE COMPLETED **12/22/2016**
ENG./GEO. **John C. Pfeiffer**
DRILLER **Independent Construction**
EQUIPMENT **CAT 325 Excavator**
HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0	TP4A-F ☒			CL	**ALLUVIUM** Moist, reddish brown to brown, Sandy lean CLAY, little round to subround gravel to 1.5 inches maximum dimension				GSA, PI
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16					- increased moisture				
17									
18			▽						
19					- increased gravel content below 19 feet				
20					TEST PIT TERMINATED AT 20 FEET GROUNDWATER ENCOUNTERED AT 18 FEET				

Figure A5, Log of Test Pit, page 1 of 1

GEOCON

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◩ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP5

ELEV. (MSL.) **~294'**
DATE COMPLETED **12/22/2016**
ENG./GEO. **John C. Pfeiffer**
DRILLER **Independent Construction**
EQUIPMENT **CAT 325 Excavator**
HAMMER TYPE **NA**

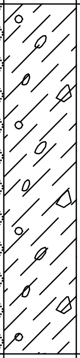
DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0 1 2 3 4 5 6	TP5A-B ☒			GC	**ALLUVIUM** Damp to moist, brown, Clayey GRAVEL, subround to round gravel to 4 inches maximum dimension				
					TEST PIT TERMINATED AT 6.5 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A6, Log of Test Pit, page 1 of 1

GEOCON

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP6

ELEV. (MSL.) **~410'**

DATE COMPLETED **12/22/2016**

ENG./GEO. **John C. Pfeiffer**

DRILLER **Independent Construction**

EQUIPMENT **Komatsu 240 Excavator w/ 36" bucket**

HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0	TP6-0-1.5 ☒			ML	Damp, brown, SILT, trace sand and fine to medium round gravel				
1									
2	TP6-1.5-8A-C ☒			GW-GC	Loose to medium dense, gray, Well graded GRAVEL with silt, clay, and sand				GSA
3									
4									
5									
6									
7									
8					TEST PIT TERMINATED AT 8 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A7, Log of Test Pit, page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP7

ELEV. (MSL.) **~422'**
DATE COMPLETED **12/22/2016**
ENG./GEO. **John C. Pfeiffer**
DRILLER **Independent Construction**
EQUIPMENT **Komatsu 240 Excavator w/ 36" bucket**
HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0	TP7-0-2.5 ☒			ML	Damp, dark brown, Sandy SILT with gravel				
1									
2				SC	Medium dense to dense, damp, yellowish brown, Silty clayey SAND with gravel, subround to round gravel to 4 inches maximum dimension				
3	TP7-3-9 ☒								GSA
4									
5	TP7-5-12 ☒								
6									
7									
8									
9									
10									
11									
12					TEST PIT TERMINATED AT 12 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A8, Log of Test Pit, page 1 of 1

GEOCON

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP8

ELEV. (MSL.) **~422'**

DATE COMPLETED **12/22/2016**

ENG./GEO. **John C. Pfeiffer**

DRILLER **Independent Construction**

EQUIPMENT **Komatsu 240 Excavator w/ 36" bucket**

HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0	TP8-0-3			ML	Damp, dark brown, Sandy SILT with gravel				
1									
2				SC	Medium dense to dense, damp, yellowish brown, Silty clayey SAND with gravel, subround to round gravel to 4 inches maximum dimension				
3	TP8-3-9								
4									
5									
6									
7									
8									
9					TEST PIT TERMINATED AT 9 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A9, Log of Test Pit, page 1 of 1

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

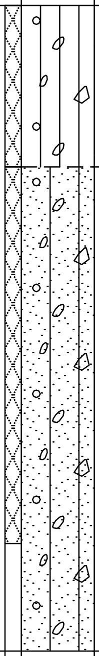
PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP9

ELEV. (MSL.) **~400'** DATE COMPLETED **12/22/2016**

ENG./GEO. **John C. Pfeiffer** DRILLER **Independent Construction**

EQUIPMENT **Komatsu 240 Excavator w/ 36" bucket** HAMMER TYPE **NA**



DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0	TP9-0-3			ML	Damp to moist, brown, SILT to gravelly SILT				
1									
2									
3	TP9-3-10			SW-SM	Medium dense, moist, gray to brownish gray, interbedded well graded SAND with gravel and well graded GRAVEL with silt, clay and sand - layers/lenses 1 to 2 feet thick, subround to round gravel to 4 inches maximum dimension				
4									
5									
6									
7									
8									
9									
10									
11									
12					TEST PIT TERMINATED AT 12 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A10, Log of Test Pit, page 1 of 1

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

☒ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **S1264-05-01** PROJECT NAME **Cemex Eliot**

TEST PIT TP10

ELEV. (MSL.) **~372**

DATE COMPLETED **12/22/2016**

ENG./GEO. **John C. Pfeiffer**

DRILLER **Independent Construction**

EQUIPMENT **Komatsu 240 Excavator w/ 36" bucket**

HAMMER TYPE **NA**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0				SW	Moist, brownish gray, Well graded SAND with gravel				
1				GC	Moist to wet, brown to light brown, Clayey GRAVEL with cobbles and boulders to 18 inches				
2									
3									
4									
5									
6					- seepage				
7									
8									
9									
10					TEST PIT TERMINATED AT 10 FEET GROUNDWATER NOT ENCOUNTERED				

Figure A11, Log of Test Pit, page 1 of 1

IN PROGRESS S1264-05-01 CEMEX ELIOT.GPJ 01/27/17

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

☒ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B3

ELEV. (MSL.) **300** DATE COMPLETED **10/30/2017**
ENG./GEO. **JP** DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary** HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	Very stiff, damp, dark yellow-brown, CLAY			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10	B3-10.5							
11	B3-11				-dark yellow-brown with trace gray-brown vertical stringers and black mottling -blocky soil structure	30	113.5	14.7
12	B3-11.5							
13								
14								
15								
16								
17								
18								
19								
20	B3-20			GC	Very dense, damp, strong brown mottle black, Clayey (f-c) GRAVEL with (f-c) sand -clasts are decomposed brown siltstone and diorite and strong to very strong sub-rounded to rounded brown sandstone	50/5"		
21								
22								
23								
24								
25								
26								
27								
28								
29								
30	B3-30		▼		-wet, yellow-brown, more sand	50/6"		14.8
31								
32								
33								
34								

Figure A12, Log of Boring B3, page 1 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

BORING B3

ELEV. (MSL.) **300**

DATE COMPLETED **10/30/2017**

ENG./GEO. **JP**

DRILLER **V&W**

EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**

HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
35								
36								
37								
38								
39								
40	B3-40				-gravels angular to sub-rounded			
41					-clasts are strong to very strong silica-rich metamorphics, chert, and quartz	50/6"		
42								
43								
44								
45					-gravel (f)			
46								
47								
48								
49								
50	B3-50.5							
51	B3-51					50/5"		
52								
53								
54								
55								
56								
57								
58								
59								
60	B3-60				-brown to strong brown, gravels (f-c) angular to sub-rounded			
61	B3-60.5				-moderately indurated	50/3"		
62								
63								
64								
65								
66								
67								
68								
69				GW	Very dense, wet, (f-c) GRAVEL with (f-c) sand			

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B3

ELEV. (MSL.) **300** DATE COMPLETED **10/30/2017**

ENG./GEO. **JP** DRILLER **V&W**

EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary** HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
70	■ B3-70					50/6"		
71	▨ B3-70.5							
72								
73								
74								
75				SW-SM	Very dense, wet, (f) Gravelly (f-c) SAND with few fines			
76								
77								
78								
79								
80	◧ B3-80							
81						50/6"		
82								
83				CL	CLAY			
84								
85	▨ B3-85-90							
86								
87								
88								
89								
90								
91								
92				GC	Very dense, brown, (f-c) Sandy (f-c) angular to sub-rounded GRAVEL with little clay			
93	▨ B3-93							
94								
95								
96								
97	▨ B3-97							
98								
99								
100	■ B3-100					50/5"		
101	▨ B3-100.5							
102	▨ B3-102							
103								
104								

Figure A14, Log of Boring B3page 3 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B3

ELEV. (MSL.) **300**
DATE COMPLETED **10/30/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
105	B3-105						
106							
107							
108							
109							
110	B3-110			-gravels (f-c)	50/4"		
111							
112	B3-112						
113							
114							
115							
116	B3-116						
117							
118							
119							
120	B3-120				50/2"		
121	B3-121						
122							
123							
124							
125	B3-125			-cuttings show white and clear quartz, pink feldspar, lithic fragments: granitic, dioritic, mafic to ultramafic (olivine-rich), metabasalt, red chert			
126							
127	B3-127						
128							
129							
130	B3-130				80/6"		
131							
132							
133							
134							
135							
136							
137							
138							
139			GW	Very dense, GRAVEL with cobbles			

Figure A15, Log of Boring B3, page 4 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B3

ELEV. (MSL.) **300** DATE COMPLETED **10/30/2017**

ENG./GEO. **JP** DRILLER **V&W**

EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary** HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
140						80/3"		
141						50/1"		
142								
143								
144								
145	B3-145							
146								
147	B3-147							
148				GC	Very dense, brown, Clayey GRAVEL with sand			
149								
150						90/4"		

END OF BORING AT APPROXIMATELY 150½ FEET
GROUNDWATER INITIALLY ENCOUNTERED AT 30 FEET
BACKFILLED WITH GROUT VIA TREMIE

Figure A16, Log of Boring B3, page 5 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B4

ELEV. (MSL.) **380** DATE COMPLETED **10/24/2017**

ENG./GEO. **JP** DRILLER **V&W**

EQUIPMENT **BK81 w/ 8-inch HSA** HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GC	Very dense, dry to damp, brown, Clayey (f-c) sub-angular to sub-rounded GRAVEL with (f-c) sand			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10	B4-10.5 B4-11				-moist, gravels (f-c) sub-rounded	50/6"		
11								
12								
13								
14								
15								
16								
17								
18								
19								
20	B4-20.3 B4-20.8				-gravels angular to sub-rounded -clasts are strong to very strong metasedimentary and metavolcanic rocks including quartzite, metabasalt, chert, and quartz	50/3"		
21								
22								
23								
24								
25								
26								
27								
28								
29								
30	B4-30.3 B4-30.8 B4-31		▼		-with interbedded layer of dark brown (f) sand	50/3" 71		
31								
32								
33								
34								

Figure A17, Log of Boring B4, page 1 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◣ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B4

ELEV. (MSL.) **380**
DATE COMPLETED **10/24/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
35		▨		CL	Very stiff, moist, strong brown, CLAY			
41	■ B4-40.5 B4-41	▨				27	104.6	21.8
51	■ B4-50.5 B4-51 ☒ B4-51.5	▨			-stiff, light yellow-brown with strong brown and trace black mottling	20	106.5	23.3
61	■ B4-60 B4-60.5 B4-61 ☒ B4-61.5	▨			-same	39	107.4	20.9
67				GW	Very dense, wet, gray-brown, (f) angular to subrounded GRAVEL with (m-c) sand -clasts are quartz, chert, dark metamorphics, including metabasalt and graywacke			

Figure A18, Log of Boring B4, page 2 of 3

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B4

ELEV. (MSL.) **380** DATE COMPLETED **10/24/2017**

ENG./GEO. **JP** DRILLER **V&W**

EQUIPMENT **BK81 w/ 8-inch HSA** HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
70								
71	B4-70.5 B4-71					50/6"		
80	B4-80				-sand (f-c), with silt	50/5"		
90	B4-90				-yellow-brown, gravel (f-c) -clasts are quartz, chert, metabasalt, and some weak sandstone	50/5"		
99				SM	Medium dense, wet, brown, Silty SAND with (f) gravel			
100	B4-100			CL	Very stiff, moist, strong brown with pale brown mottling, CLAY with trace (m-c) sand	52		
101								

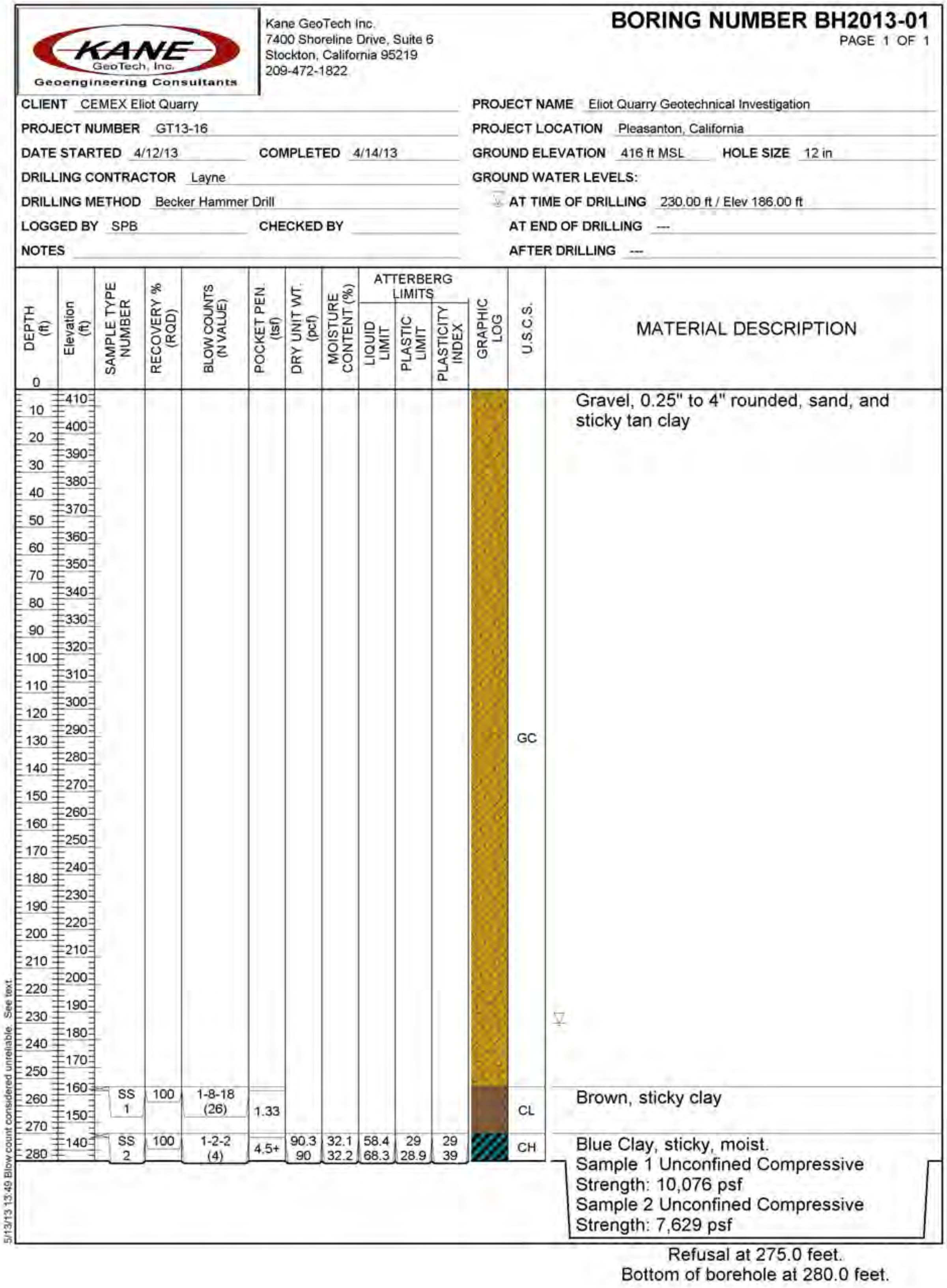
END OF BORING AT APPROXIMATELY 101½ FEET
GROUNDWATER INITIALLY ENCOUNTERED AT 30 FEET
BACKFILLED WITH GROUT VIA TREMIE

Figure A19, Log of Boring B4, page 3 of 3

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE



Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-01

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/12/13 **COMPLETED** 4/14/13
GROUND ELEVATION 416 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 230.00 ft / Elev 186.00 ft
LOGGED BY SPB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
												GC	Gravel, 0.25" to 4" rounded, sand, and sticky tan clay
		SS 1	100	1-8-18 (26)	1.33							CL	Brown, sticky clay
		SS 2	100	1-2-2 (4)	4.5+	90.3 90	32.1 32.2	58.4 68.3	29 28.9	29 39		CH	Blue Clay, sticky, moist. Sample 1 Unconfined Compressive Strength: 10,076 psf Sample 2 Unconfined Compressive Strength: 7,629 psf

Refusal at 275.0 feet.
Bottom of borehole at 280.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

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209-472-1822

BORING NUMBER BH2013-07

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/6/13 **COMPLETED** 4/8/13
GROUND ELEVATION 392 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 65.00 ft / Elev 327.00 ft
LOGGED BY JFR **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	390											GC	Gravel, up to 3" diameter, sand, and tan clay ▽
		SS 1	0	27								CL	Brown clay, some gravel
												GC	Gravel, up to 3" diameter, sand, tan clay
												CL	Brown clay
		SS 2	100	6-12-24 (36)	3.13							GC	Gravel, sand, and clay, light brown, up to 4" diameter clasts
												GC	Clayey gravel/gravel and clay layers
												GC	Gravel, sand, and clay, light brown
												GC	Gravel and clay, light brown
												GC	Gravel, sand, and clay, light brown
300													

Bottom of borehole at 300.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text

KANE
GeoTech, Inc.
Geoengineering Consultants

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Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-08

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/4/13 **COMPLETED** 4/5/13

GROUND ELEVATION 401 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

▽ **AT TIME OF DRILLING** 70.00 ft / Elev 331.00 ft

LOGGED BY JFR **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	400										▨		Gravel, rounded, up to 4" diameter, sand, brown clay
10	390												
20	380												
30	370												
40	360												
50	350												
60	340												
70	330												▽
80	320											GC	
90	310												
100	300												
110	290												
120	280												
130	270												
140	260												
150	250												
160	240										▨		Gravel, rounded, up to 2" diameter, sand, tan clay
170	230												
180	220												
190	210												
200	200												
210	190												
220	180												
230	170											GC	
240	160												
250	150												
260	140												
270	130												
280	120												
290	110												
300													

Bottom of borehole at 300.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text

KANE GeoTech, Inc.
Geoengineering Consultants

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209-472-1822

BORING NUMBER BH2013-09

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/2/13 **COMPLETED** 4/3/13

GROUND ELEVATION 300 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

▽ **AT TIME OF DRILLING** 49.40 ft / Elev 250.60 ft

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	300												
												GC	Gravel
10	290												
		SS 1	100	20								CL	Clay, brown, moist
					2.81								
20	280												
		SS 2	100	21-72-35 (107)	2.67								
													Gravel, sub-angular, sand, brown clay
30	270												
40	260												
												GC	
50	250												▽
60	240												
70	230	GB 3										CL	Clay, brown, moist
80	220												Gravel, sub-angular to round, sand, brown clay
90	210												
100	200	GB 4											
110	190												
120	180												
130	170												
140	160											GC	
150	150												
160	140												
170	130												
180	120												
190	110												
200	100												

Bottom of borehole at 200.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

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Geoengineering Consultants

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Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-10 A

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/14/13 **COMPLETED** 4/14/13

GROUND ELEVATION 304 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

▽ **AT TIME OF DRILLING** 2.00 ft / Elev 302.00 ft

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0												GW	▽ Gravel
	300												
		SS 1	89	19-34-103 (137)	4.29							CL	Clay- brown, sticky, moist
10												GC	Gravel, sticky brown clay, sand
	290											CL	Clay- brown, sticky, moist
		SS 2	67	37-82	4.38								
20													
		SS 3	100	26-47-57 (104)	2.75								
	280											GC	Gravel, sand, and clay-brown, sticky, moist
30													
	270												
40													
	260												
50													

Bottom of borehole at 50.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

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BORING NUMBER BH2013-10 B

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/14/13 **COMPLETED** 4/14/13
GROUND ELEVATION 304 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 4.70 ft / Elev 299.30 ft
LOGGED BY SPB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0												GW	Gravel
	300												
		SS 1	0	34-72									
												CL	▽ Clay- brown, sticky, moist. Unconfined Compressive Strength: 5,111 psf
10		SS 2	94	24-20-98 (118)	2.92	106.8	21.4	34.1	19.3	15			
	290												
												GC	Gravel, tan clay, sand.
20													
	280												
30													
	270												
40													
	260												
50													Bottom of borehole at 50.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

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BORING NUMBER BH2013-11

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/5/13 **COMPLETED** 4/5/13
GROUND ELEVATION 320 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
∇ **AT TIME OF DRILLING** 6.50 ft / Elev 313.50 ft
LOGGED BY SPB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	320											GC	∇ Gravel, sand, and clay- brown, moist and sticky
												CL	Clay- brown, moist, sticky
		SS 1	100	9-17-35 (52)	4.5+							GC	Gravel, sand, and clay- brown, moist, sticky
220	100												Bottom of borehole at 220.0 feet.

Depth scale (ft): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220
Elevation scale (ft): 320, 310, 300, 290, 280, 270, 260, 250, 240, 230, 220, 210, 200, 190, 180, 170, 160, 150, 140, 130, 120, 110, 100

5/13/13 13:49 Blow count considered unreliable. See text.

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BORING NUMBER BH2013-12

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/9/13 **COMPLETED** 4/10/13
GROUND ELEVATION 376 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 4.00 ft / Elev 372.00 ft
LOGGED BY TJB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX
SS 1	0 92	17-17-40 (57)	1.86	98.6	26.1	39	20	19
SS 2	100	38-38	2.47					
SS 3		7-13-18 (31)						
SS 4	100	6-18-19 (37)	2.36					

U.S.C.S.	MATERIAL DESCRIPTION
GC	▽ Gravel, and and clay- light brown
CH	Clay and gravel- dark gray
CL	Clay and sand, light brown. Unconfined Compressive Strength: 1,408 psf
GC	Sand, gravel, and clay- light grey
CL	Clay and gravel- light brown
GC	Gravel, sand, and clay- light brown. Clasts well rounded

Bottom of borehole at 280.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

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BORING NUMBER BH2013-13

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/11/13 **COMPLETED** 4/12/13

GROUND ELEVATION 412 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

▽ **AT TIME OF DRILLING** 59.50 ft / Elev 352.50 ft

LOGGED BY TJB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	410												Gravel, sand, and clay. Light brown, dry to moist. Gravel to 4" diameter and well rounded
10	400												
20	390												
30	380											GC	
40	370												
50	360												
60	350												▽
70	340	SS 1	67	11-39-39 (78)	3.21							CL	Clay, light brown, moist
80	330												Gravel, sand, and clay. Light brown, wet. Gravel to 4" diameter, well rounded.
90	320												
100	310												
110	300											GC	
120	290												
130	280												
140	270	SS 2	100	9-16-21 (37)	2.08			46.7	21.7	25			Clay and sand. Light brown, moist.
150	260											CL	
160	250	SS 3	100	5-17-17 (34)	1.00								
170	240												
180	230												Gravel, sand, and clay. Light brown. Gravel up to 4" diameter and well rounded.
190	220												
200	210												
210	200												
220	190												
230	180											GC	
240	170												
250	160												
260	150												
270	140												
280	130												
290	120	SS 4	67	1-1	3.83							CL	Sandy brown clay.
300													

Bottom of borehole at 300.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

APPENDIX B

APPENDIX B

LABORATORY TESTING PROGRAM

Laboratory tests were performed in accordance with generally accepted test methods of the ASTM or other suggested procedures. Selected soil samples were tested for their grain size distribution, plasticity characteristics, maximum dry density/optimum moisture content, shear strength parameters, and hydraulic conductivity. Laboratory test results from our current laboratory testing program and pertinent laboratory test results from previous studies are presented on the following pages.

Sample ID	Depth (feet)	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)
TP1-3 (5-20')	5	31	13	18	---	55.3		
TP4A-F (0-20')	0	31	14	17	---	54.8		
TP6A-C (1.5-8')	1.5				---	6.9		
TP7-8 (3-12')	3				---	39.1		

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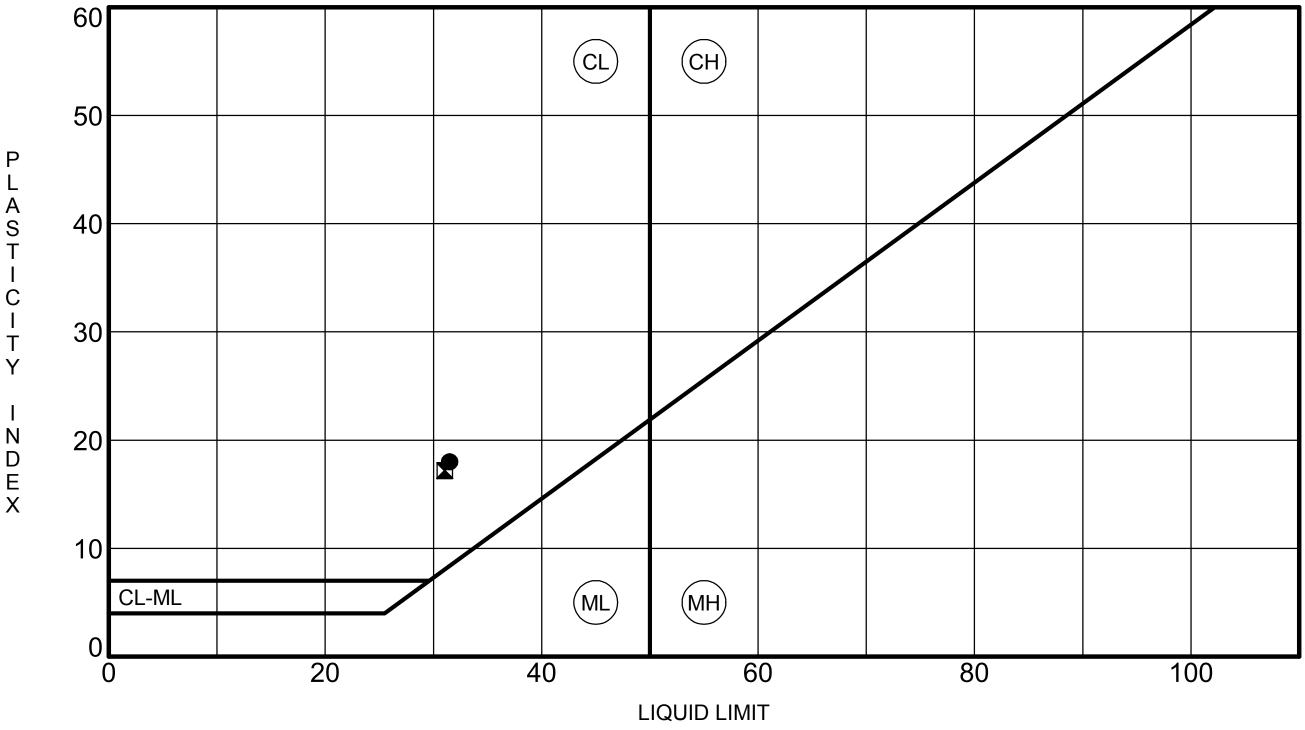
Summary of Laboratory Results

Project: Cemex Eliot
Location: Alameda County, California
Number: S1264-05-01
Figure: B1



	Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	% Pass #200 Sieve	Unified Soil Classification Description	Preparation Method
●	**TP1-3 (5-20')**	**31**	**13**	**18**	**55.3**	**SANDY LEAN CLAY with GRAVEL(CL)**	**dry**
☒	**TP4A-F (0-20')**	**31**	**14**	**17**	**54.8**	**SANDY LEAN CLAY(CL)**	**dry**

PI COPY 2 S1264-05-01 CEMEX ELIOT.GPJ US_LAB.GDT 1/23/17

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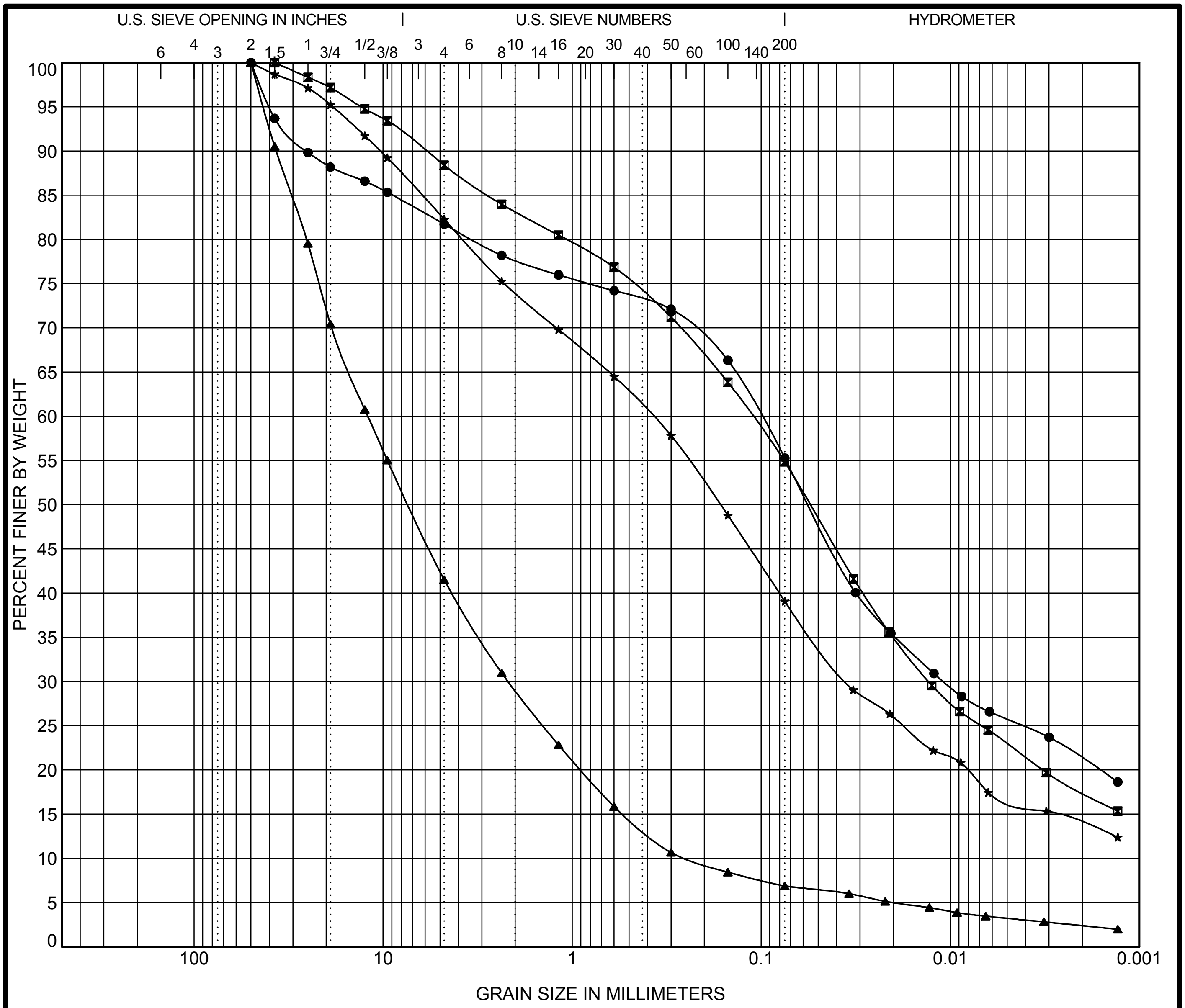
ATTERBERG LIMITS (ASTM D4318)

Project: Cemex Eliot
Location: Alameda County, California
Number: S1264-05-01
Figure: B2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample No.	Classification	LL	PL	PI	Cc	Cu
●	**TP1-3 (5-20')**	**SANDY LEAN CLAY with GRAVEL(CL)**	**31**	**13**	**18**		
☒	**TP4A-F (0-20')**	**SANDY LEAN CLAY(CL)**	**31**	**14**	**17**		
▲	**TP6A-C (1.5-8')**	**WELL-GRADED GRAVEL with SILT CLAY and SAND (GW-GC)**				**1.60**	**49.3**
★	**TP7-8 (3-12')**	**SILTY, CLAYEY SAND with GRAVEL (SC-SM)**					

	Sample No.	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP1-3 (5-20')**	**50**	**0.101**	**0.011**		**18.3**	**26.5**	**29.5**	**25.7**
☒	**TP4A-F (0-20')**	**37.5**	**0.112**	**0.013**		**11.6**	**33.5**	**31.9**	**22.9**
▲	**TP6A-C (1.5-8')**	**50**	**12.061**	**2.172**	**0.244**	**58.5**	**34.6**	**3.7**	**3.2**
★	**TP7-8 (3-12')**	**50**	**0.376**	**0.035**		**17.7**	**43.2**	**22.3**	**16.8**

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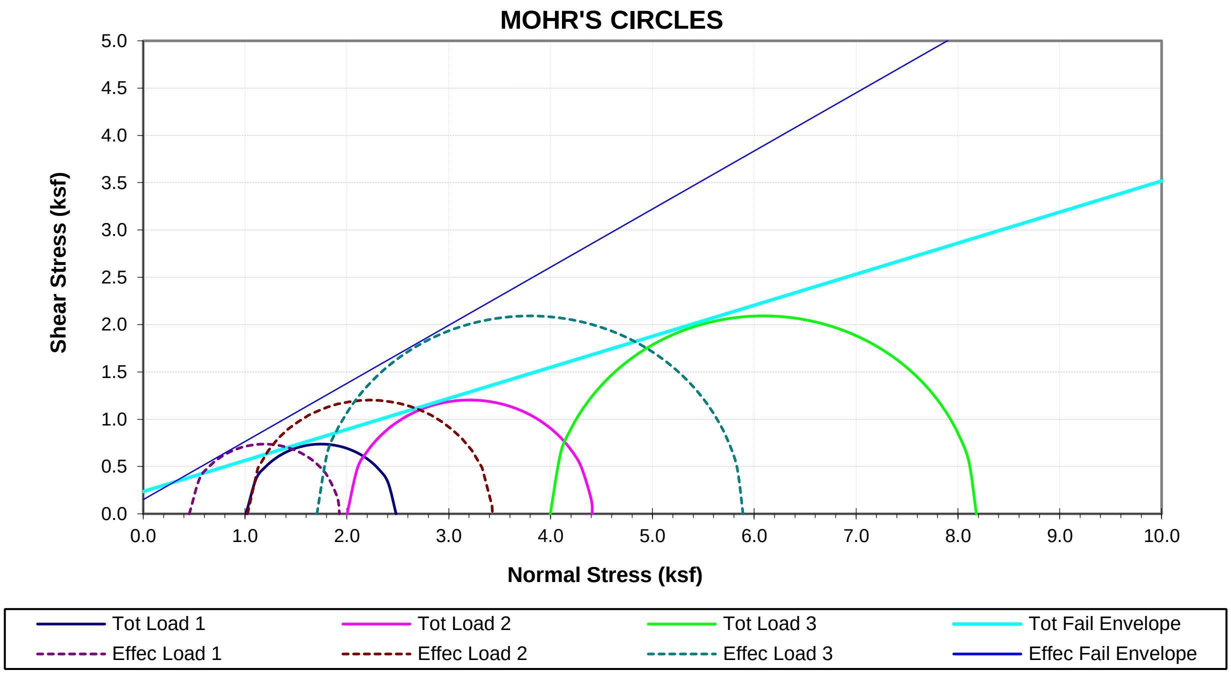
GRAIN SIZE DISTRIBUTION (ASTM D422, D6913)

Project: Cemex Eliot
Location: Alameda County, California
Number: S1264-05-01
Figure: B3

Consolidated Undrained Triaxial Compression - ICU Test ASTM D4767

Boring Number	TP4
Sample Number	TP4-A-F
Sample Description	Sandy Lean CLAY (CL)



Test Results, At Maximum Principal Stress Ratio	Total	Effective
Friction Angle ϕ (degrees)	**18.2**	**31.6**
cohesion (psf)	**235**	**150**

Initial Conditions at Start of Test	stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure	**1000**	**2000**	**4000**
Height (inch)	5.010	4.978	4.895
Diameter (inch)	2.414	2.446	2.448
Moisture Content (%)	11.3	--	--
Dry Density (pcf)	114.4	--	--
Saturation (%)	64.6	--	--
After Saturation			
Dry Density (pcf)	111.9	--	--
After Consolidation			
Dry Density (pcf)	112.1	--	--
Shear Test Conditions			
Dry Density (pcf)	112.1	113.7	115.5
Moisture Content (%)	--	--	16.7
Saturation (%)	--	--	98.3
Strain rate (%/hr)	1.86	1.89	1.95
Cell pressure (psf)	11220	12210	14230
Initial Back Pressure (psf)	10210	10210	10230
Initial Effective Confining Pressure (psf)	1010	2000	4000
Total Major Principal Stress At Failure (psf)	2480	4410	8180
Effective Major Principal Stress At Failure (psf)	1930	3430	5890
Pore Pressure At Failure (psf)	560	980	2290
Effective Minor Principal Stress At Failure (psf)	450	1020	1710

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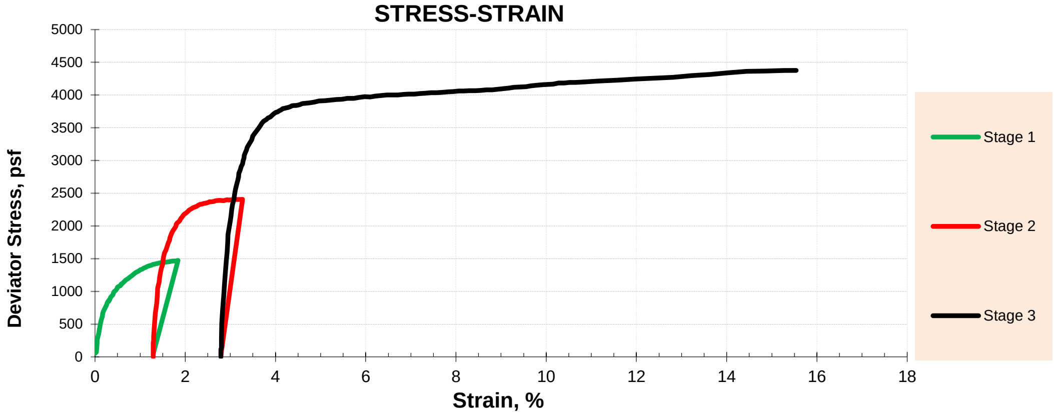
Triaxial Shear Strength - CU Test, ASTM D4767 with Pore Pressure Measurements (staged)

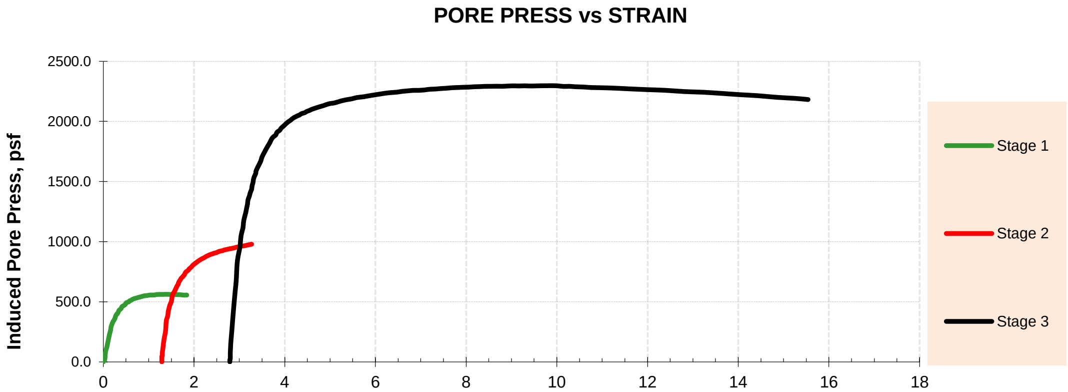
Project: Cemex Eliot
Location: Alameda County, CA
Number: S1264-05-01
Figure: B4

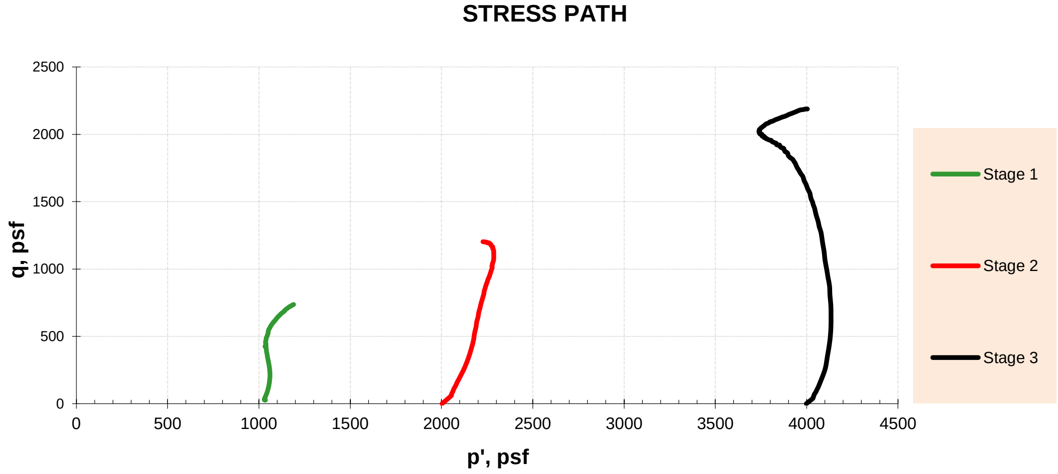
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION - ICU TEST ASTM D4767

Boring Number	TP4
Sample Number	TP4-A-F
Sample Description	Sandy Lean CLAY (CL)


STRESS-STRAIN

After shear photo


PORE PRESS vs STRAIN


STRESS PATH

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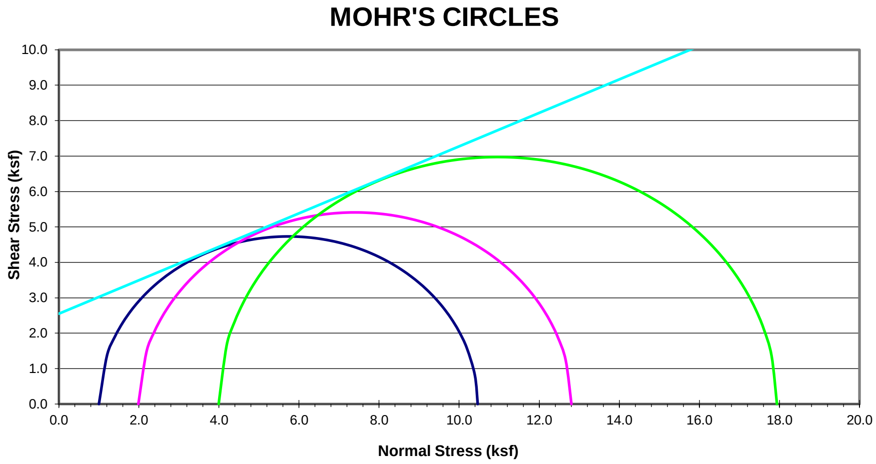
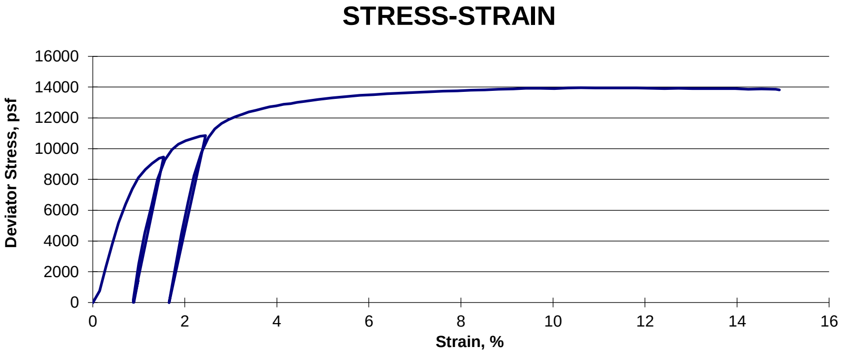
Triaxial Shear Strength - CU Test, ASTM D4767 with pore pressure measurements

Project: Cemex Eliot
Location: Alameda County, CA
Number: S1264-05-01
Figure: B5 Page 2 of 2





Failure Photo

Test Results

ϕ, degrees	**25.3**
c, psf	**2550**

Sample Description

Sample Number	A-F
Sample Depth (feet)	0
Material Description	dark yellowish brown Sandy lean CLAY

Initial Conditions at Start of Stage

Sample ID (psf), minor principal stress	**1000**	**2000**	**4000**
Height (inch)	4.990	4.940	4.890
Diameter (inch)	2.402	2.414	2.414
Moisture Content (%)	11.8	11.8	11.8
Dry Density (pcf)	116.9	116.9	116.9
Saturation (%)	72.2	72.2	72.2

Shear Test Conditions

Strain Rate (%/min)	0.2937	0.3011	0.2977
Major Principal Stress at Failure (psf)	10460	12800	17940
Strain at failure (%)	1.54	2.33	10.33
Deviator Stress and Fail (psf)	9460	10820	13950

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Triaxial Shear Strength - UU Test (staged)

Project: Cemex Eliot
Location: Alameda County, CA
Number: S1264-05-01
Figure: B6

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Hydraulic Conductivity
(ASTM D5084)

Project Name: Cemex Eliot
Project Number: S1264-05-01
Beginning Test Date: 1/6/2017
Ending Test Date: 1/7/2017
Sample ID: TP4-A-F
Sample Description: d. y. brn. Lean CLAY
Estimated Specific Gravity: 2.67

Cell Pressure (psi)	72
In Pressure (psi)	70
Out Pressure (psi)	70
Burette area (cm^2)	0.872
Burette Correction (cm/ml)	1.147

	1	2	3	AVG (inches)	AVG (cm)
Initial Height (in.)	3.000	3.000	3.000	3.00	7.62
Final Height (in.)	3.069	3.062	3.049	3.06	7.77
Initial Diameter (in.)	2.409	2.406	2.409	2.41	6.12
Final Diameter (in.)	2.458	2.463	2.456	2.46	6.25
Initial Area				4.55	29.38
Initial Volume (ft^3)	0.00791	Final Volume (ft^3)		0.00841	
Initial Volume (cm^3)	223.9	Final Volume (cm^3)		238.1	

	Weight (grams)	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Void Ratio	Saturation (%)
Initial	459.46	**11.7**	128.1	**114.7**	0.453	69.0
Final	493.07	19.9	129.3	107.8	0.545	97.3
Dry	411.37					

Beginning Date & Time	End Date & Time	Elapsed Time (sec.)	Burette Out (ml)	Burette In (ml)	Pressure Head (cm)	Gradient	H1 (cm)	H2 (cm)	Outflow (ml)	Inflow (ml)	Outflow to Inflow Ratio	Permeability (cm/s)
1/6/17 9:04 AM			23.55	1.55	-	3.3	25.2					
	1/6/17 9:23 AM	1,140	22.95	2.15	-	3.1		23.9	0.60	0.60	1.00	5.56E-06
1/6/17 9:23 AM		1,140	22.95	2.15	-	3.1	23.9					
	1/6/17 9:46 AM	1,380	22.25	2.90	-	2.9		22.2	0.70	0.75	0.93	5.92E-06
1/6/17 9:46 AM		2,520	22.25	2.90	-	2.9	22.2					
	1/6/17 12:23 PM	9,420	18.90	6.40	-	1.9		14.3	3.35	3.50	0.96	5.25E-06
1/7/17 11:08 AM		11,940	24.10	1.05	-	3.5	26.4					
	1/7/17 11:52 AM	2,640	22.70	2.45	-	3.0		23.2	1.40	1.40	1.00	5.55E-06
1/7/17 11:52 AM		14,580	22.70	2.45	-	3.0	23.2					
	1/7/17 12:34 PM	2,520	21.52	3.60	-	2.7		20.6	1.18	1.15	1.03	5.48E-06
1/7/17 12:34 PM		17,100	21.52	3.60	-	2.7	20.6					
	1/7/17 1:21 PM	2,820	20.40	4.72	-	2.4		18.0	1.12	1.12	1.00	5.35E-06
1/7/17 1:21 PM		19,920	20.40	4.72	-	2.4	18.0					
	1/7/17 1:58 PM	2,220	19.62	5.50	-	2.1		16.2	0.78	0.78	1.00	5.34E-06
		22,140										

Average Permeability (cm/s): **5.36E-06**

Permeability @ 20^{O}C **5.09E-06**

Notes: spec remolded to 90% of ASTM D1557 at +2% optimum moisture

Average temperature during test ^{0}C = 22.2

Tap water utlized as permeant

Tested By: M. Repking

Calculated By: MR

Reviewed By: JZ

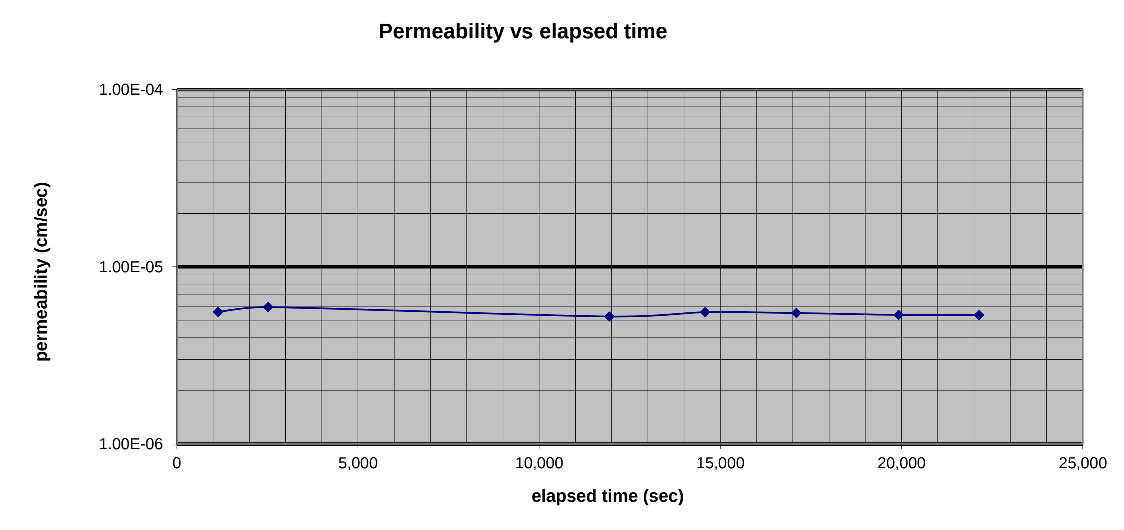
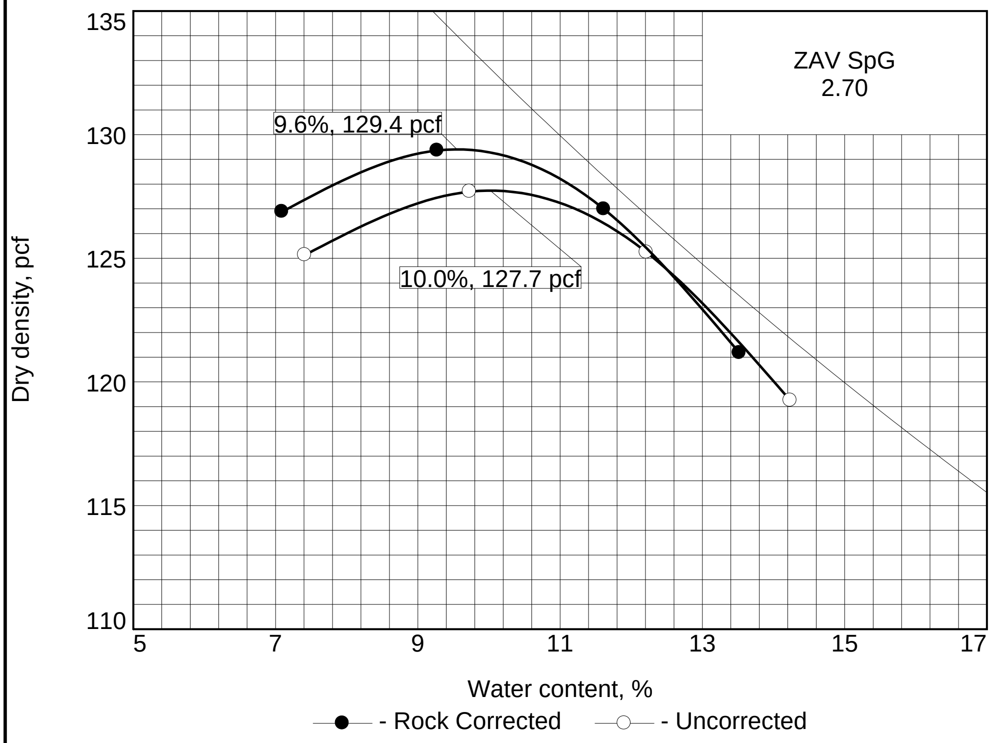


Figure B7

COMPACTION TEST REPORT



Curve No.
1

Test Specification:
ASTM 1557 Method B 2016
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Preparation Method
Hammer Wt. 10.00
Hammer Drop 18
Number of Layers 5
Blows per Layer 25
Mold Size 0.03341 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**
NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. 5.8 **%<No.200**
USCS **AASHTO**
Date Sampled
Date Tested 1/3/2017
Tested By VG

TESTING DATA

	1	2	3	4	5	6
WM + WS	4108.1	4042.7	4101.7	4015.2		
WM	1978.3	1978.3	1978.3	1978.3		
WW + T #1	2586.2	2353.3	2411.0	2236.6		
WD + T #1	2354.5	2096.3	2223.0	2097.5		
TARE #1	457.6	291.0	290.7	221.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	11.6	13.5	9.3	7.1		
DRY DENSITY	127.0	121.2	129.4	126.9		

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 129.4 pcf	127.7 pcf
Optimum moisture = 9.6 %	10.0 %

Material Description
Reddish Brown Gravelly Clay

Remarks:

Project No. S1264-05-01 **Client:** Cemex
Project: Cemex Eliot

○ **Sample Number:** TP4-A-F

GEOCON CONSULTANTS, INC.

Checked by: BP
Title: Staff Engineer

Figure B8

Geo-Logic
ASSOCIATES

Geo-**L**ogic **A**ssociates
143E Spring Hill Drive
Grass Valley, CA 95945
USA
T+1 530 272 2448
F+1 530 272 8533
www.geo-logic.com

DATE: January 26, 2017

TO: John Pfeiffer
GEOCON Consultants, Inc.
3160 Gold Valley Drive, Suite 800
Rancho Cordova, CA 95742

e-mail: pfeiffer@geoconinc.com

JOB NO: AU17.1011.00
LAB LOG: 4148.0

RE: **Lab Report: Cemex Eliot / Project No. S1264-05-01**

Enclosed are results for: Samples Received - January 16, 2017

Code	Item	Quantity
2600	Moisture Density Curve, Mod. 4" - ASTM D-1557	1
1650	Direct Shear CD / pt., 2.5 - 4" - ASTM D-3080	3
1750	Large Box, 12" x 12" add / pt -	3
2250	Hydraulic Conductivity-Flex-wall, 2-4" - ASTM D-5084	1
3350	Remold fee, 2-3" dia -	1
4650	Bulk Sample Preparation & Processing, per hr. -	1

Thank you for consulting Geo-Logic Associates for your material testing requirements. We look forward to working with you again. If you have any questions or require any additional information, please call us at 1-530-272-2448. This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job. This report shall not be reproduced except in full without written approval of Geo-Logic Associates.

Sincerely,

Prepared By: Kindra Hillman
Laboratory Manager

Reviewed By: Kenneth R. Criley
Technical Director

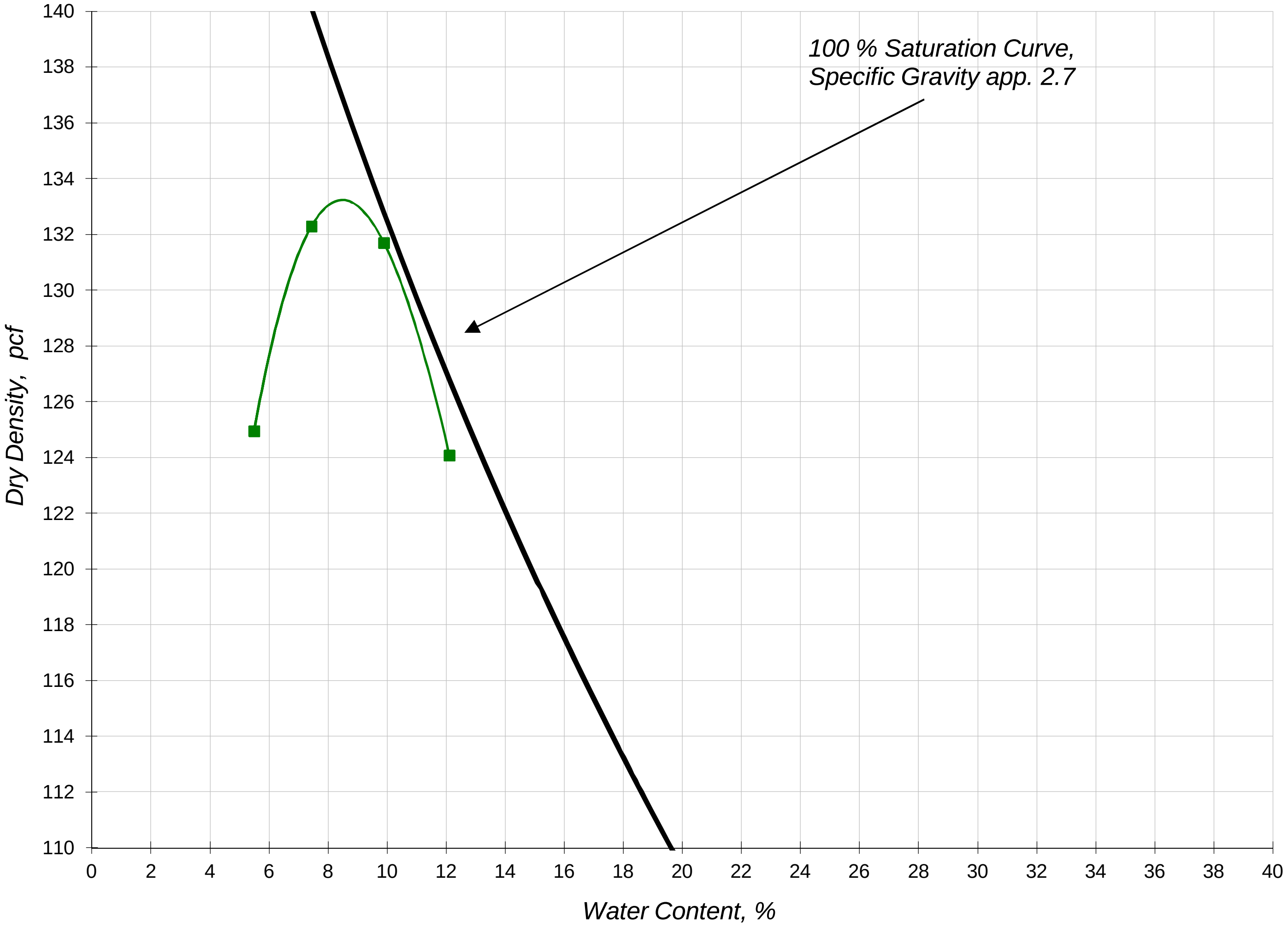
MOISTURE / DENSITY RELATIONSHIPS

Geo-Logic
ASSOCIATES

Test Report

ASTM D - 1557

Client: GEOCON Consultants, Inc.
Project No.: AU17.1011.00
Lab Log No.: **4148A**
Project Name: Cemex Eliot/ Project No. S1264-05-01
Report Date: January 19, 2017



Symbol	**Lab No.**	**Sample Identification**	**Description**	**Maximum Dry Density**		**Optimum Water Content**
				pcf	**kg / m^3**	**%**
🟩	4148A	TP 7/8 (3-12)	Brown Sandy Silty, Clay with Gravel	133.2	2134	8.5

Corrected Values For Oversized Particles, per ASTM D-4718

🟩 4148A with 22.9 Percent +#4 Gravel, the maximum Dry Density = 139.9 6.5

Note: The test was conducted as method A with 0 percent retained on the no. 4 sieve (minus #4)

Print Date: 1/26/2017
Entered By: JL
Reviewed By: KH
LSN: **4148A**

Geo-Logic
ASSOCIATES

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear D-3080 Modified

Report Date: January 24, 2017

Client / Project Name: GEOCON CONSULTANTS, INC. / CEMEX ELIOT / PROJECT NO. S1264-05-01

Project No: AU17.1011.00

Superstrate: ⇦ Spacers

Material 1: ⇦ TP 7/8 (3-12) Sandy Silty Clay w/ Gravel *LSN:* 4148A Remolded

Material 2: ⇨ TP 7/8 (3-12) Sandy Silty Clay w/ Gravel *LSN:* 4148A Remolded

Substrate: ⇨ Spacers

PEAK STRENGTH

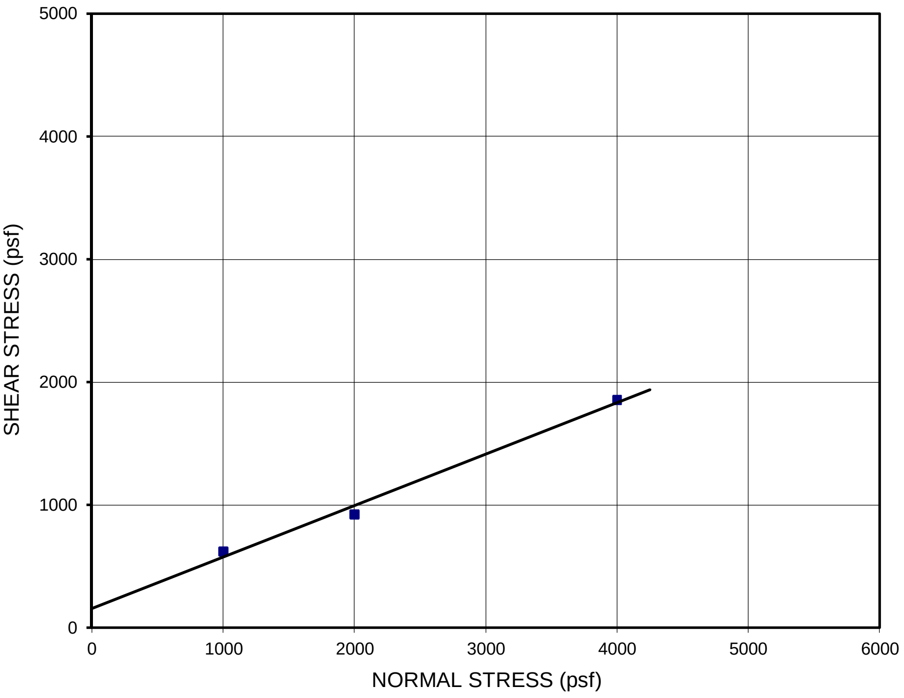
Test Point	*Normal Stress*		*Shear Stress*	*Secant Friction*
	psi	*psf*	*psf*	*Angle*
1.	6.9	1000	620	32
2.	13.9	2000	930	25
3.	27.8	4000	1860	25

Adhesion: 160 psf

Friction Angle: 23 degrees

Coefficient of Friction: 0.42

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 3.0 in. displacement)

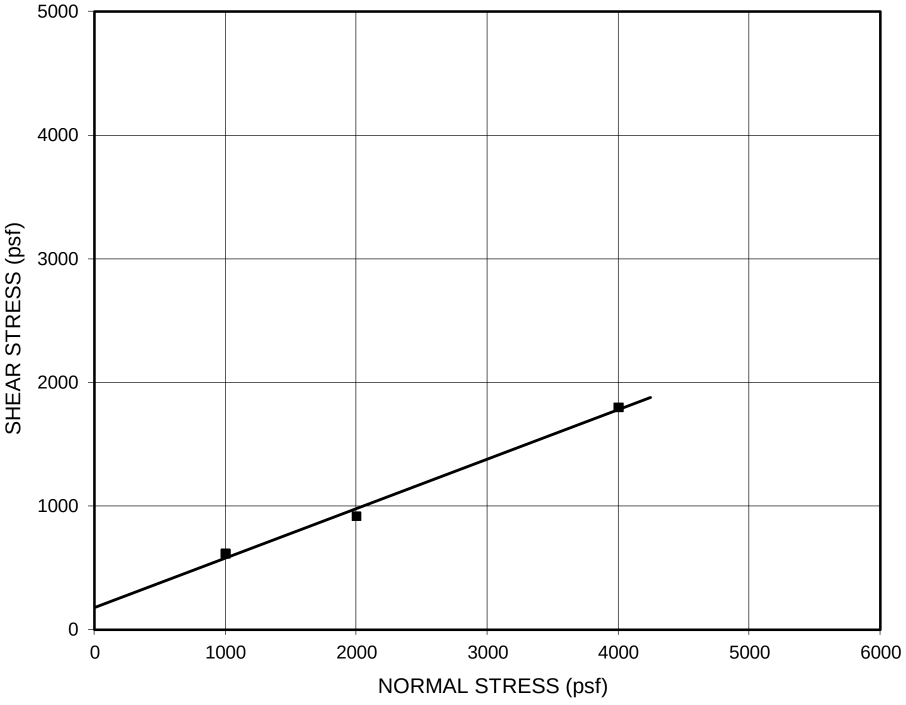
Test Point	*Normal Stress*		*Shear Stress*	*Secant Friction*
	psi	*psf*	*psf*	*Angle*
1.	6.9	1000	620	32
2.	13.9	2000	920	25
3.	27.8	4000	1800	24

Adhesion: 180 psf

Friction Angle: 22 degrees

Coefficient of Friction: 0.4

NOTE: GRAPH NOT TO SCALE



This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L:Labexcel \Projects \ Client \ Name \ AU17.1011.00 \ 4148A-LSDS-rp

Print Date:	*Entered By:*	*Reviewed By:*	*Lab Log:*
01/24/17	*KH*	*krc*	**4148A**

DCN: LSDS-rp (rev., 11/29/12)

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear D-3080 Modified

Report Date: January 24, 2017

Client / Project Name: GEOCON CONSULTANTS, INC. / CEMEX ELIOT / PROJECT NO. S1264-05-01

Project No: AU17.1011.00

Superstrate: ⇦ Spacers

Material 1: ⇦ TP 7/8 (3-12) Sandy Silty Clay w/ Gravel *LSN:* 4148A Remolded

Material 2: ⇨ TP 7/8 (3-12) Sandy Silty Clay w/ Gravel *LSN:* 4148A Remolded

Substrate: ⇨ Spacers

DISPLACEMENT vs. SHEAR STRESS

Test Point	*Normal Stress*	
	psi	*psf*
1.	6.9	1000
2.	13.9	2000
3.	27.8	4000

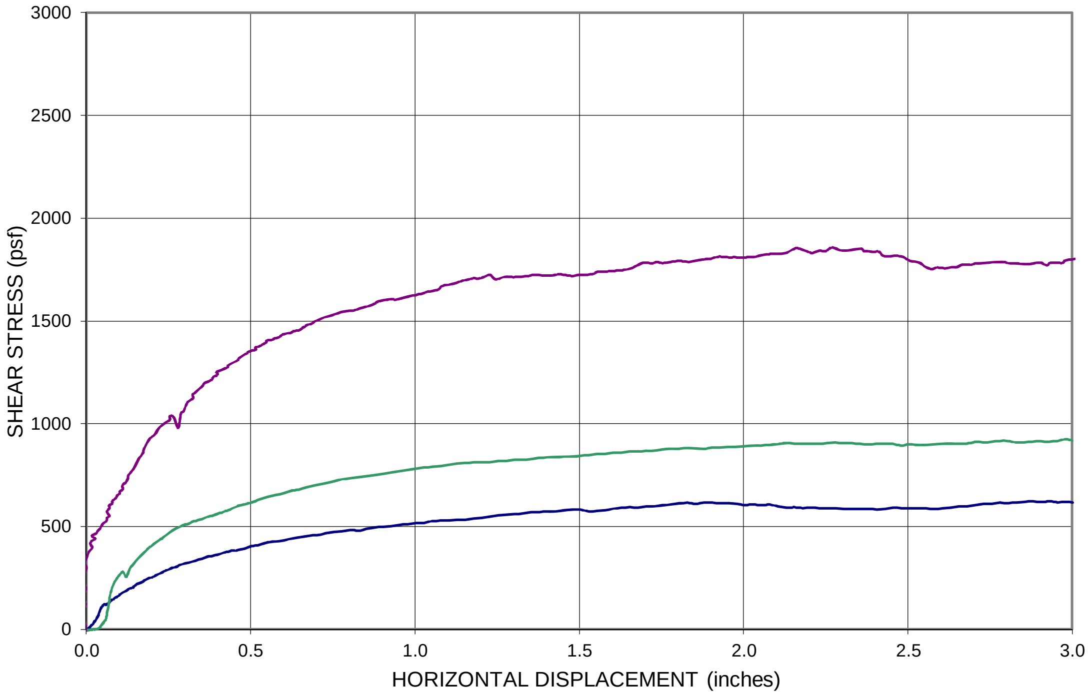
MOISTURE DATA:

(Soil)

Initial Water Content:
6.5%

Initial Dry Density:
125.9 pcf

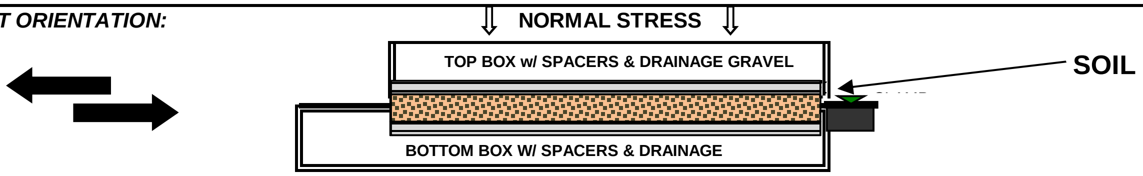
Final Water Content:(%)
1) 11.3 2) 11.8 3) 11.5



STANDARD CONDITIONS: ***SHEAR DISPLACEMENT RATE: 0.04 in/min***

1. The "gap" between shear boxes was set at 0.5 inches.
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-3080 - Modified using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. The test method was modified to measure the internal shear characteristics of the soill.
2. The soil was remolded into both the upper and lower box to the specified dry density and water content.
3. Each test point was consolidated under specified normal stress for approximately 24 hours, then sheared.
4. The test was performed in a "wet" or "flooded" condition.
5. Shearing occurred internally within the soil.
6. The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line.
7. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L:Labexcel \Projects \ Client \ Name \ AU17.1011.00 \ 4148A-LSDS-rp	*Print Date:*	*Entered By:*	*Reviewed By:*	*LLN:*
DCN: LSDS-rp (rev., 11/29/12)	*01/24/17*	*KH*	*krc*	**4148A**

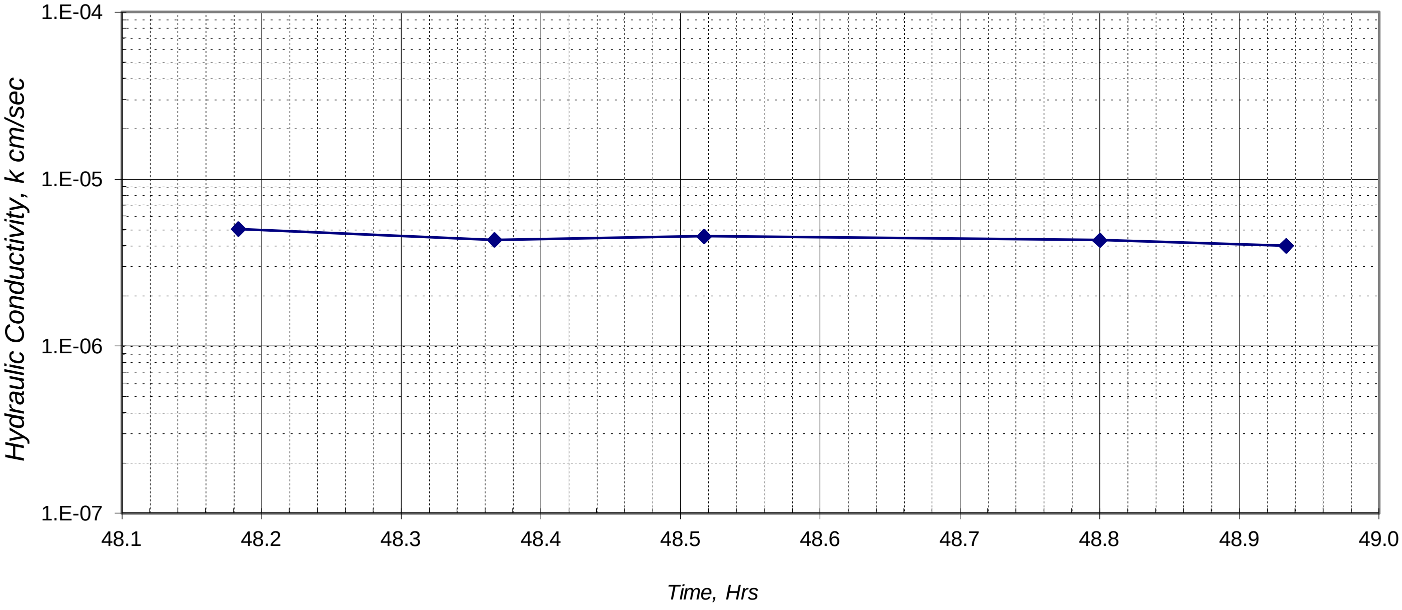
Geo-Logic ASSOCIATES

HYDRAULIC CONDUCTIVITY
REPORT

Client / Project Name:	Project No:	Lab Sample Number:
GEOCON Consultants, Inc. / Cemex Eliot / Project No. S1264-05-01	AU17.1011.00	**4148A**

Sample ID:	Description:	Report Date:
TP7/8 (3-12)	**Brown Sandy Silty Clay w/ Gravel**	**January 26, 2017**

Hydraulic Conductivity vs Time



SPECIMEN DATA

SAMPLE ID:	**TP7/8 (3-12)**	
DESCRIPTION:	Brown Sandy Silty Clay w/ Gravel	
	INITIAL	FINAL
HEIGHT, in.	3.1	3.0
DIAMETER, in.	2.9	2.9
WATER CONTENT, %	6.0	15.0
DRY DENSITY, pcf	123	118
SATURATION, %	44	95
(Specific Gravity assumed as 2.7)		
MAXIMUM DRY DENSITY, pcf	139.9	
OPTIMUM WATER CONTENT, %	6.5	
SPECIFIED COMPACTION, %	90.0	
ACHIEVED COMPACTION, %	88.2	

COMMENTS:

Tap water used as permeant.

TEST DATA

ASTM D-5084, Method C

EFFECTIVE STRESS:	2 psi
GRADIENT RANGE:	4 - 6
IN / OUT RATIO:	1.00
"B" PARAMETER:	0.97

TRIAL nos.	TIME hrs.	HYDRAULIC CONDUCTIVITY, k^{20} cm / s
1	48.2	5.0E-06
2	48.4	4.3E-06
3	48.5	4.5E-06
4	48.8	4.3E-06
5	48.9	4.0E-06

AVERAGE LAST 4 : **4.3E-06**

corrected to 20° C

Print Date:	Entered By:	Reviewed By:	LSN:
01/26/17	KH	krc	**4148A**

APPENDIX B

MATERIAL PROPERTIES

BH2013-01

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
01-2 tube 1	58.4	29	29.4	1.33	119.2	90.3	32.1
01-2 tube 2	68.3	28.9	39.4	4.5+	119	90	32.2

BH2013-03

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
03-1 tube 3				2.81	128		

BH2013-04

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
04-2 tube 1				1.83			
04-2 tube 2	28.8	16.8	12	3.11	118.3	106	12

BH2013-05

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
05-2 tube 1				3.19			

BH2013-06

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
06-1 tube 2				3.36	116		

BH2013-07

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
07-2 tube 2				3.13	119		

BH2013-09

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
09-1 tube 1				2.81	128		
09-2 tube 1				2.67			

BH2013-10A

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
10A-1 tube 2				4.29	122		
10A-2 tube 3				4.38	114		
10A-3 tube 1				2.75	101		

BH2013-10B

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
10B-2 tube 2	34.1	19.3	14.8	2.92	129.6	106.8	21.4

BH2013-11

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
11-1 tube 1				4.5	127		

BH2013-12

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
12-1 tube 1				1.86			
12-2 tube 2	39.3	20	19.3	2.47	124.3	98.6	26.1
12-4 tube 1				2.36	123		

BH2013-13

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
13-1 tube 1				3.21			
13-2 tube 3	46.7	21.7	25	2.08	115	98.6	16.6
13-3 tube 1				1	117		
13-4 tube 3				3.83	120		

BH2013-16

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
16-1 tube 1				4.19	121		

BH2013-17

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
17-1 tube 2				1.83	119		
17-3 tube 1				2.97	98		
17-4 tube 3	47.1	21.9	25.2	3.28	128	105	23

BH2013-18

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
18-1 tube 1				3.32	90		

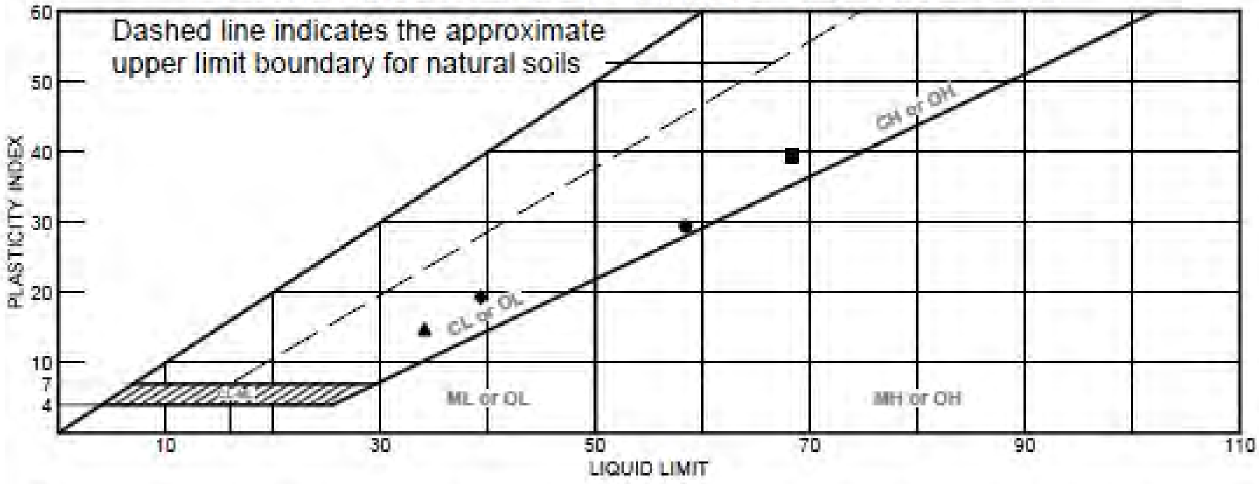
BH2013-19

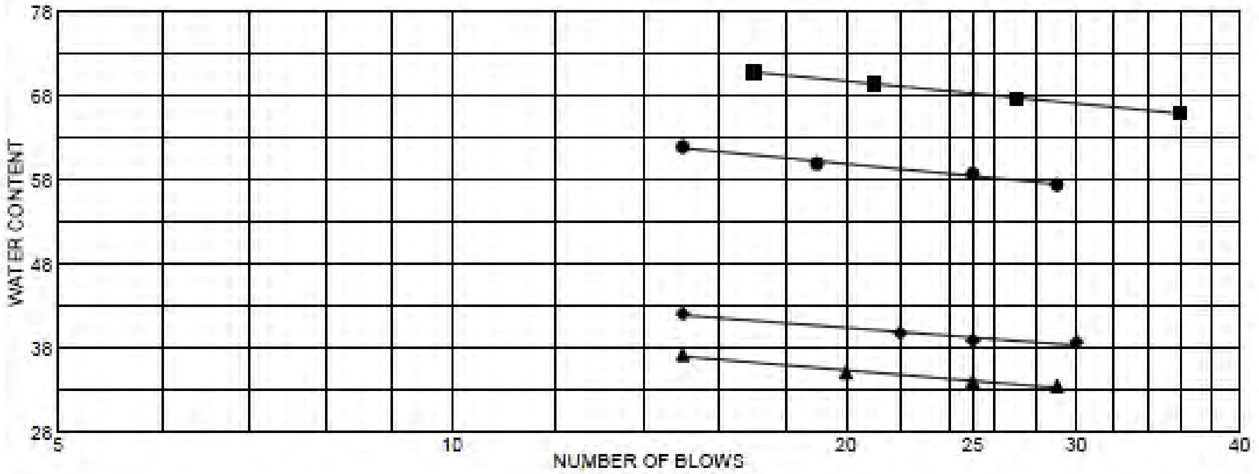
Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
19-1 tube 2				3.39	117		

BH2013-21

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
21-1 tube 1				3.34	102		
21-2 tube 1				3.21	109		

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Bluish Gray Fat CLAY	58.4	29.0	29.4			
■	Dark Bluish Gray Fat CLAY	68.3	28.9	39.4			
▲	Dark Yellowish Brown Lean CLAY w/ Sand	34.1	19.3	14.8			
◆	Dark Yellowish Brown CLAY w/ Sand	39.3	20.0	19.3			

Project No. 808-001 **Client:** KANE GeoTech

Project: Eliot Quarry Geotechnical Investigation - GT13-16

● **Source**: BH2013-01 **Sample No.**: 01-2 tube 1 **Elev./Depth:** 270'
■ **Source**: BH2013-01 **Sample No.**: 01-2 tube 2 **Elev./Depth:** 270'
▲ **Source**: BH2013-10B **Sample No.**: 10B-2 tube 2 **Elev./Depth:** 9'
◆ **Source**: BH2013-12 **Sample No.**: 12-2 tube 2 **Elev./Depth:** 30'

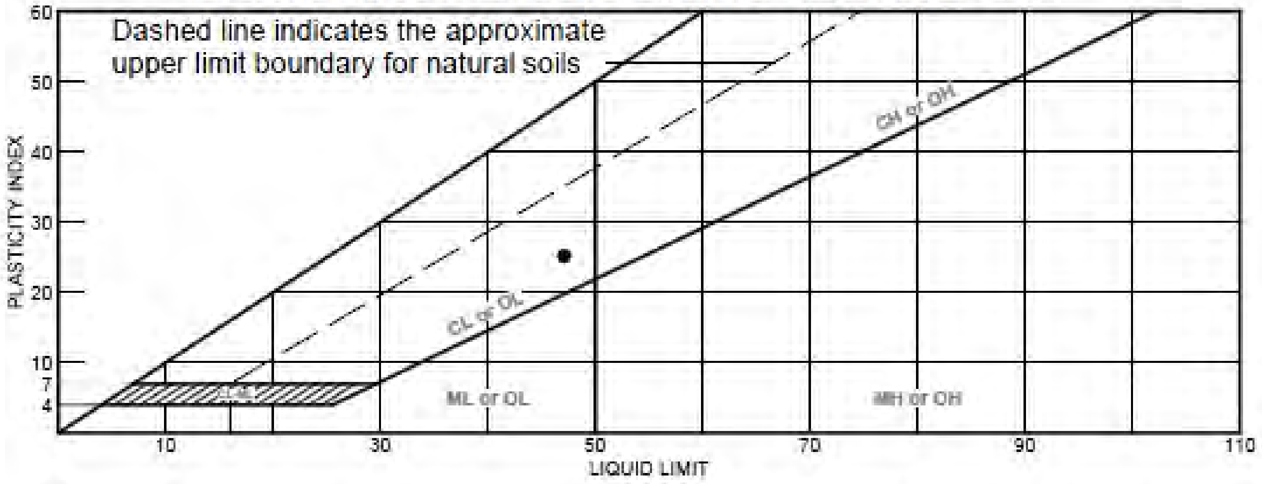
Remarks:
- ● Sample was prepared using the wet prep method.
- ■ Sample was prepared suing the wet prep method.
- ▲ Sample was prepared using the wet prep method.
- ◆ Sample was prepared using the wet prep method.

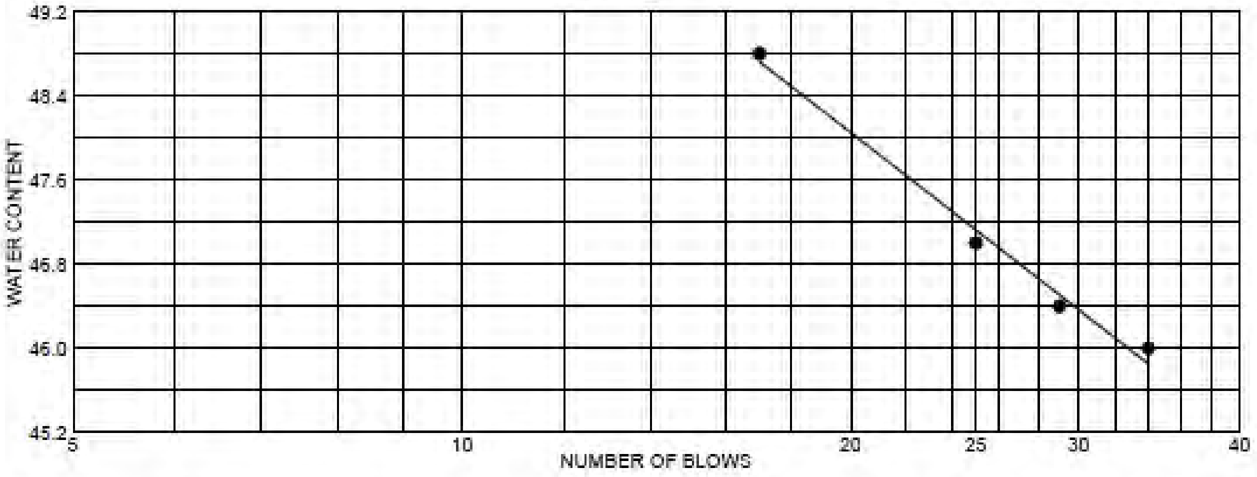
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very Dark Bluish Gray CLAY	47.1	21.9	25.2			

Project No. 808-001 **Client:** KANE GeoTech

Project: Eliot Quarry Geotechnical Investigation - GT13-16

● **Source:** BH2013-17 **Sample No.:** 17-4 tube 3 **Elev./Depth:** 162'

Remarks:

● Sample was prepared using the wet prep method.

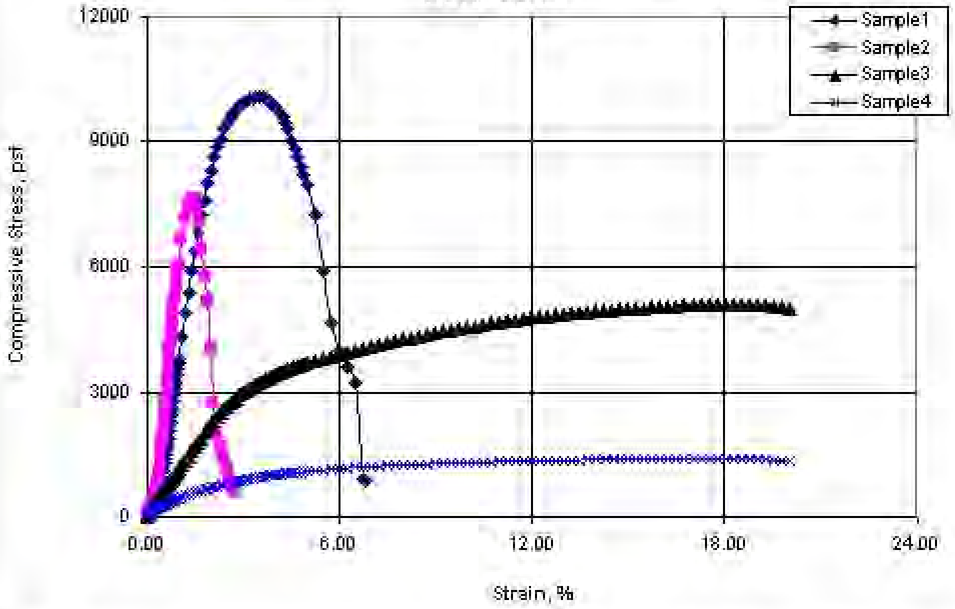
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

Unconfined Compressive Strength

ASTM D2166



Sample No.:	1	2	3	4
Unconfined Compressive Strength, psf	10076	7629	5111	1408
Unconfined Compressive Strength, psi	70.0	53.0	35.5	9.8
Undrained Shear Strength, psf	5038	3815	2556	704
Failure Strain, %	3.4	1.4	18.0	16.5
Strain Rate, % per minute	1.0	1.0	1.0	1.0
Strain Rate, inches/minute	0.04	0.04	0.04	0.04
Moisture Content, %	32.1	32.2	21.4	26.1
Dry Density, pcf	90.3	90.0	106.8	98.6
Saturation, %	99.8	99.6	99.7	99.1
Void Ratio	0.867	0.874	0.579	0.710
Specimen Diameter, inches	1.930	1.930	1.917	1.930
Specimen Height, inches	3.99	3.99	3.99	4.00
Height to Diameter Ratio	2.1	2.1	2.1	2.1
Assumed Specific Gravity	2.70	2.70	2.70	2.70

	Sample Location			
	Boring	**Sample**	**Depth, ft.**	**Soil Description**
1	BH2013-01	01-2 tube 1	270	Dark Bluish Gray Fat CLAY
2	BH2013-01	01-2 tube 2	270	Very Dark Bluish Gray Fat CLAY
3	BH2013-10B	10B-2 tube 2	9	Dark Yellowish Brown Lean CLAY w/ Sand
4	BH2013-12	12-2 tube 2	30	Dark Yellowish Brown Lean CLAY w/ Sand

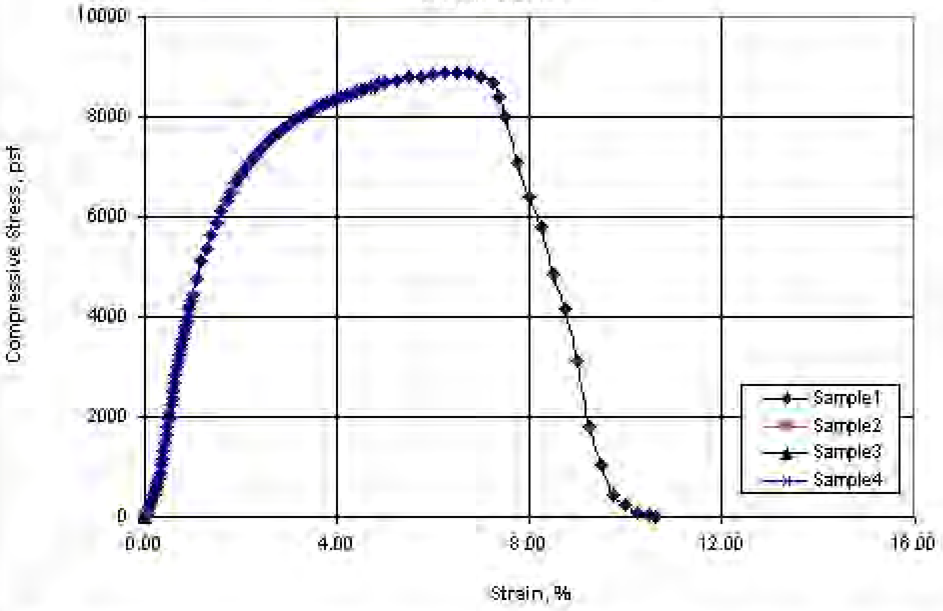
Job No.: 808-001a
Type of Sample Undisturbed
Client: KANE GeoTech
Project: Eliot Quarry Geotechnical Investigation - GT13-16
Date: 4/30/2013 **By:** MD/RU

Remarks:

COOPER

Unconfined Compressive Strength

ASTM D2166



Sample No.:	1	2	3	4	
Unconfined Compressive Strength, psf	8889				
Unconfined Compressive Strength, psi	61.7				
Undrained Shear Strength, psf	4445				
Failure Strain, %	6.5				
Strain Rate, % per minute	1.0				
Strain Rate, inches/minute	0.04				
Moisture Content, %	22.6				
Dry Density, pcf	104.6				
Saturation, %	99.9				
Void Ratio	0.612				
Specimen Diameter, inches	1.767				
Specimen Height, inches	4.00				
Height to Diameter Ratio	2.3				
Assumed Specific Gravity	2.70				

	Sample Location			
	Boring	**Sample**	**Depth, ft.**	**Soil Description**
1	BH2013-17	17-4 tube 3	162	Very Dark Bluish Gray Lean CLAY
2				
3				
4				

Job No.: 808-001b

Client: KANE GeoTech

Project: Eliot Quarry Geotechnical Investigation - GT13-16

Date: 4/30/2013 **By:** MD/RU

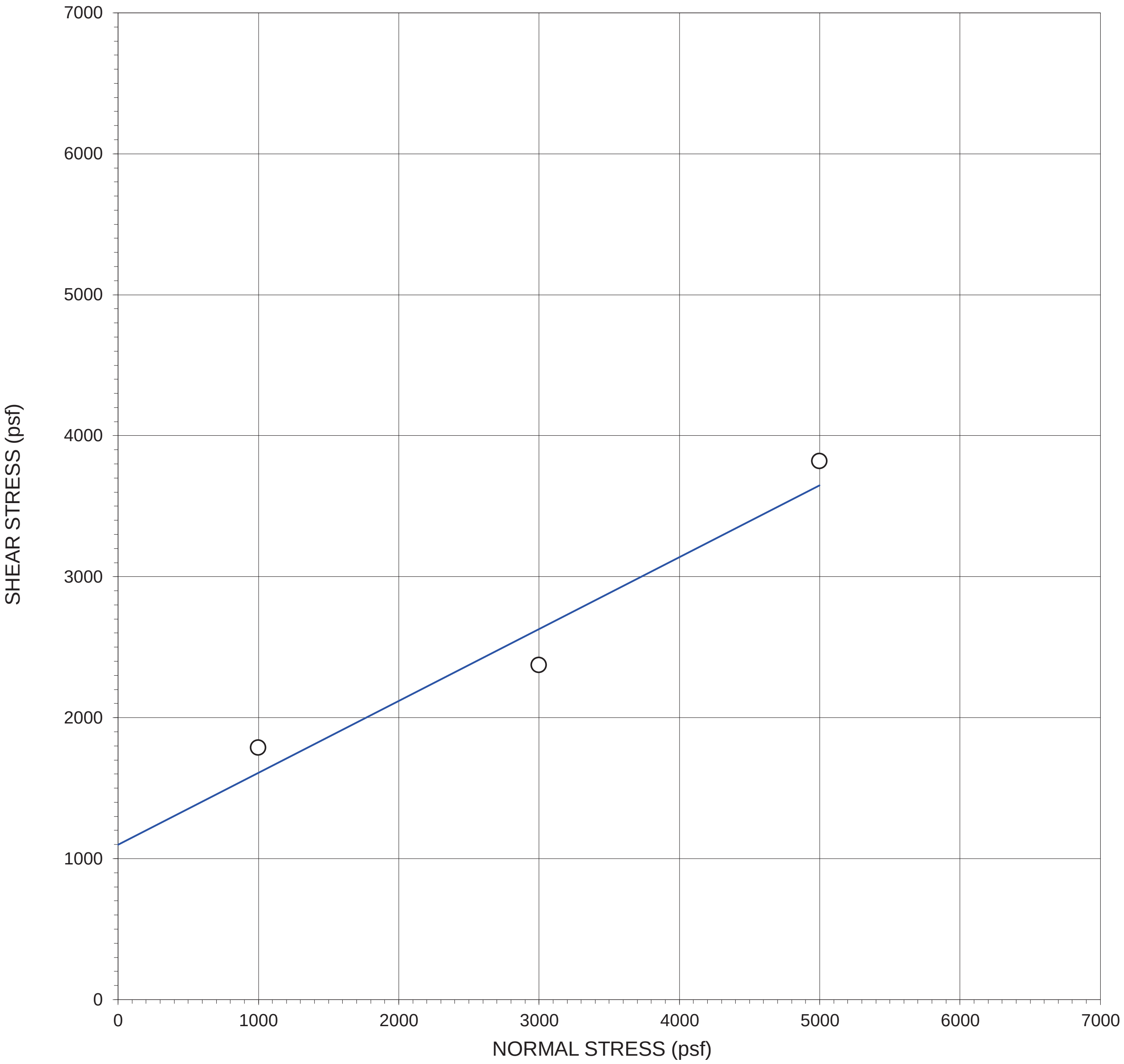
Type of Sample Undisturbed

Remarks:

JOB NUMBER: 3415.700

DATE:6-5-12

BY: CC



LOCATION: B-1 at 32 feet

SAMPLE: CLAYEY SAND with GRAVEL, brown

TEST TYPE: Consolidated Drained

RATE OF SHEAR (in/min): 0.00099

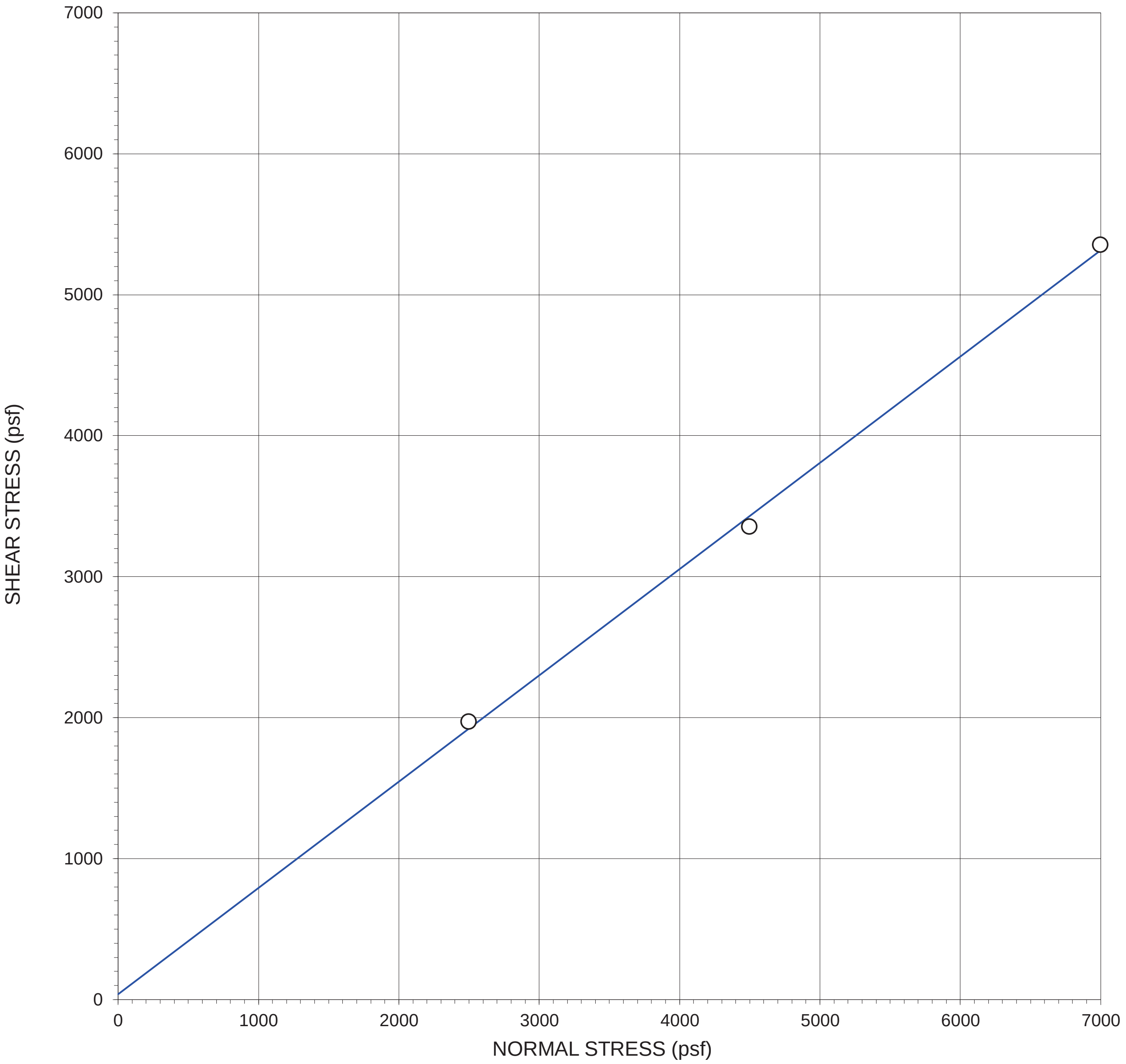
FRICTION ANGLE: 27

COHESION (psf): 1,100

SPECIMEN	A	B	C
DRY DENSITY (psf)	127.1	123.7	123.4
INITIAL WATER CONTENT (%)	10.1	10.1	10.1
FINAL WATER CONTENT (%)	11	13.7	11
NORMAL STRESS (psf)	1000	3000	5000
MAXIMUM SHEAR (psf)	1785	2373	3819

DIRECT SHEAR TEST

JOB NUMBER: 3415.700 DATE:6-5-12 BY: CC



LOCATION: B-1 at 37 feet

SAMPLE: CLAYEY SAND with GRAVEL, red-brown

TEST TYPE: Consolidated Drained

RATE OF SHEAR (in/min): 0.00099

FRICTION ANGLE: 37

COHESION (psf): 40

SPECIMEN	A	B	C
DRY DENSITY (psf)	125.8	113.8	122.3
INITIAL WATER CONTENT (%)	9.2	9.2	9.2
FINAL WATER CONTENT (%)	11.4	11	10.4
NORMAL STRESS (psf)	2500	4500	7000
MAXIMUM SHEAR (psf)	1969	3353	5354

DIRECT SHEAR TEST

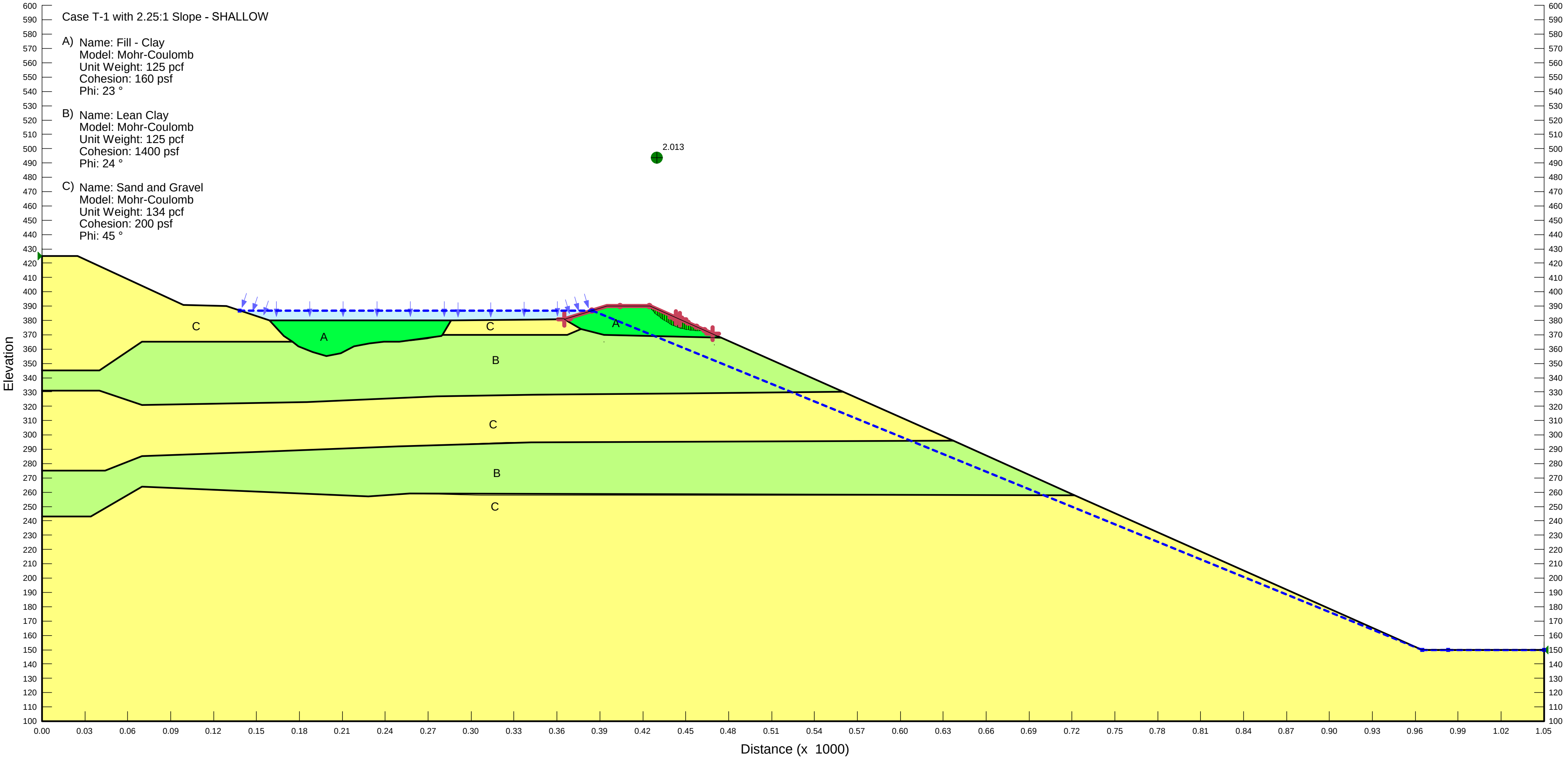
APPENDIX C

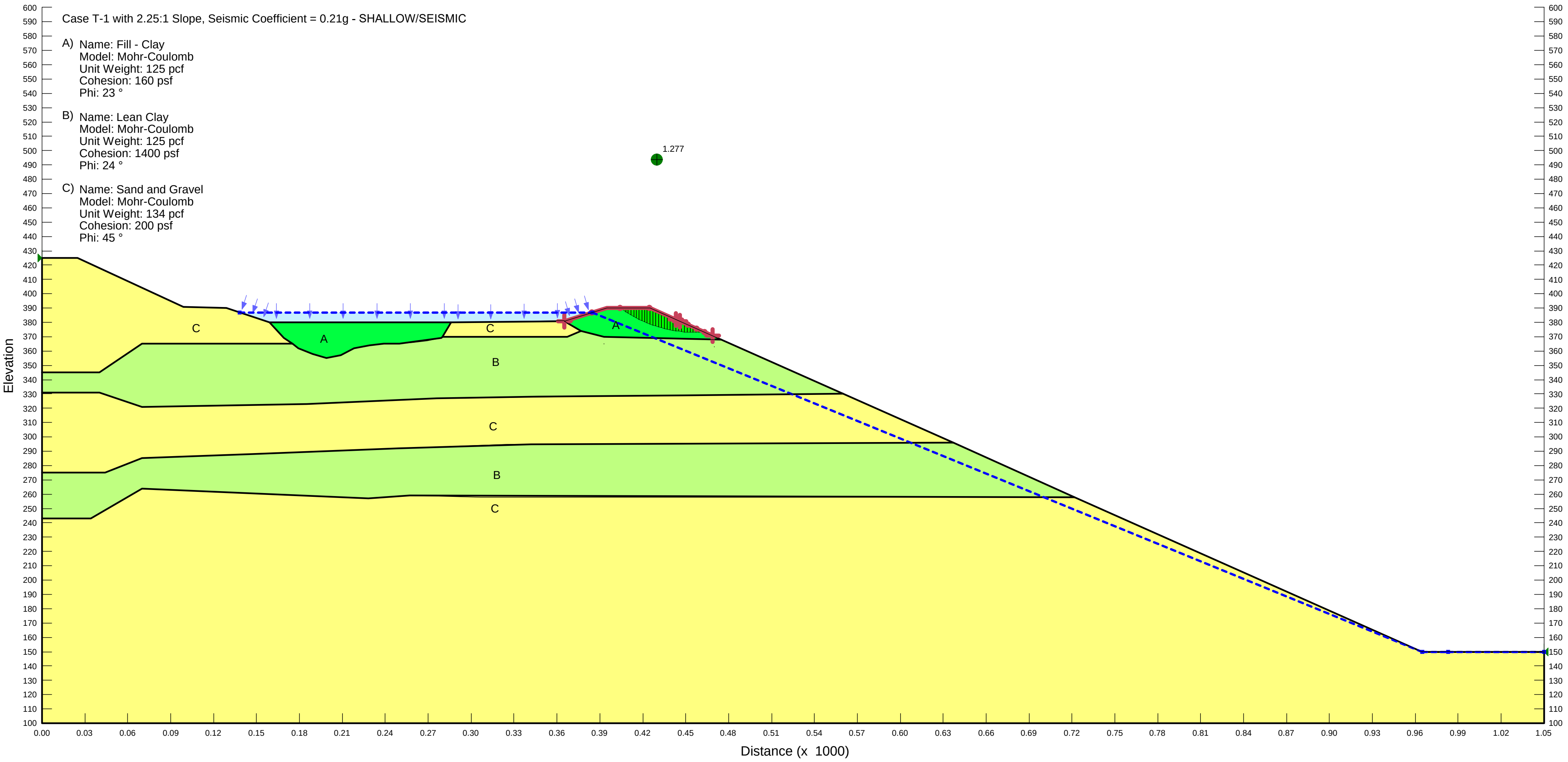
APPENDIX C

SLOPE STABILITY ANALYSES

We used the computer program SLOPE/W Version 7.22 distributed by Geo-Slope International to perform slope stability analyses. SLOPE/W uses conventional slope stability equations and a two-dimensional limit-equilibrium method to calculate the factor of safety against failure. For our analyses, the Bishop's and/or Spencer's Method with a circular failure mechanism were used.

The computer program searches for the critical failure surface based on user-provided input parameters. For a circular failure search, a linear search of entry and exit locations is specified and the computer searches for the critical failure slip surface. Graphical representations of the slope stability analyses, potential critical failure surfaces, and parameters used for each analysis are presented on the following pages.


Case T-1 with 2.25:1 Slope - SHALLOW
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
2.013
A
B
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
Distance (x 1000)
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

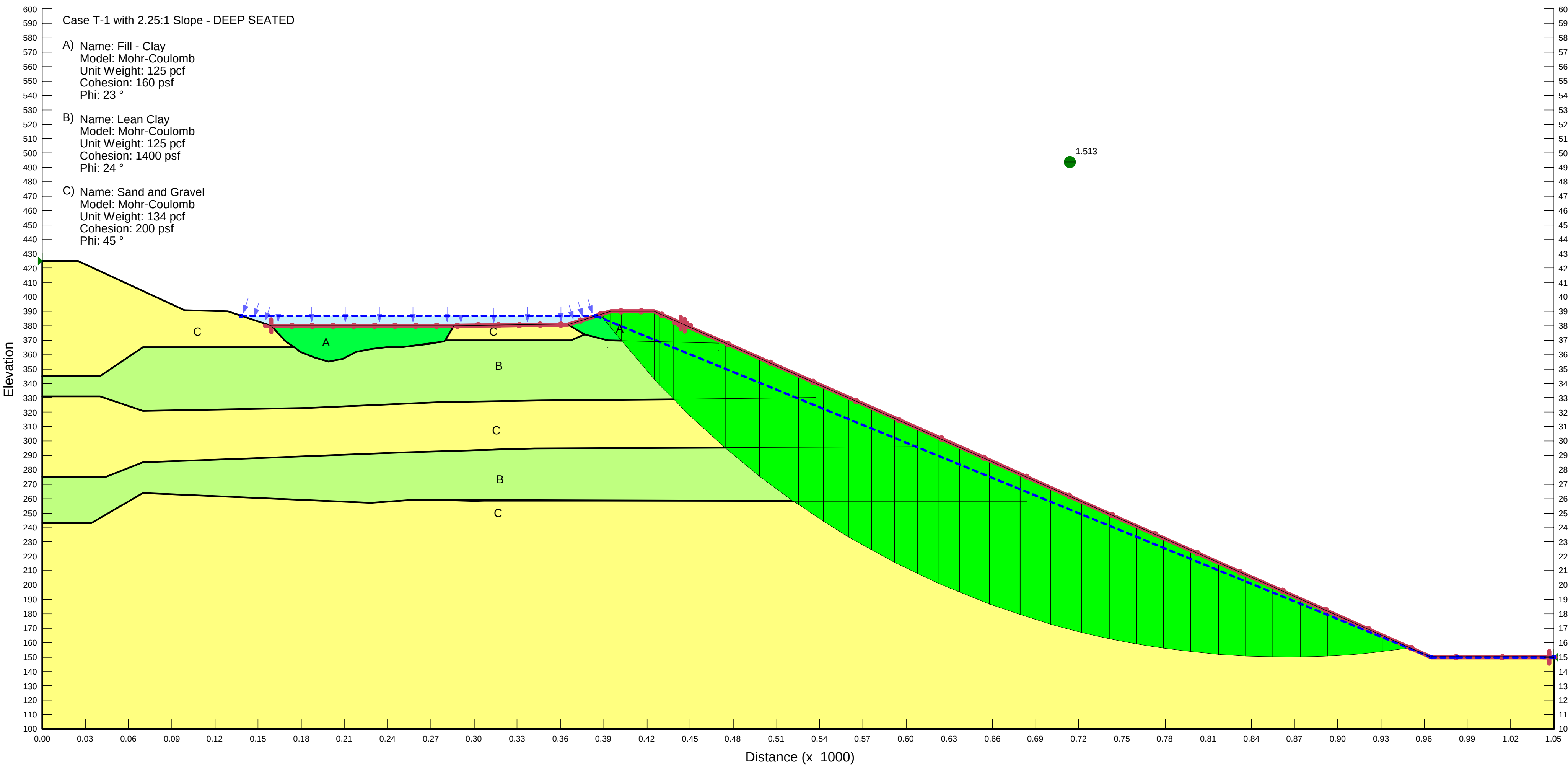


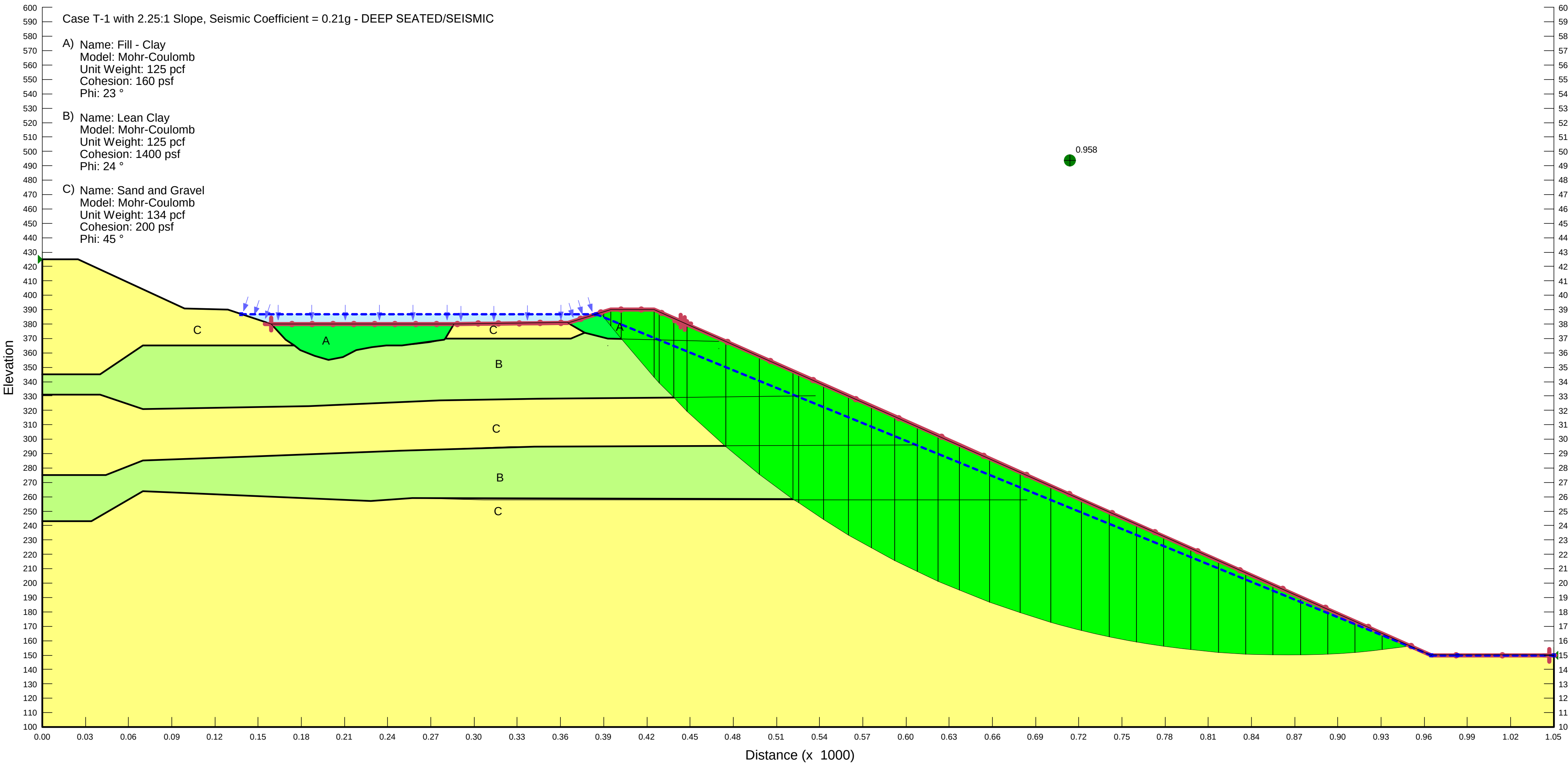
Case T-1 with 2.25:1 Slope, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC

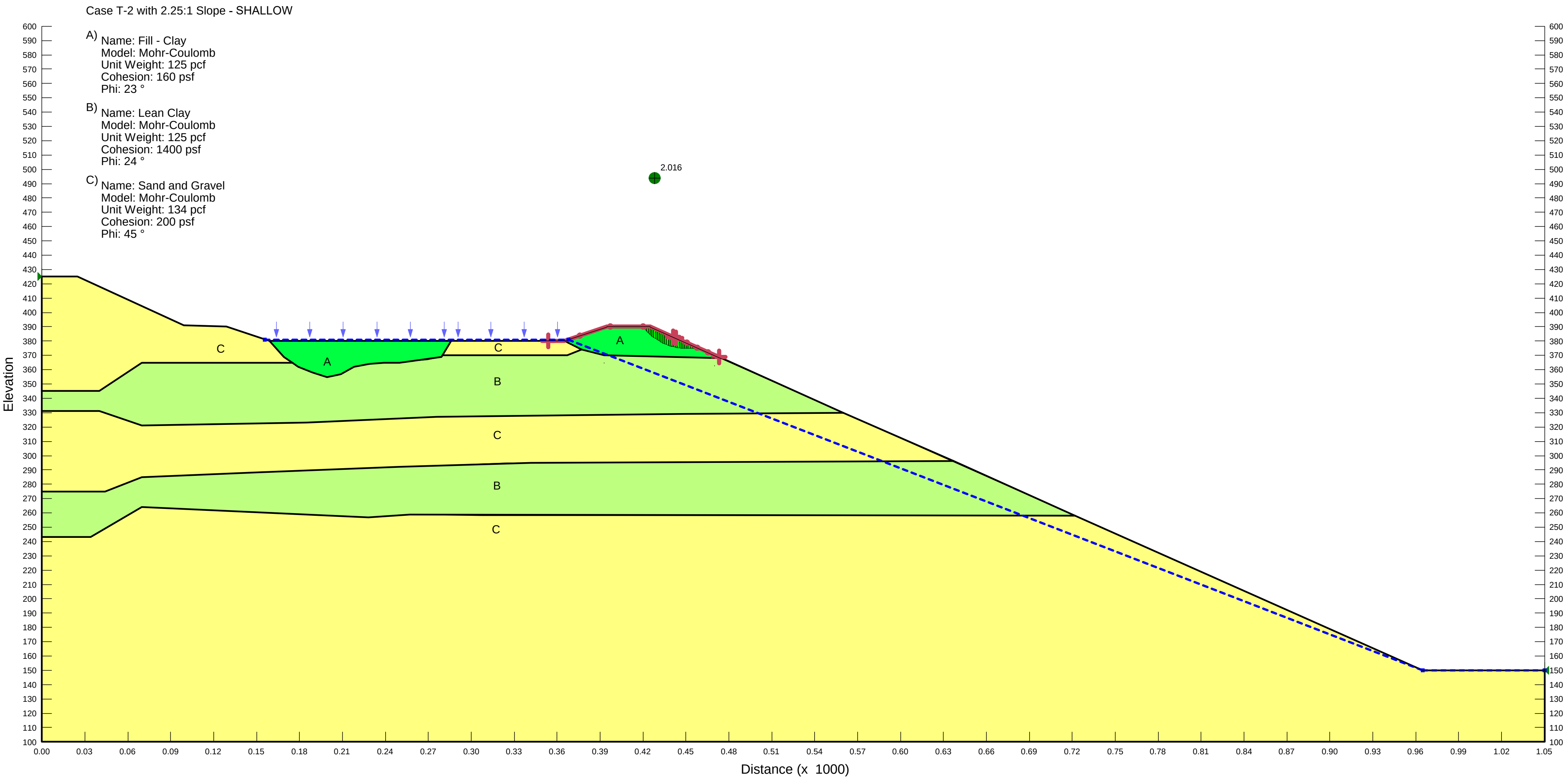
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °


Case T-1 with 2.25:1 Slope - DEEP SEATED
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.513
A
A
B
B
C
C
C
C
Elevation
600 590 580 570 560 550 540 530 520 510 500 490 480 470 460 450 440 430 420 410 400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100
Distance (x 1000)
0.00 0.03 0.06 0.09 0.12 0.15 0.18 0.21 0.24 0.27 0.30 0.33 0.36 0.39 0.42 0.45 0.48 0.51 0.54 0.57 0.60 0.63 0.66 0.69 0.72 0.75 0.78 0.81 0.84 0.87 0.90 0.93 0.96 0.99 1.02 1.05


Case T-1 with 2.25:1 Slope, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
0.958
A
B
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)



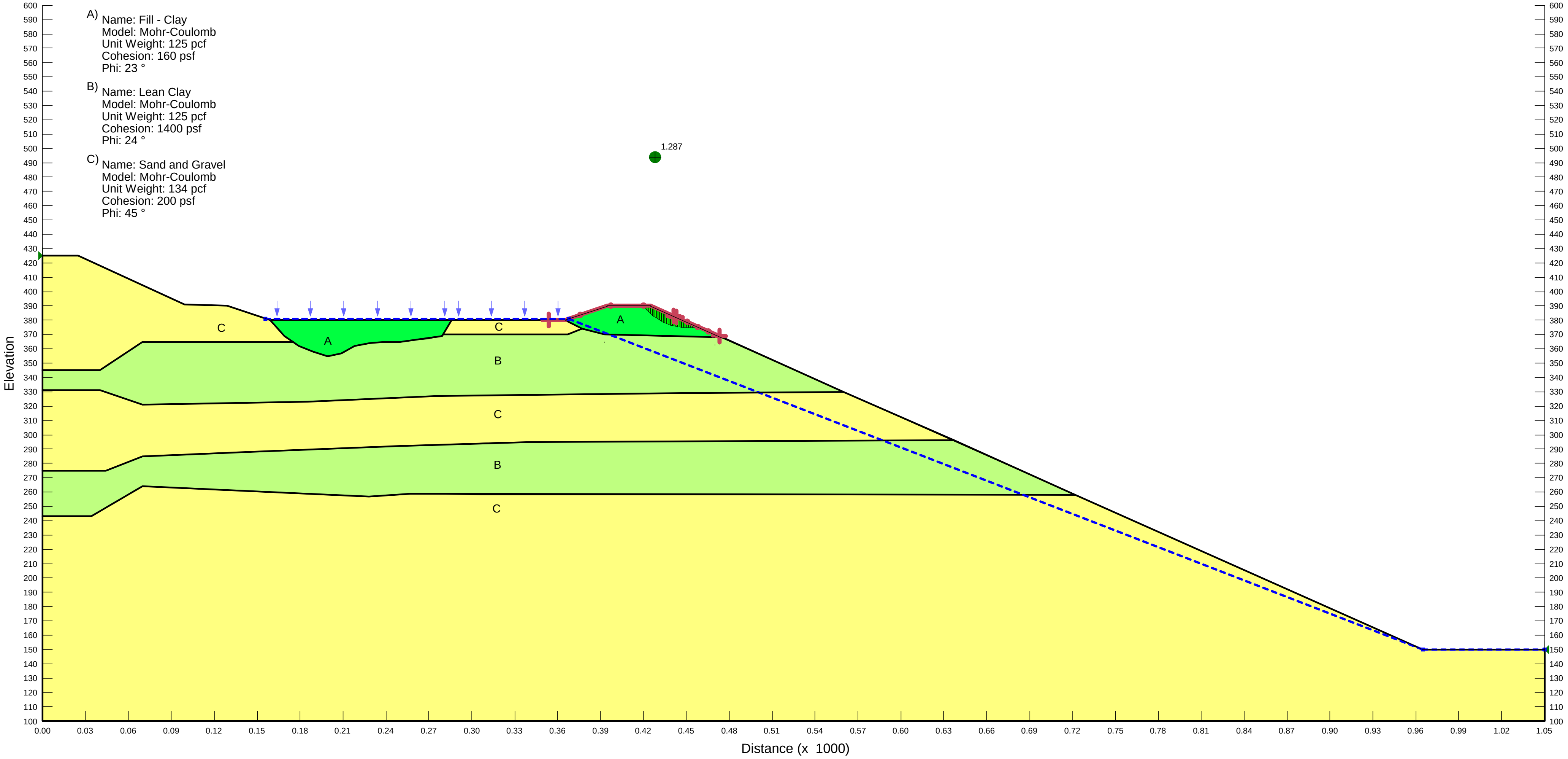
Case T-2 with 2.25:1 Slope - SHALLOW

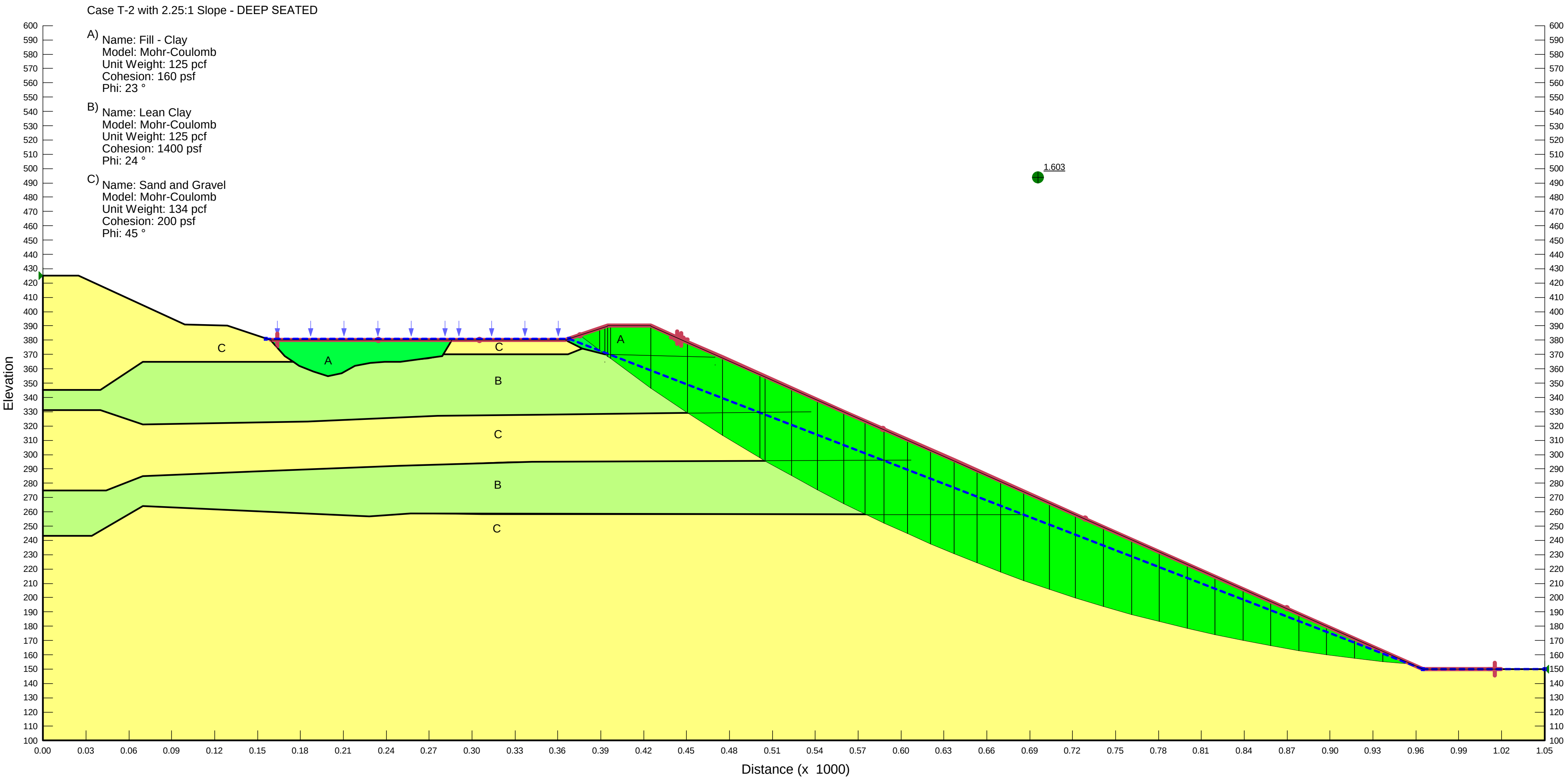
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

Case T-2 with 2.25:1 Slope, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC





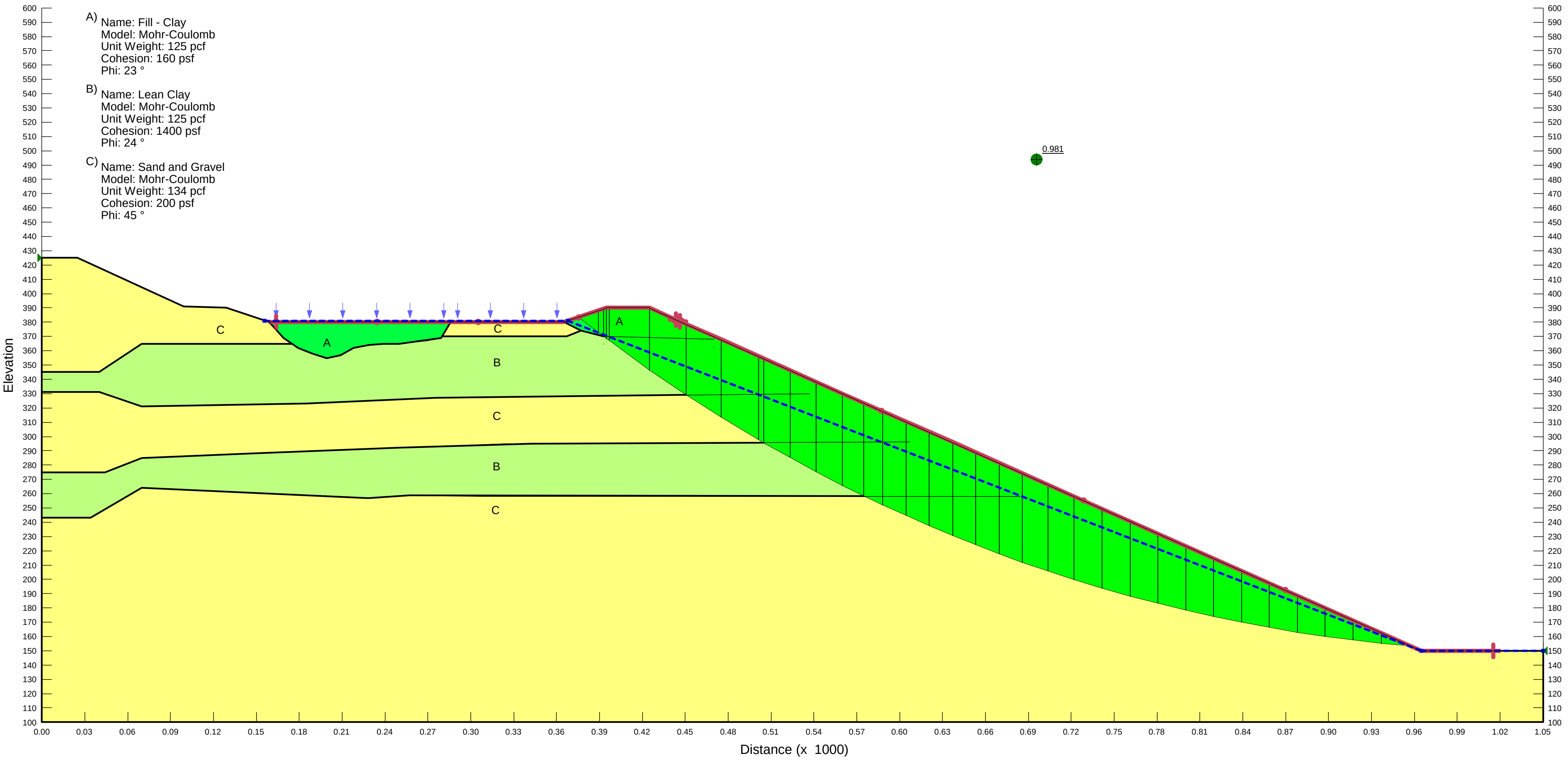
Case T-2 with 2.25:1 Slope - DEEP SEATED

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

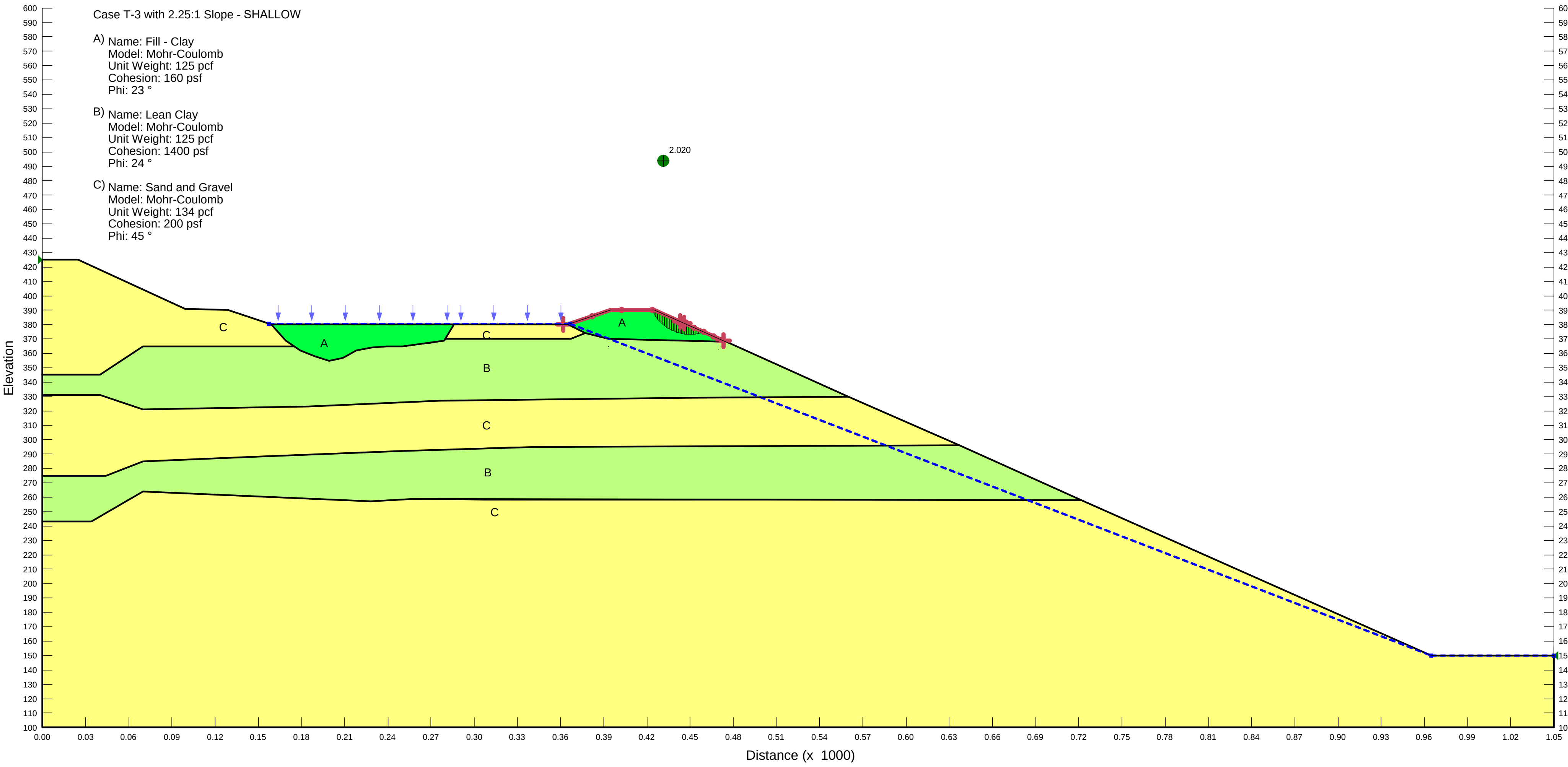
Case T-2 with 2.25:1 Slope, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC

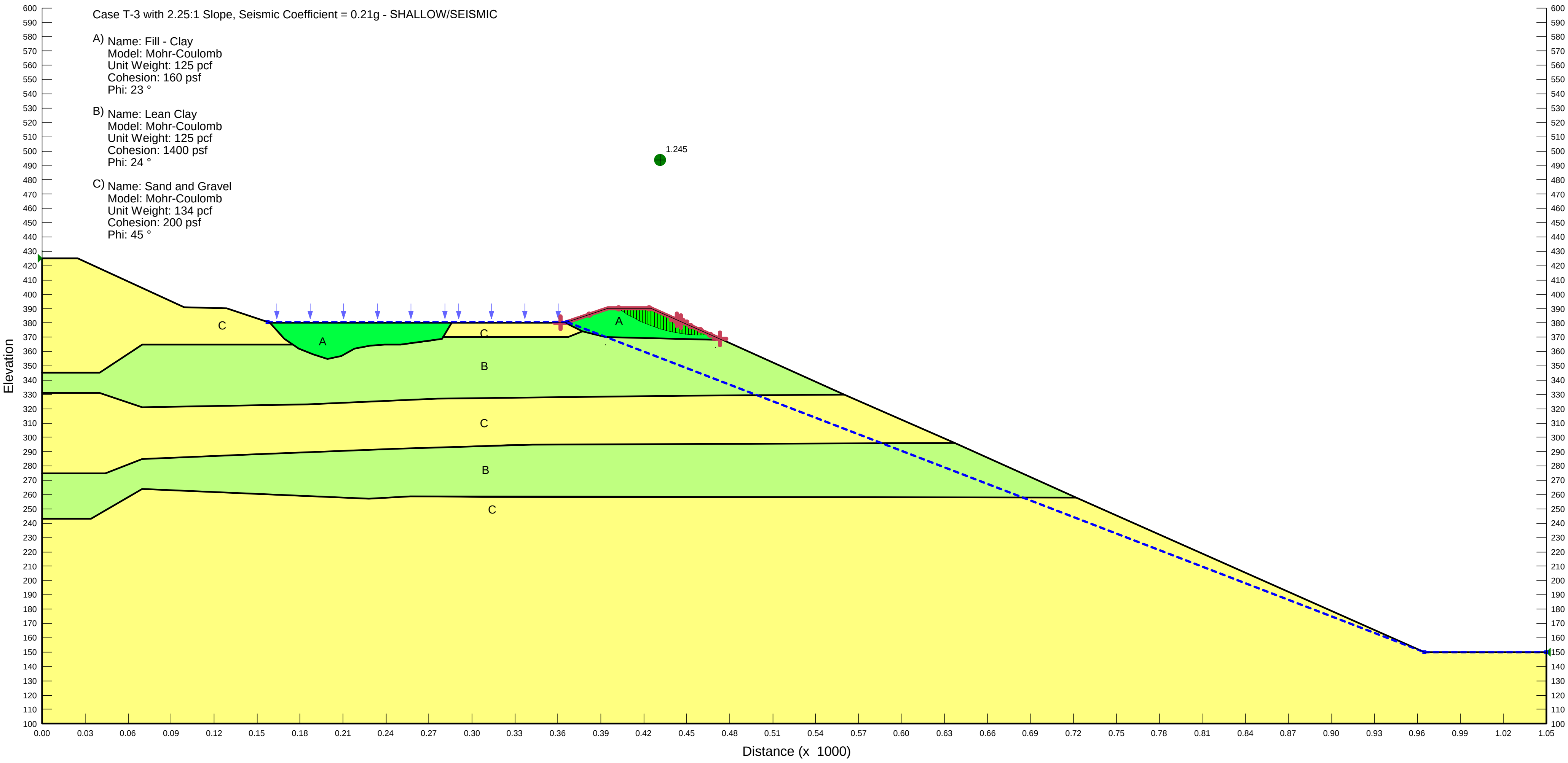


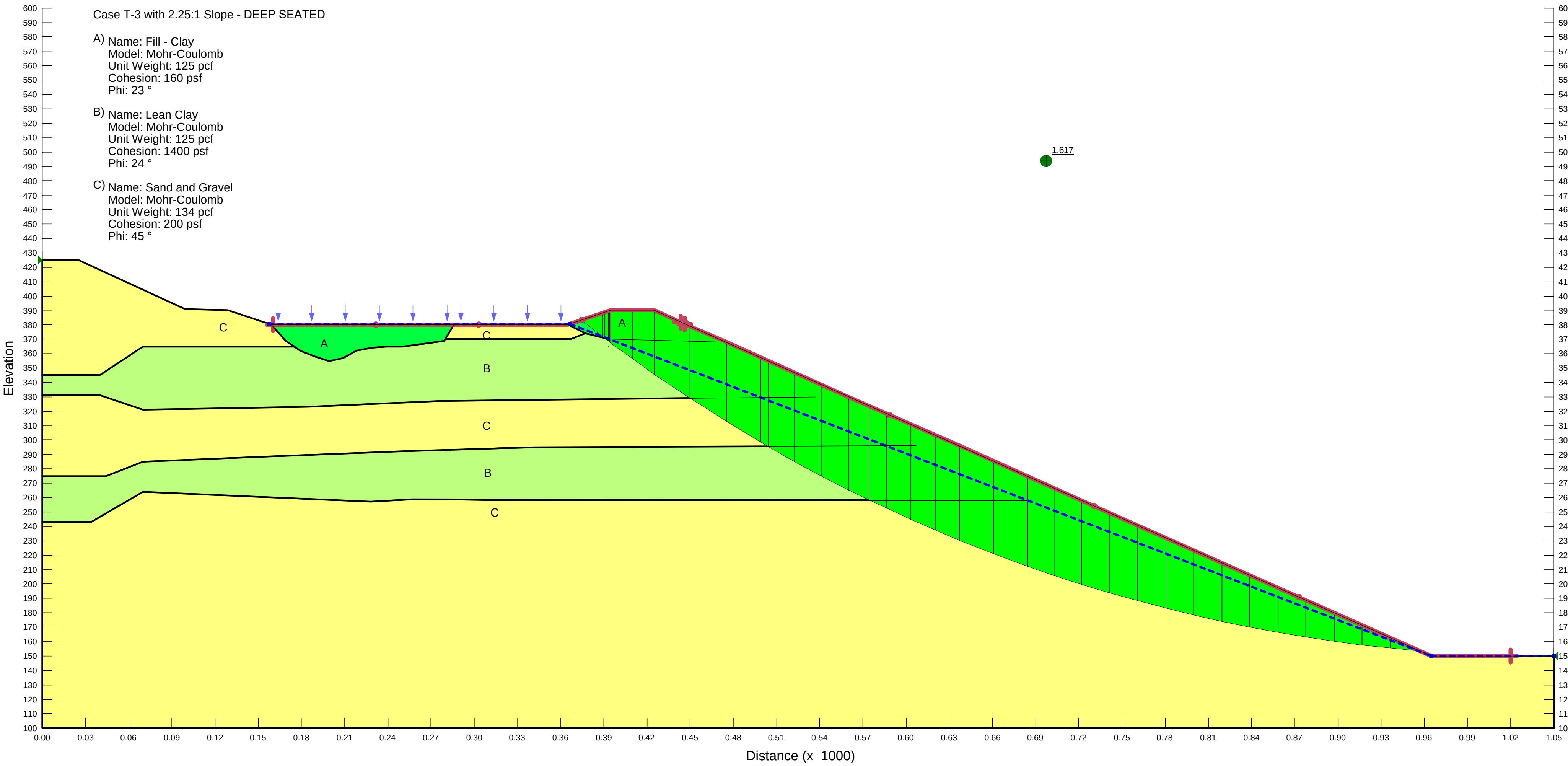
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

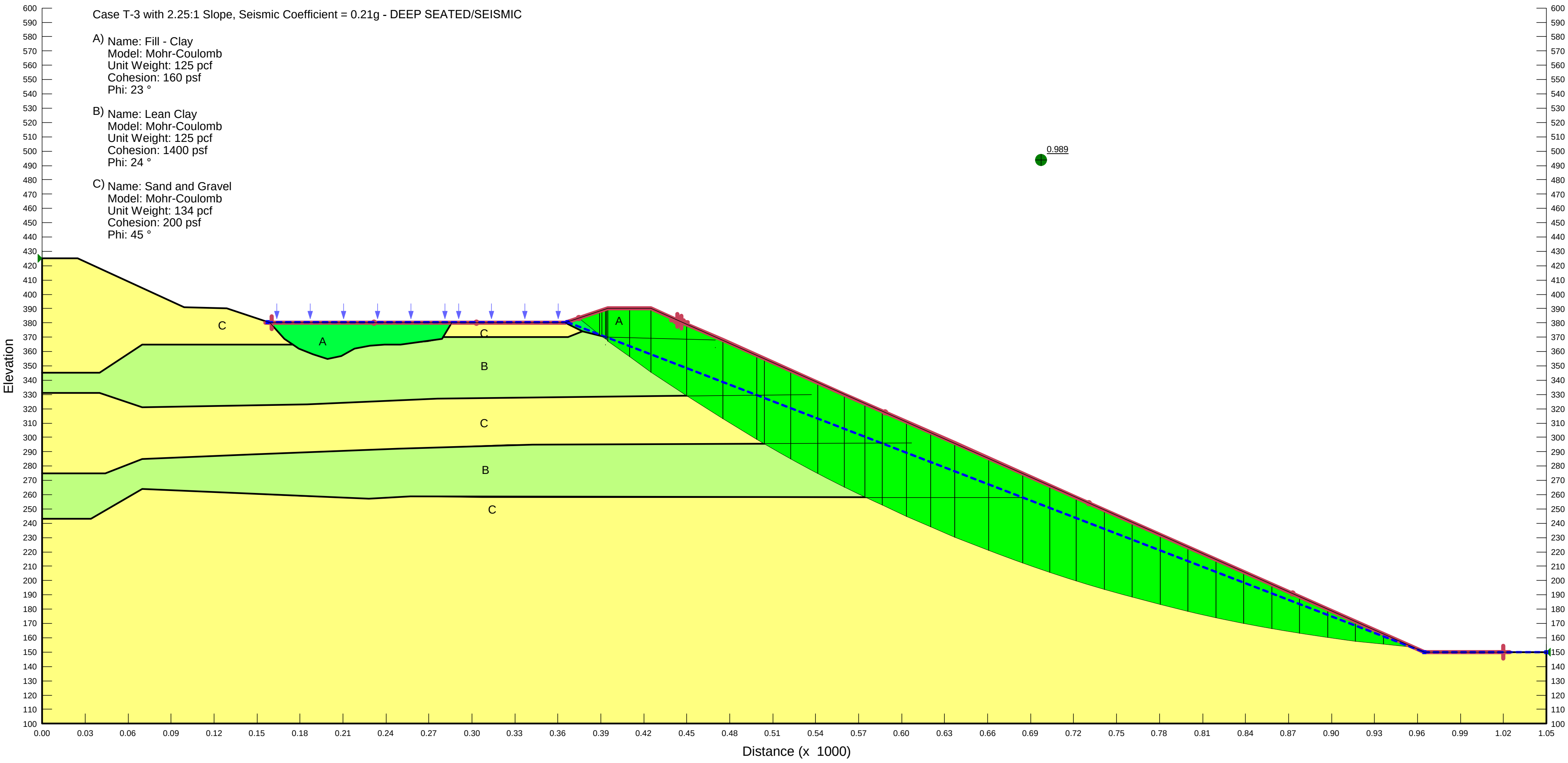
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °


Case T-3 with 2.25:1 Slope - SHALLOW
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
2.020
A
A
B
B
C
C
C
C
C
Elevation
Distance (x 1000)
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05


Case T-3 with 2.25:1 Slope, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.245
A
B
C
Elevation
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370
380
390
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
Distance (x 1000)
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05


Case T-3 with 2.25:1 Slope - DEEP SEATED
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.617
A
A
B
B
C
C
C
C
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)

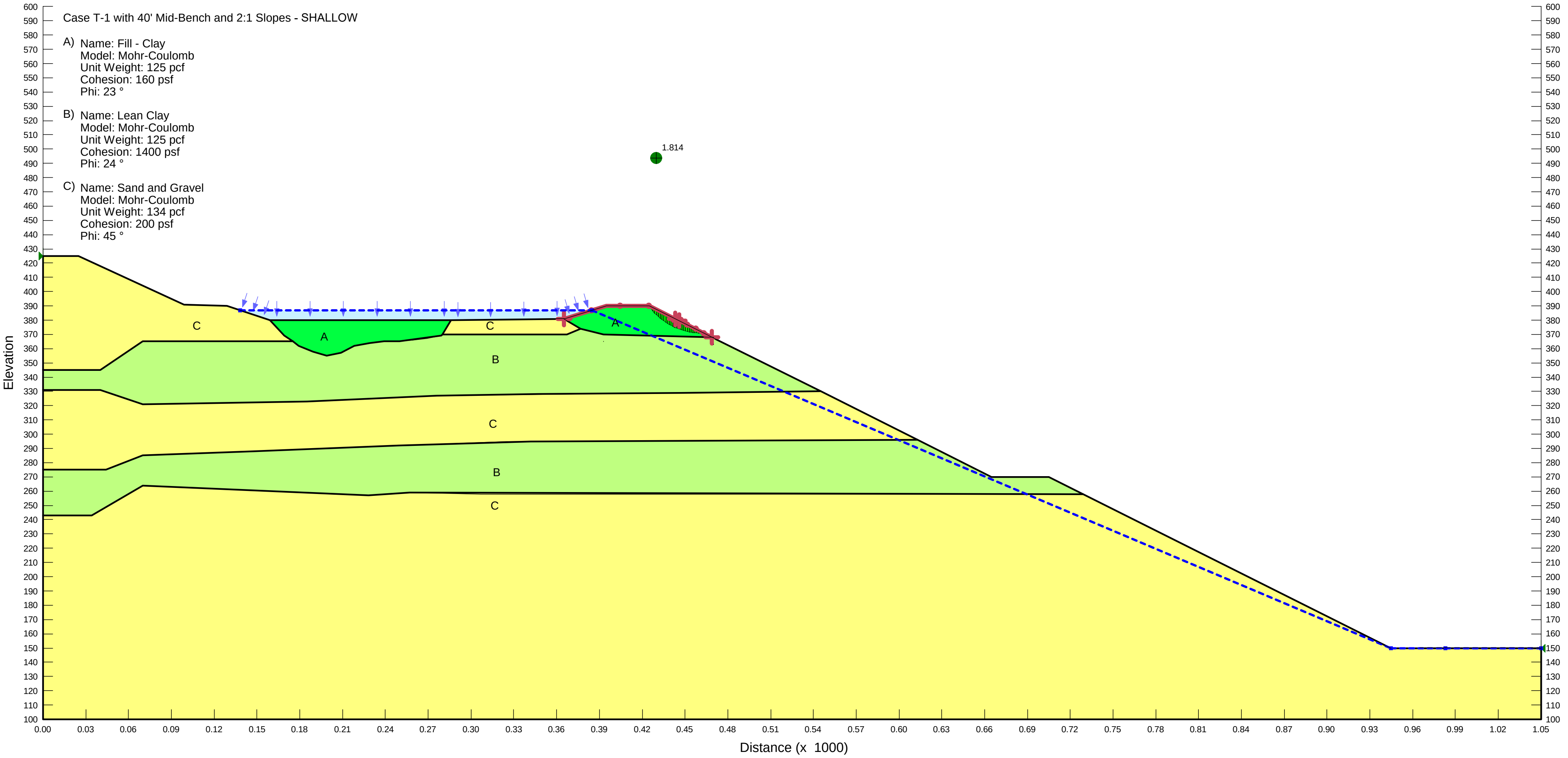


Case T-3 with 2.25:1 Slope, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

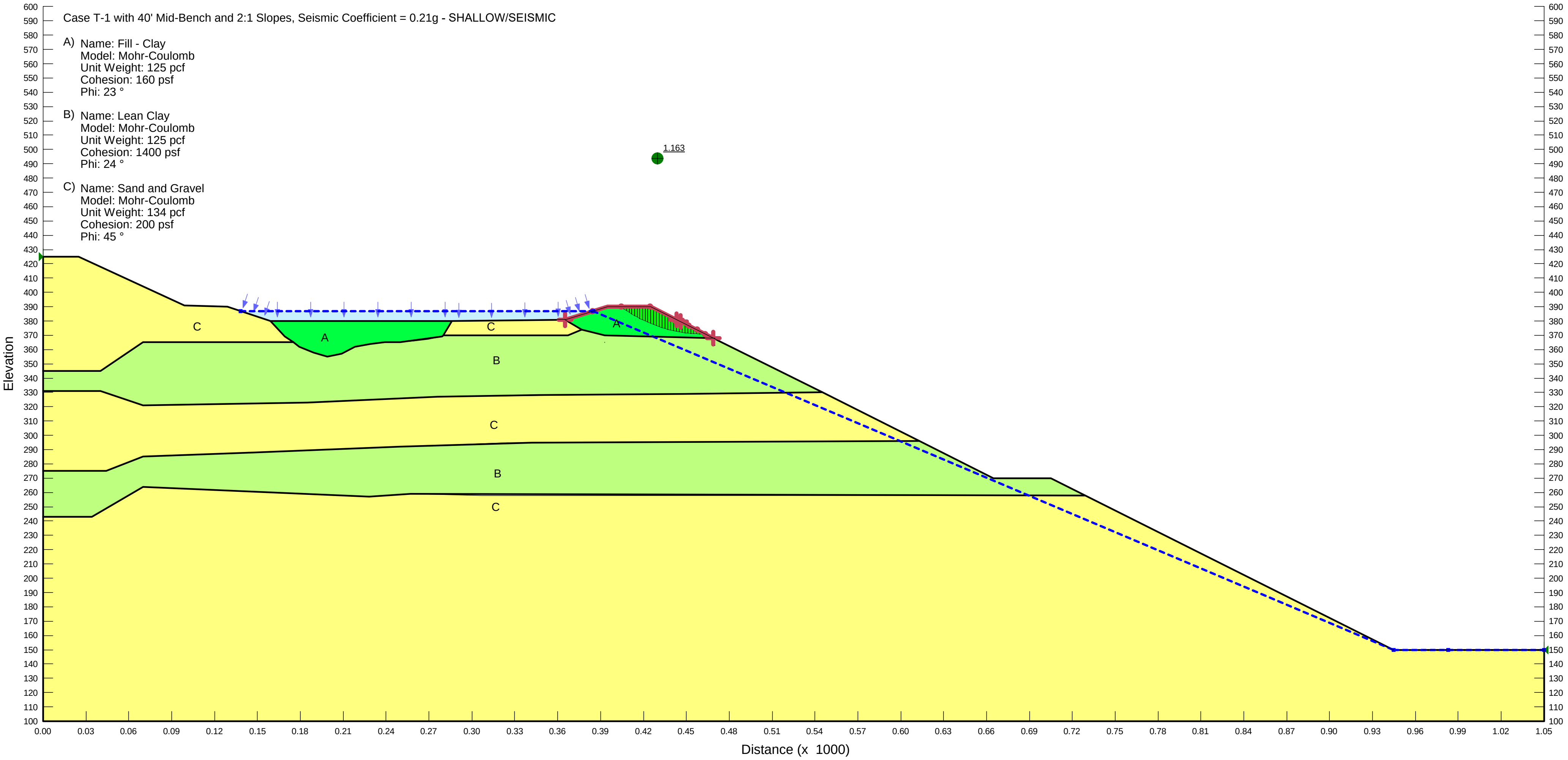


Case T-1 with 40' Mid-Bench and 2:1 Slopes - SHALLOW

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

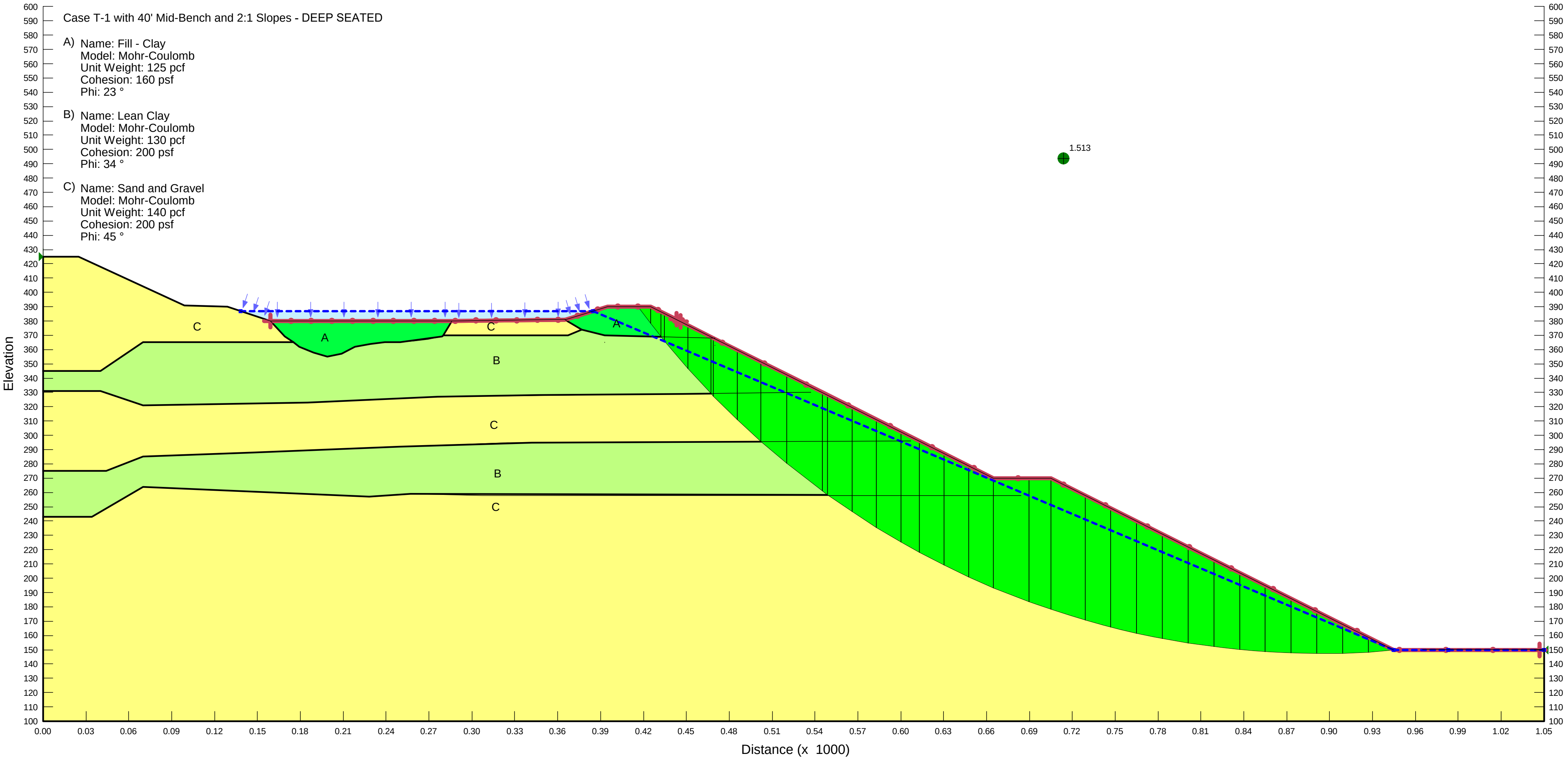


Case T-1 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

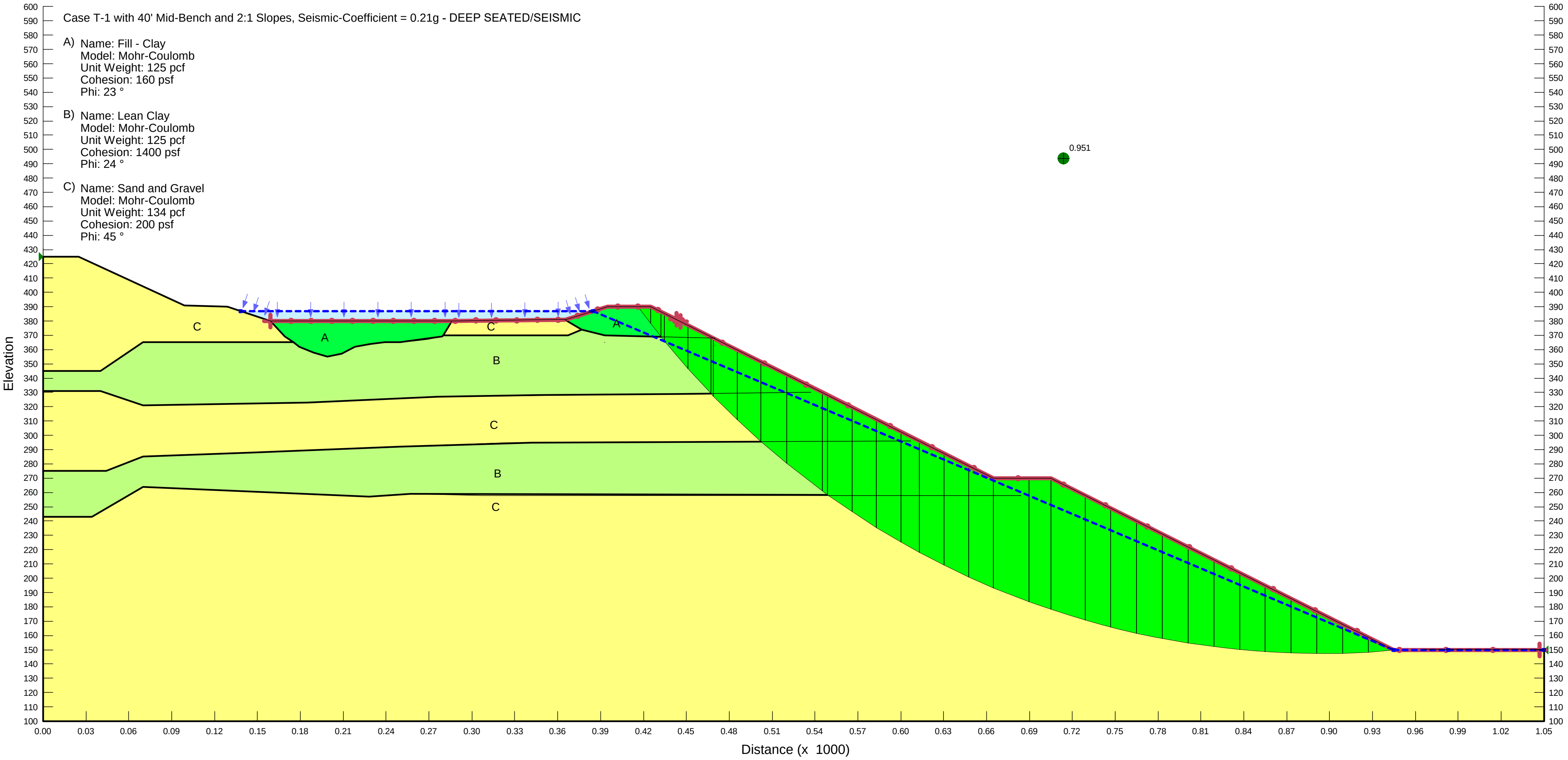


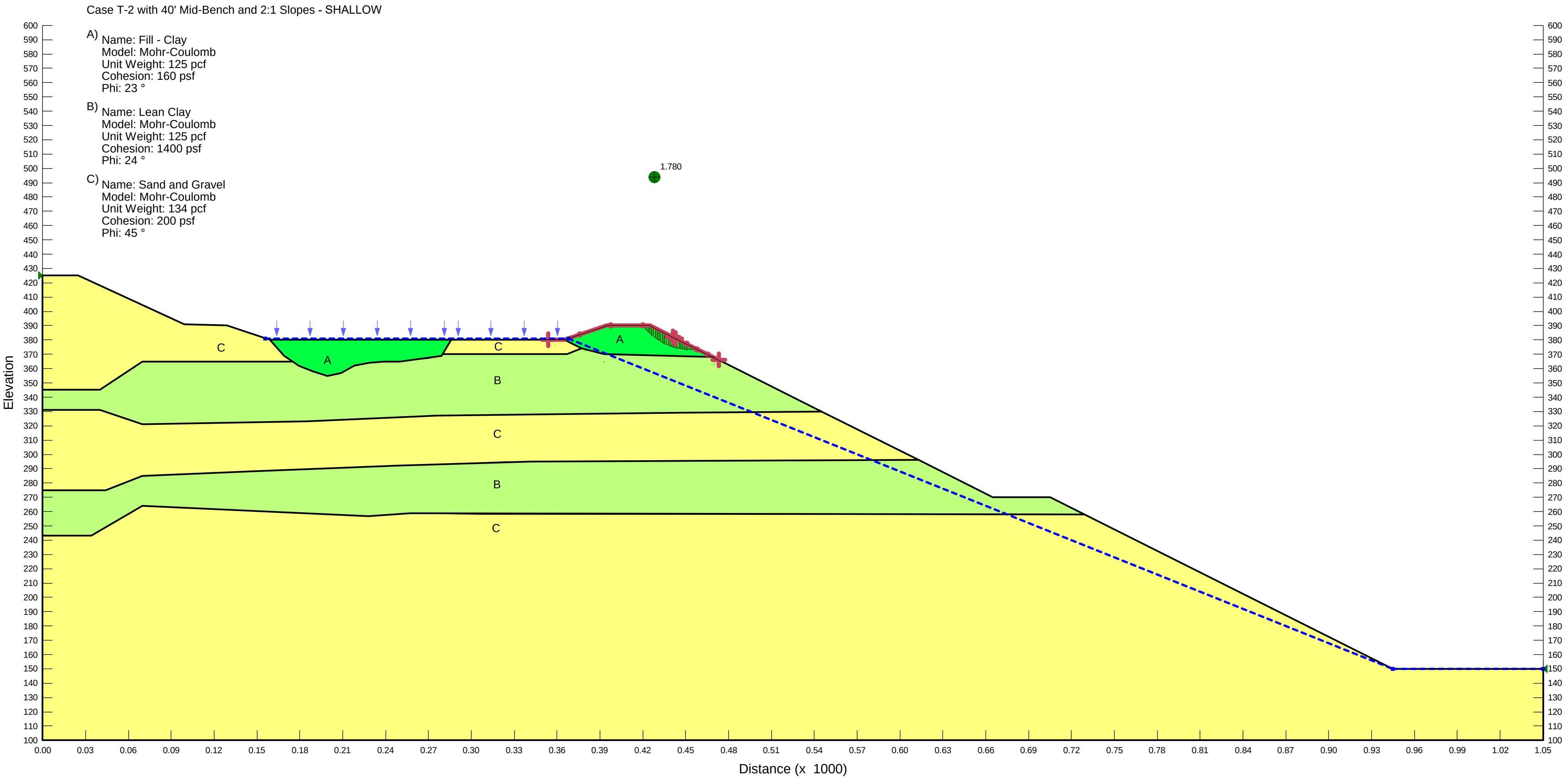
Case T-1 with 40' Mid-Bench and 2:1 Slopes - DEEP SEATED

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 200 psf
Phi: 34 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 200 psf
Phi: 45 °


Case T-1 with 40' Mid-Bench and 2:1 Slopes, Seismic-Coefficient = 0.21g - DEEP SEATED/SEISMIC
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
0.951
A
B
C
Elevation
Distance (x 1000)
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05



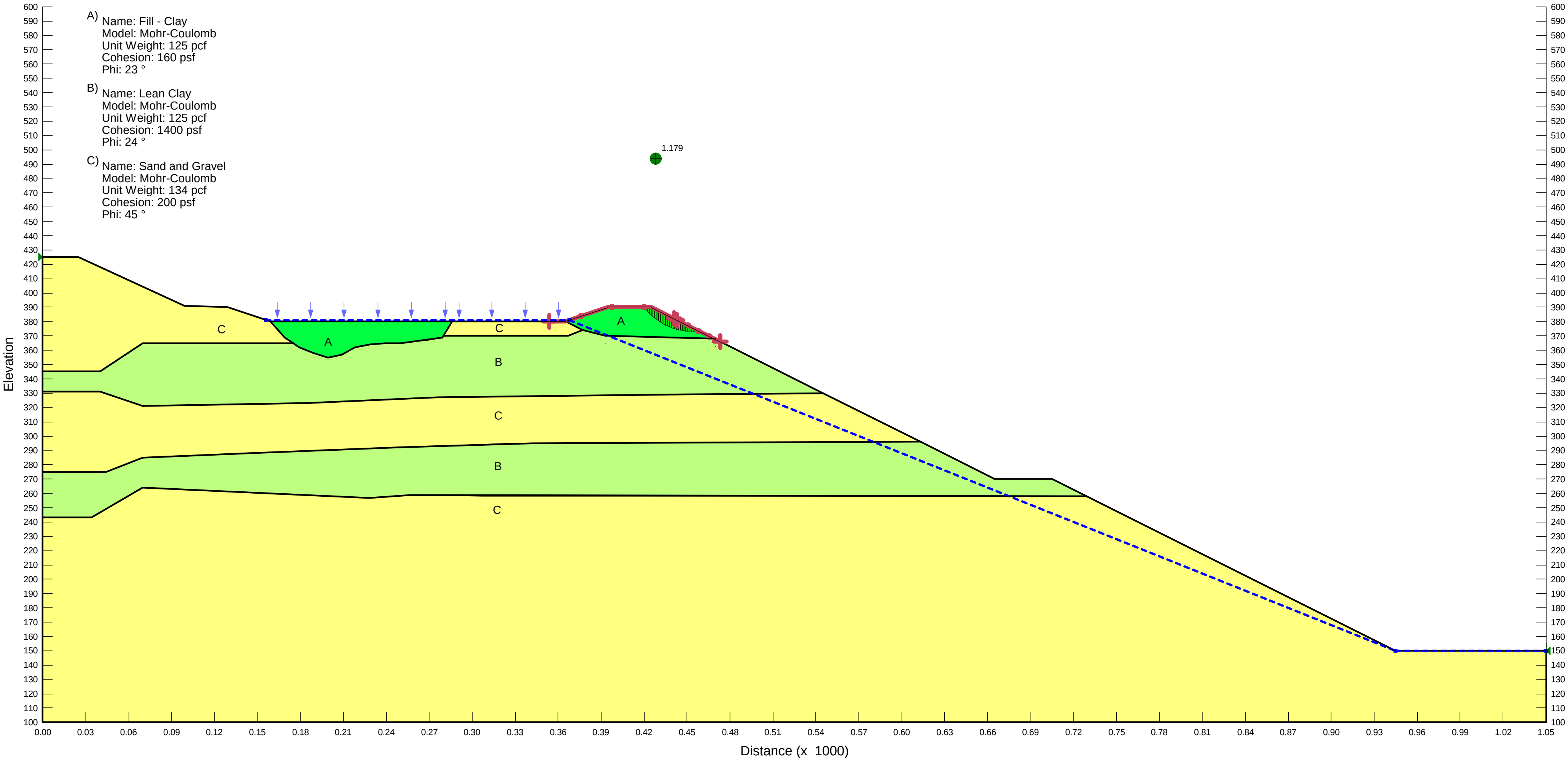
Case T-2 with 40' Mid-Bench and 2:1 Slopes - SHALLOW

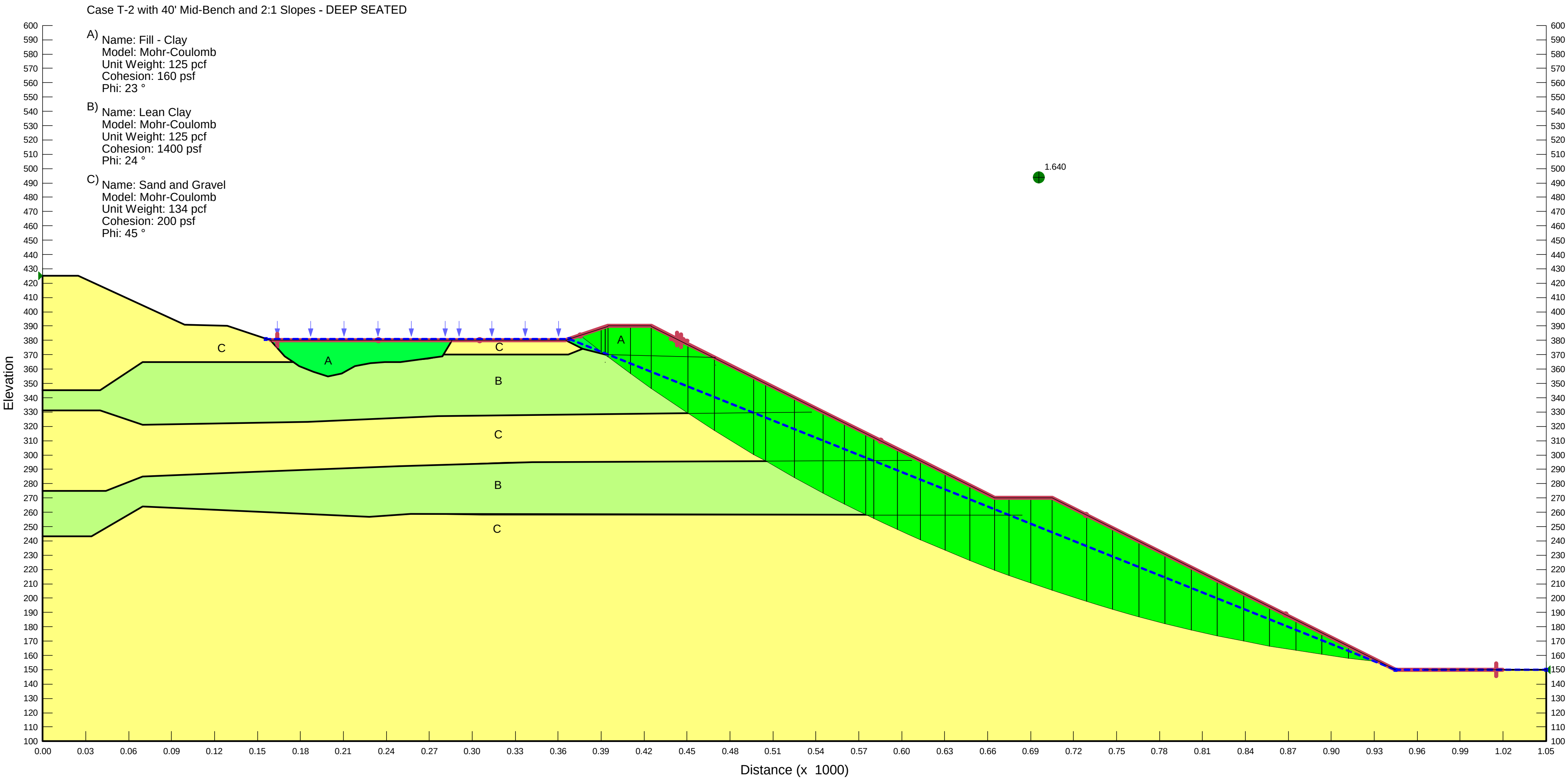
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

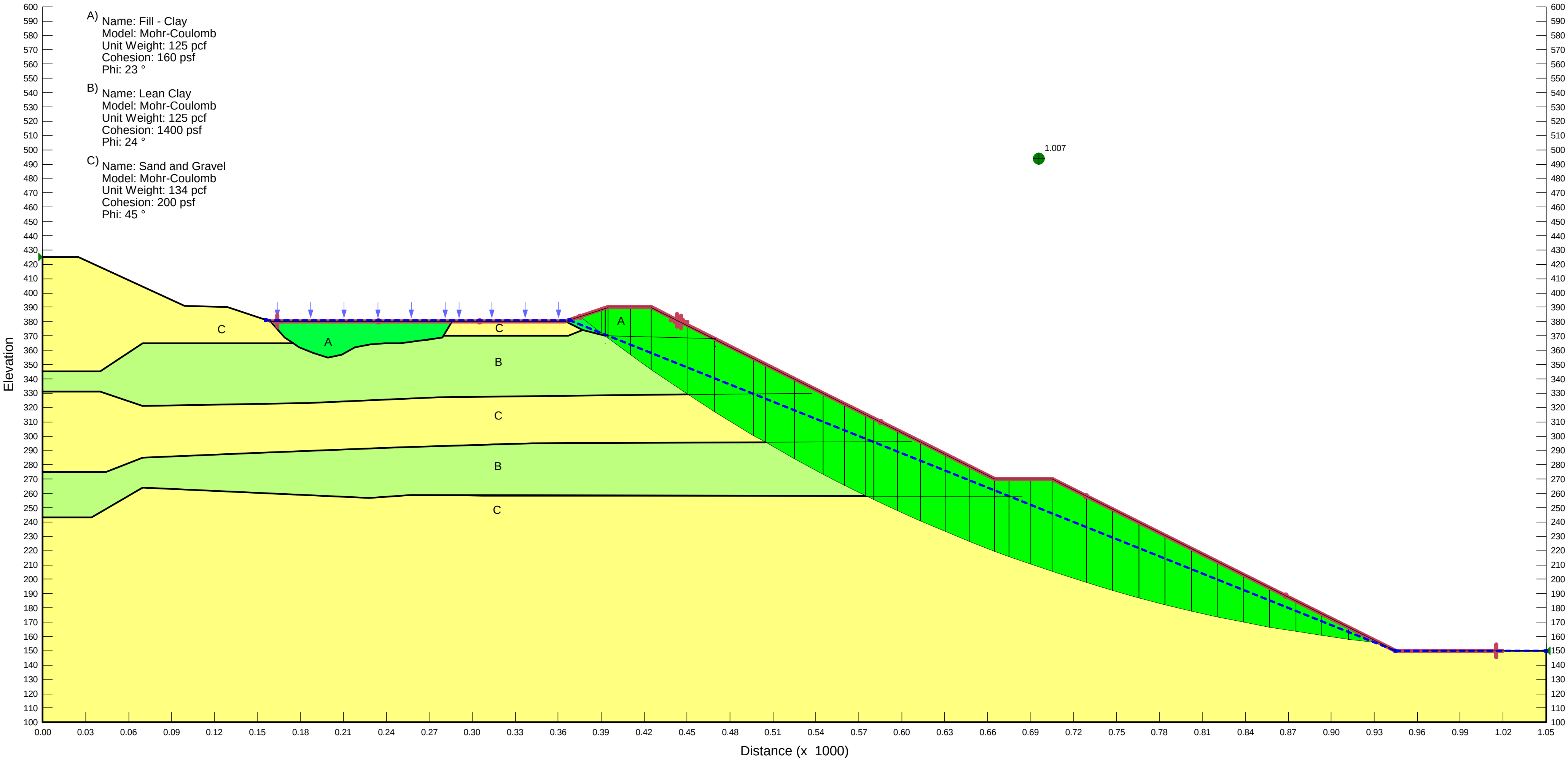
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

Case T-2 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC




Case T-2 with 40' Mid-Bench and 2:1 Slopes - DEEP SEATED
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.640
A
B
C
Elevation
Distance (x 1000)
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

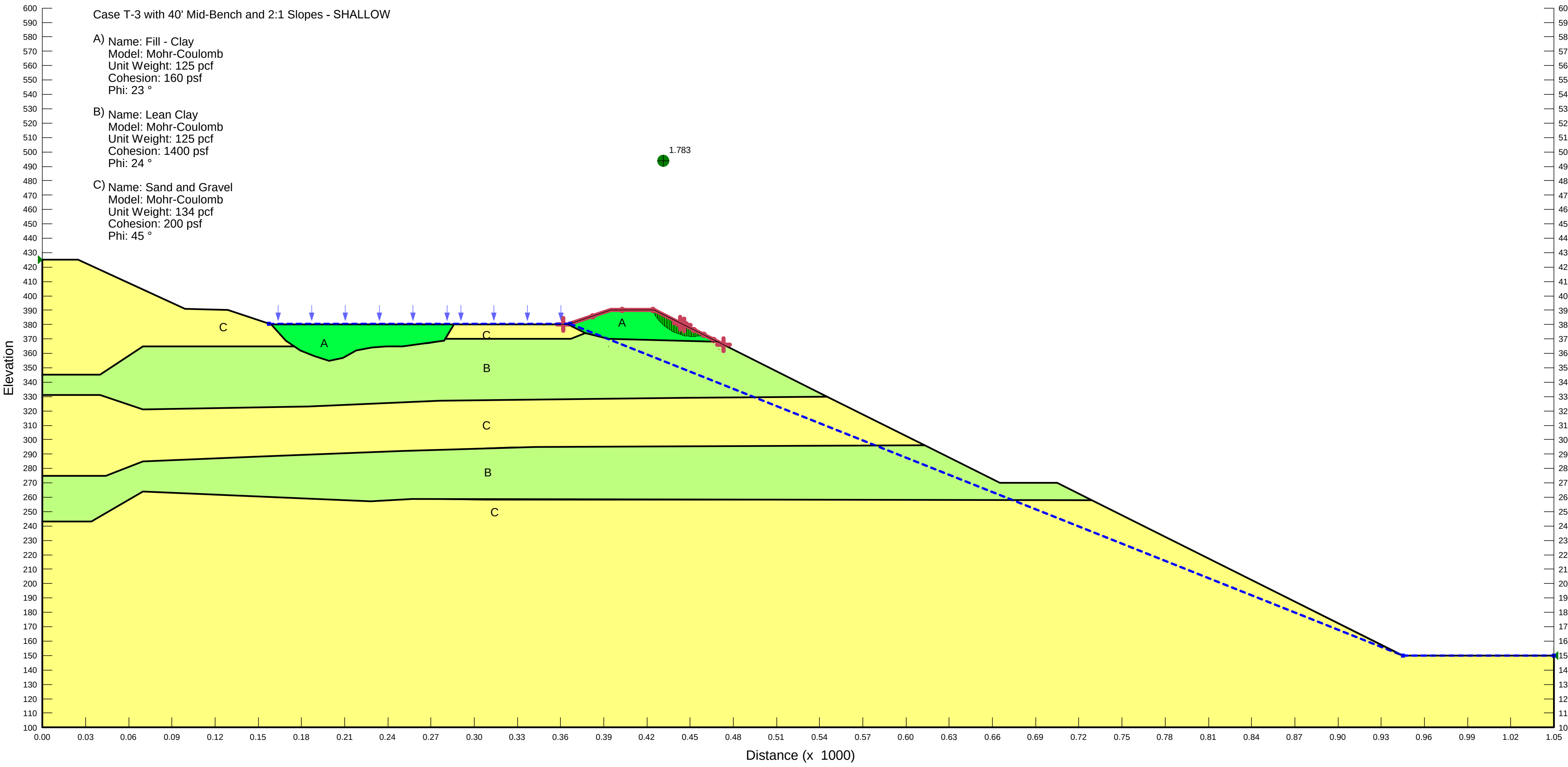


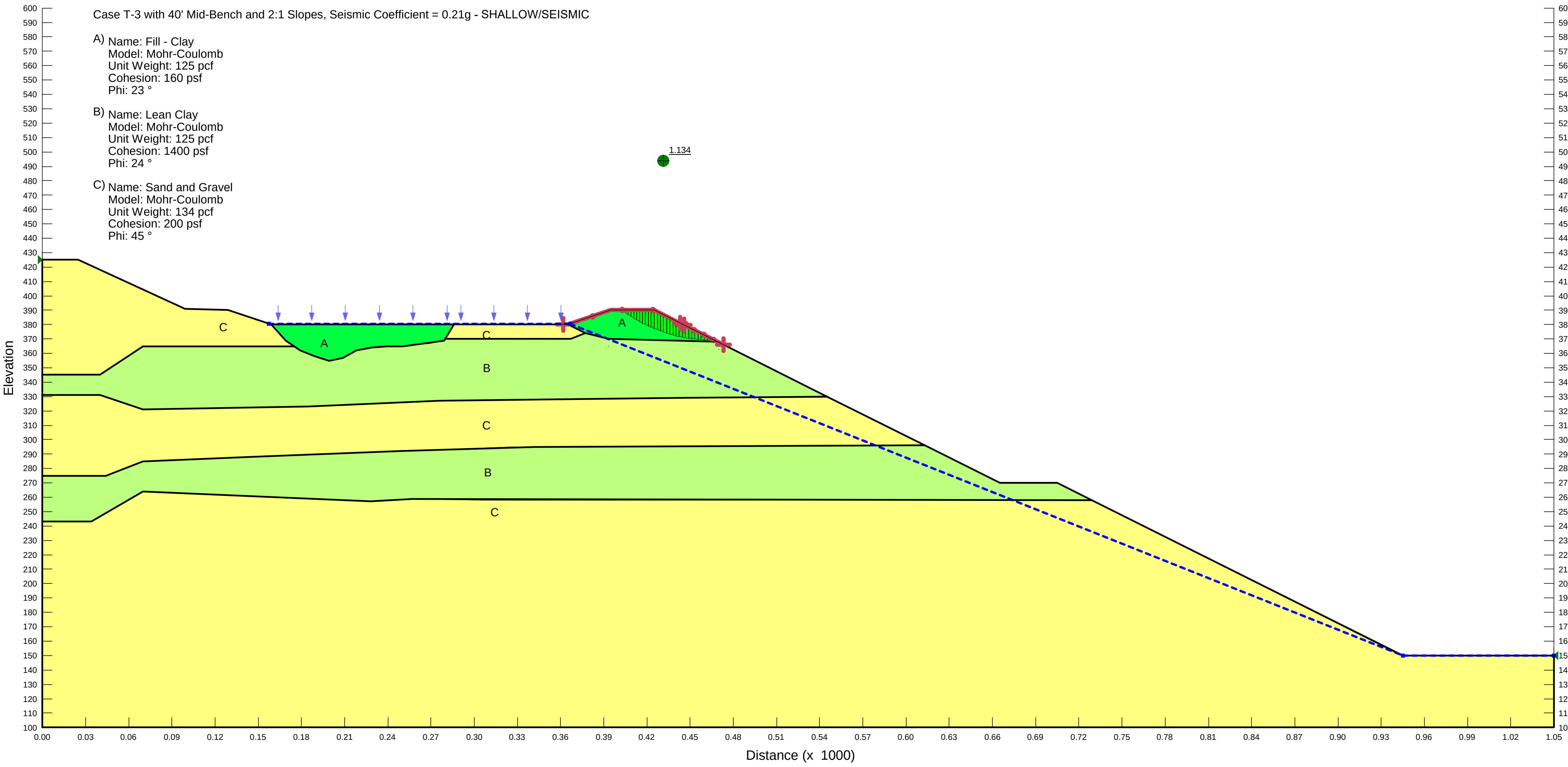
Case T-2 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °


Case T-3 with 40' Mid-Bench and 2:1 Slopes - SHALLOW
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.783
A
B
C
Elevation
Distance (x 1000)
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

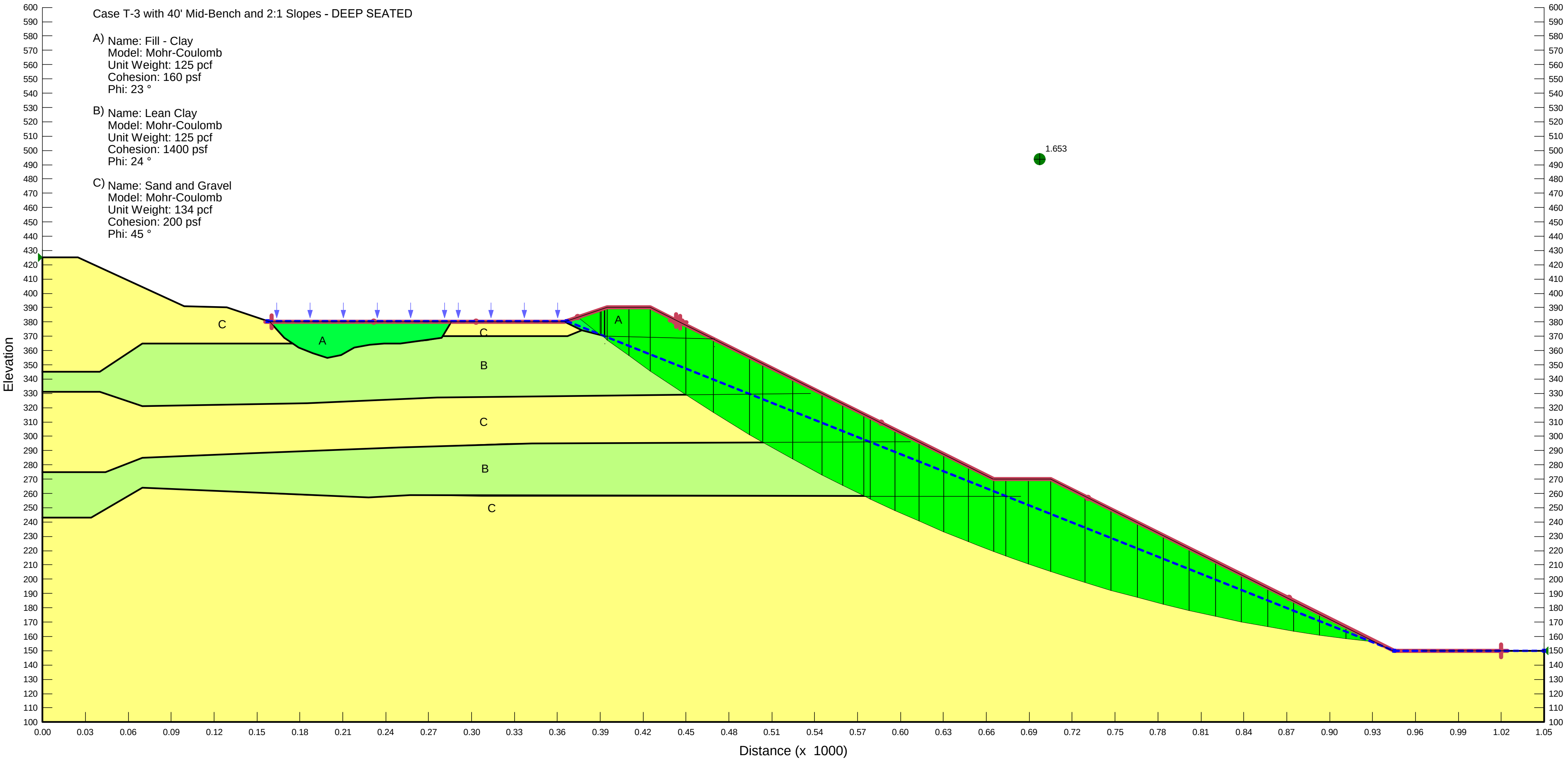


Case T-3 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

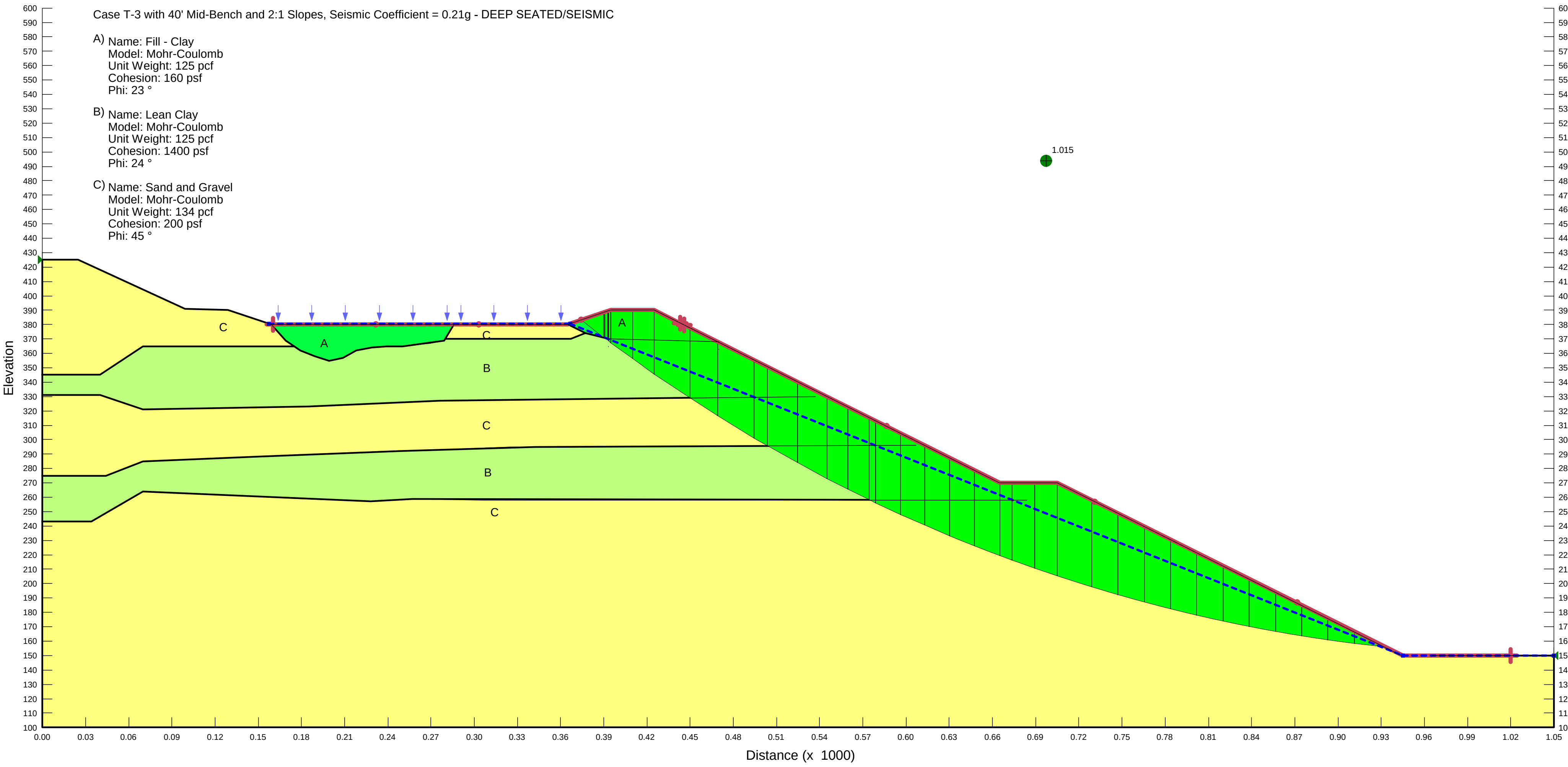


Case T-3 with 40' Mid-Bench and 2:1 Slopes - DEEP SEATED

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

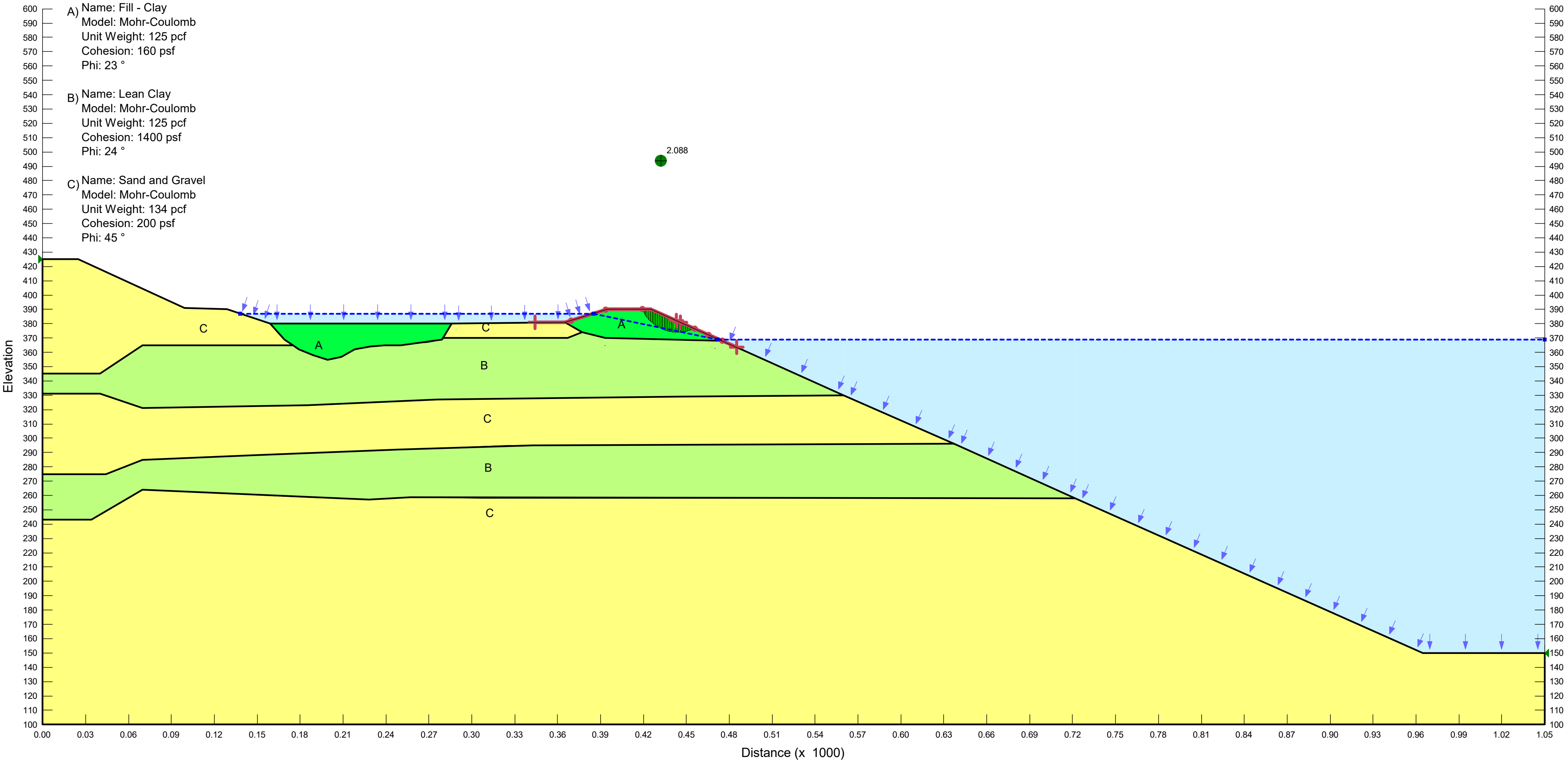
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °



Case T-3 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.015
A
A
B
B
C
C
C
C
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)

Case P-1 with 2.25:1 Slope - SHALLOW

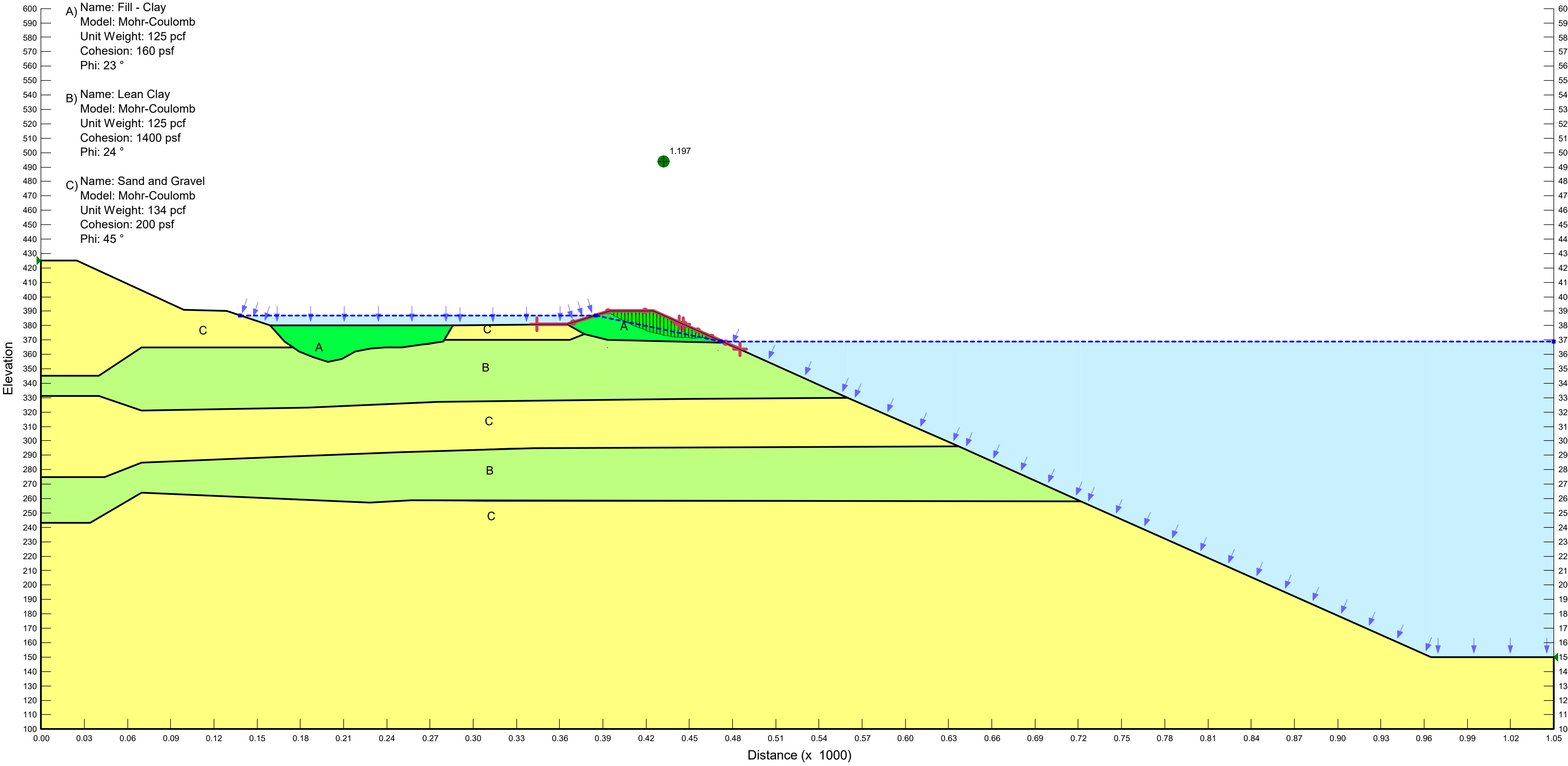


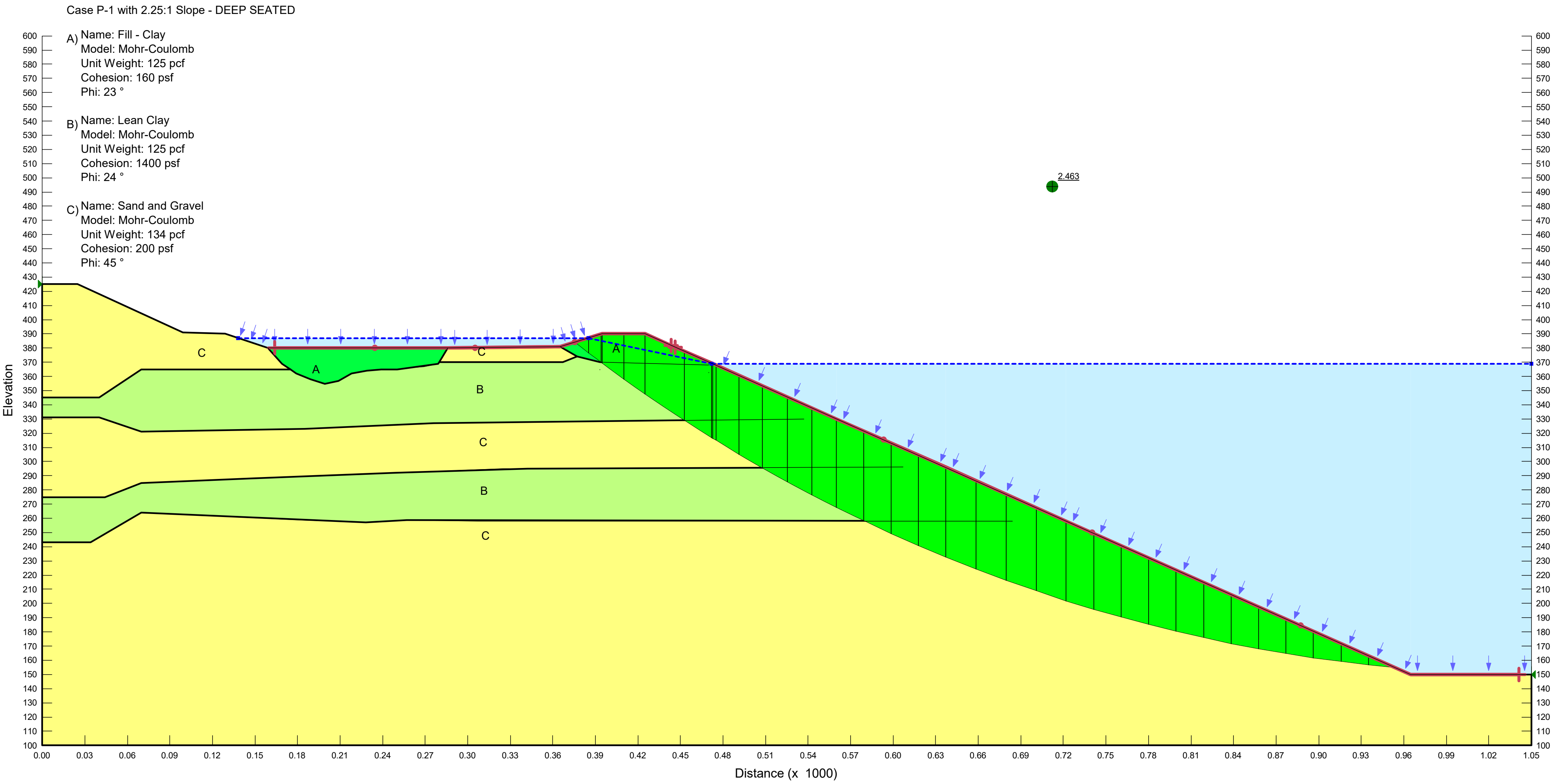
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

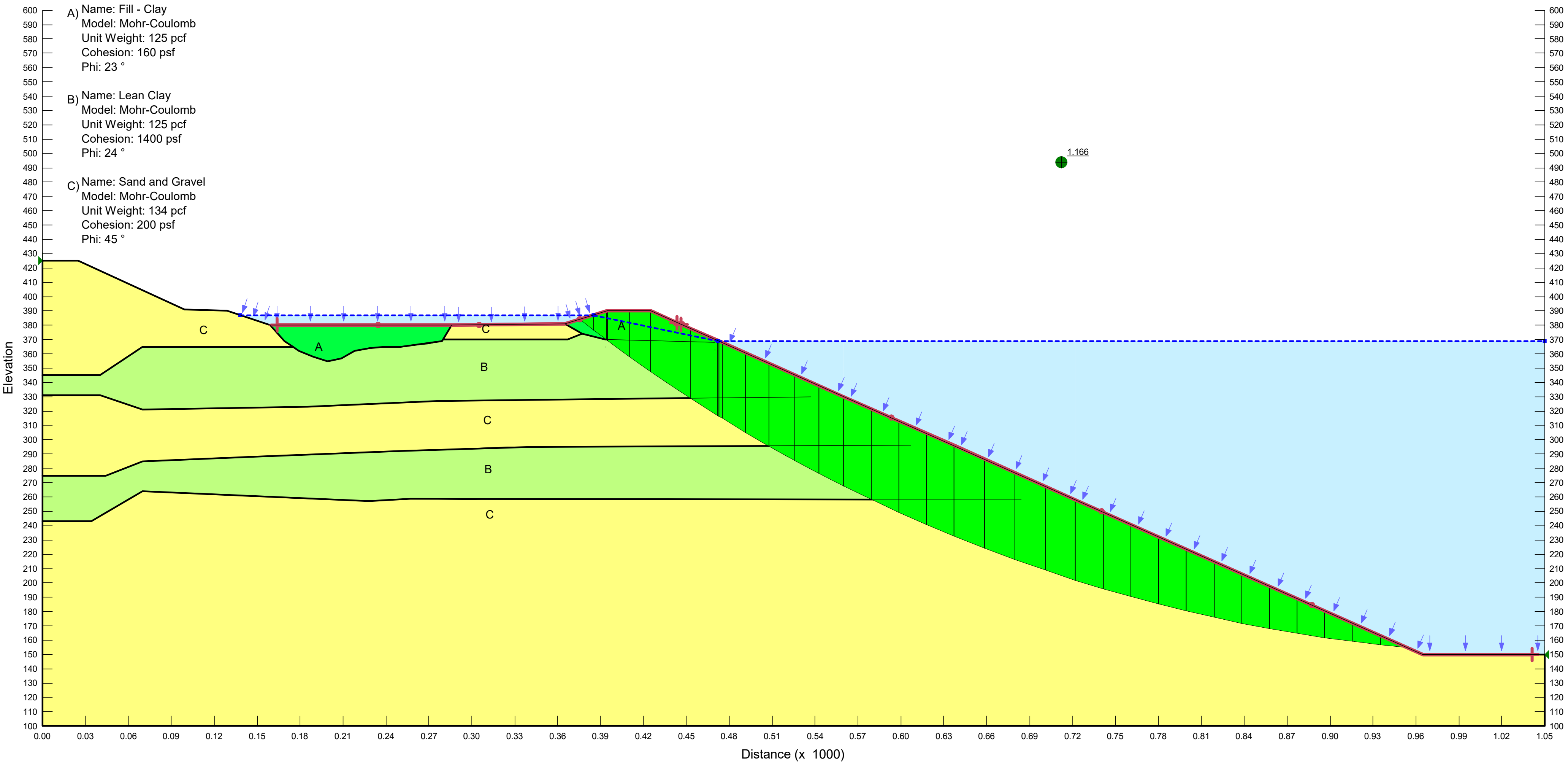
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

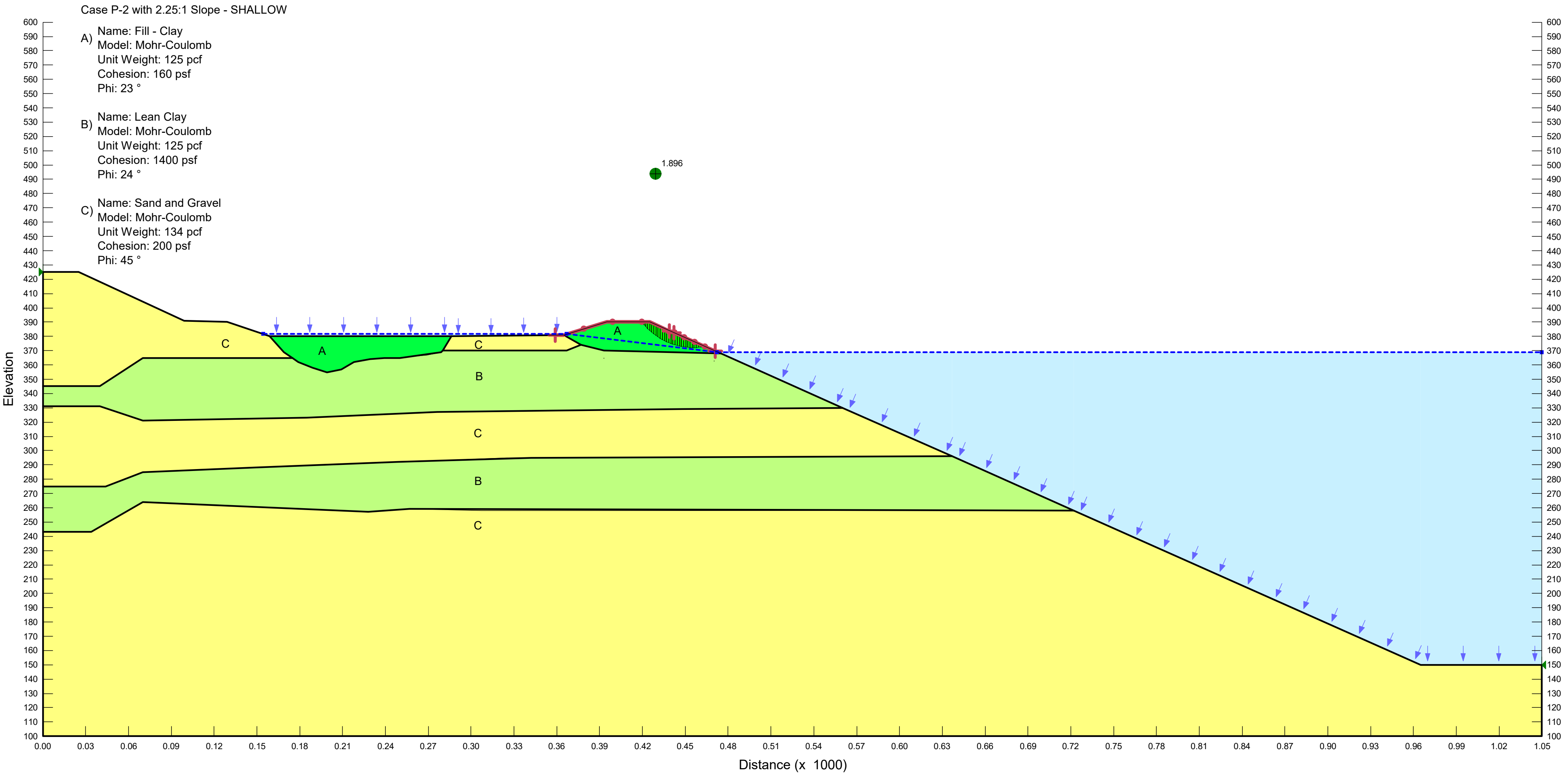
Case P-1 with 2.25:1 Slope, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC

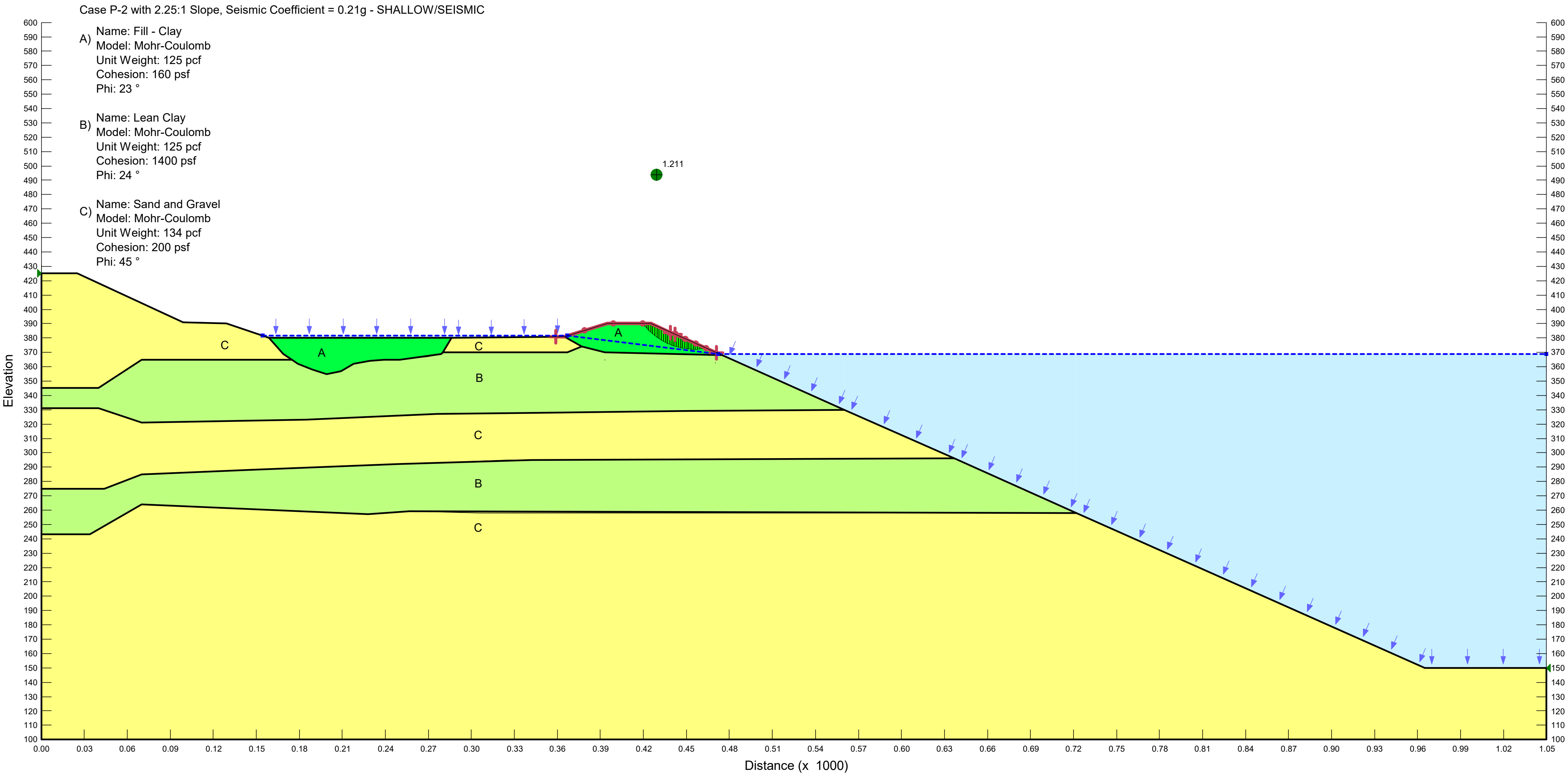



Case P-1 with 2.25:1 Slope - DEEP SEATED
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
2.463
C
A
C
A
B
C
B
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)

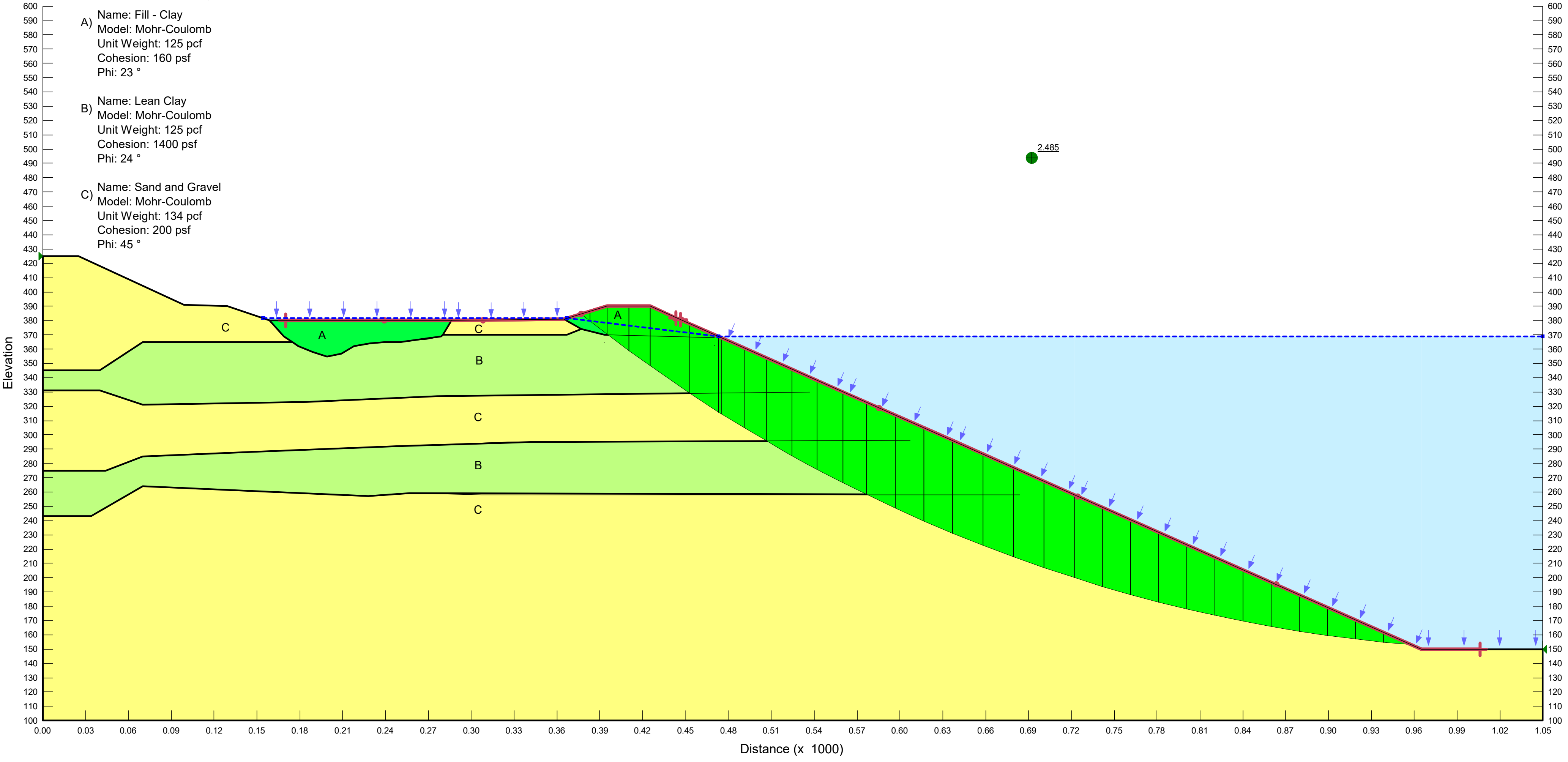
Case P-1 with 2.25:1 Slope - DEEP SEATED/SEISMIC



Case P-2 with 2.25:1 Slope - SHALLOW
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.896
A
B
C
Elevation
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370
380
390
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
Distance (x 1000)
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

Case P-2 with 2.25:1 Slope, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC
A)
Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B)
Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C)
Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.211
A
C
A
C
B
C
B
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)

Case P-2 with 2.25:1 Slope - DEEP SEATED

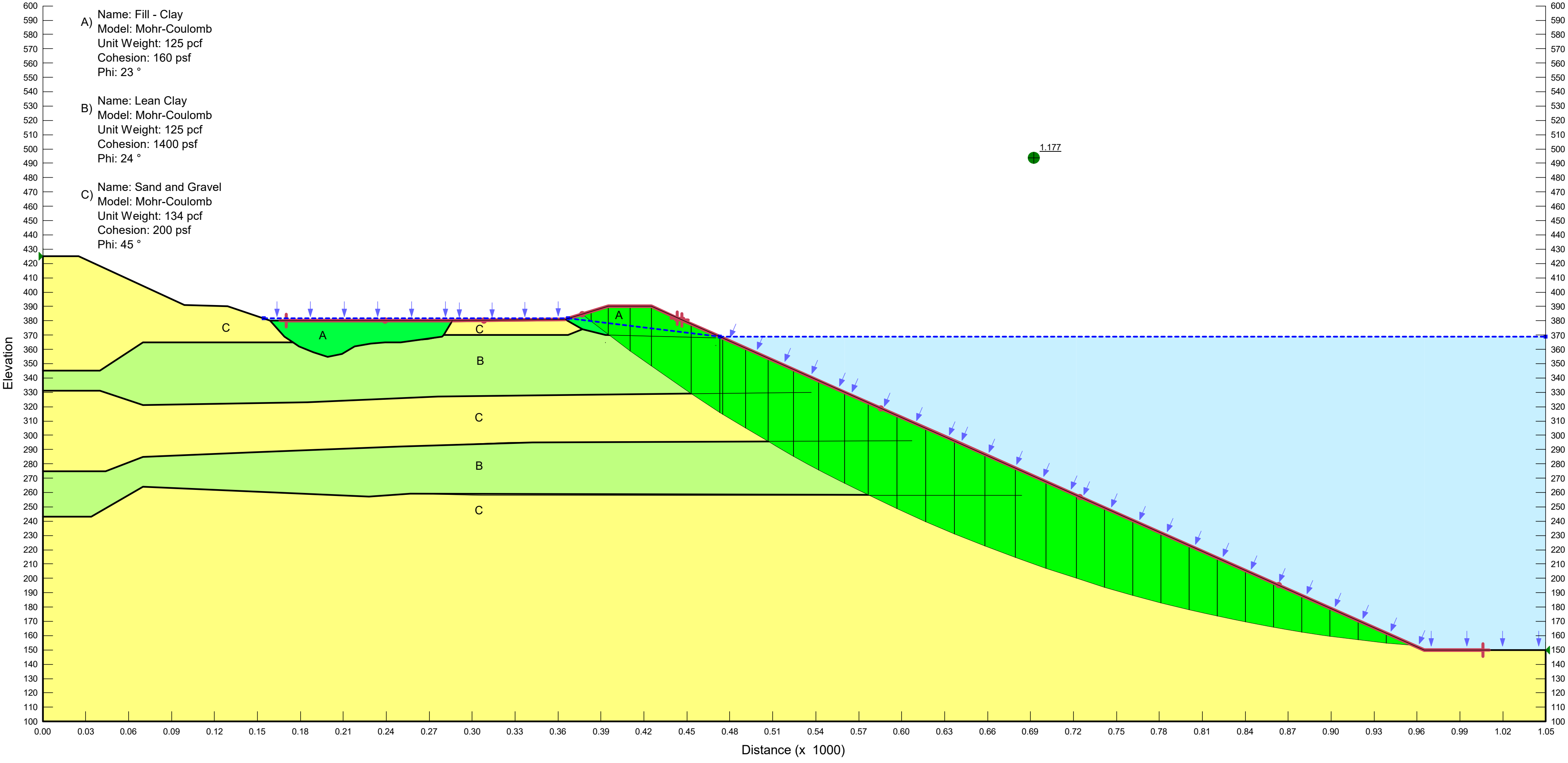


A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

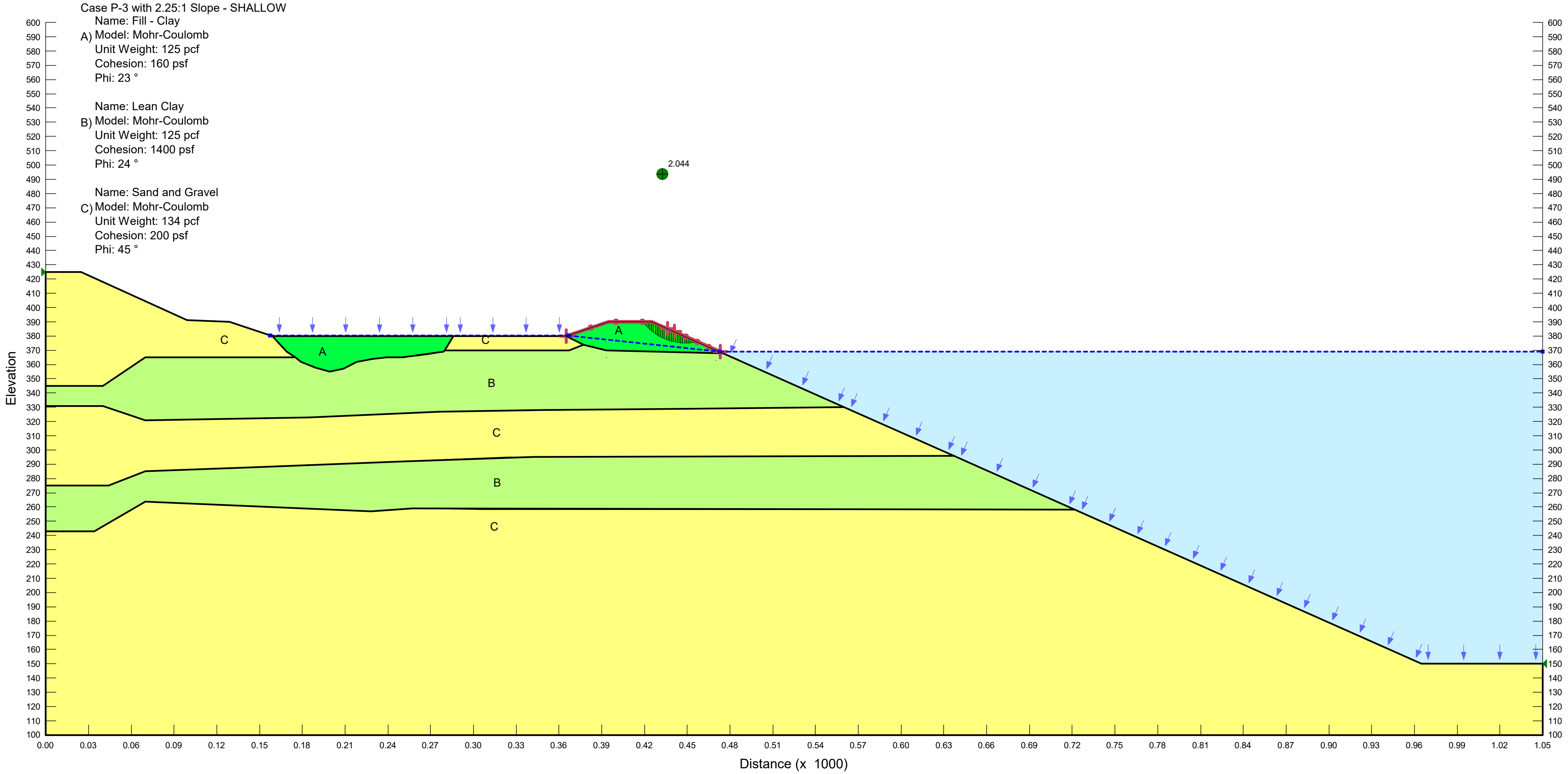
Case P-2 with 2.25:1 Slope, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC



A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

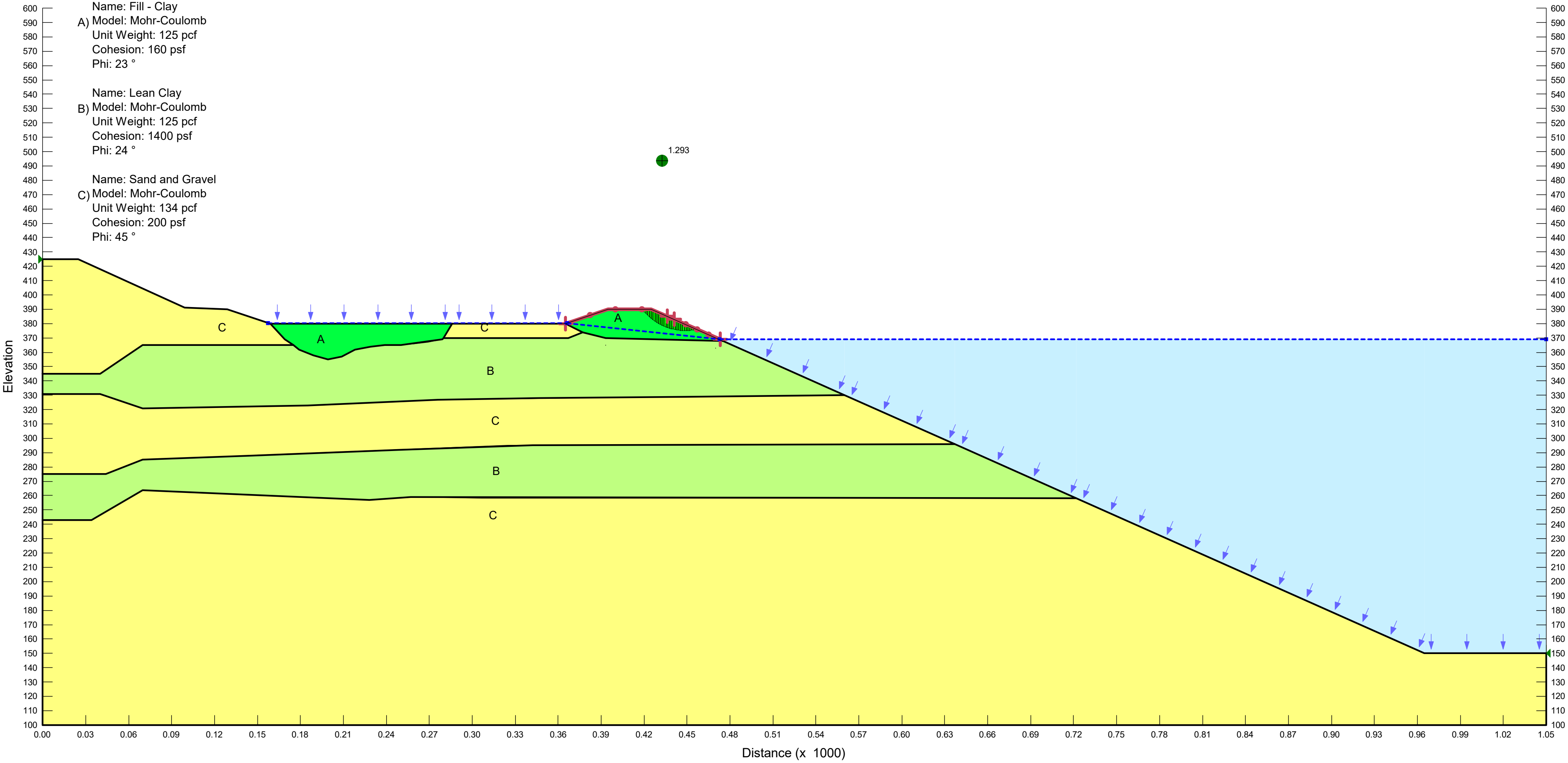
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

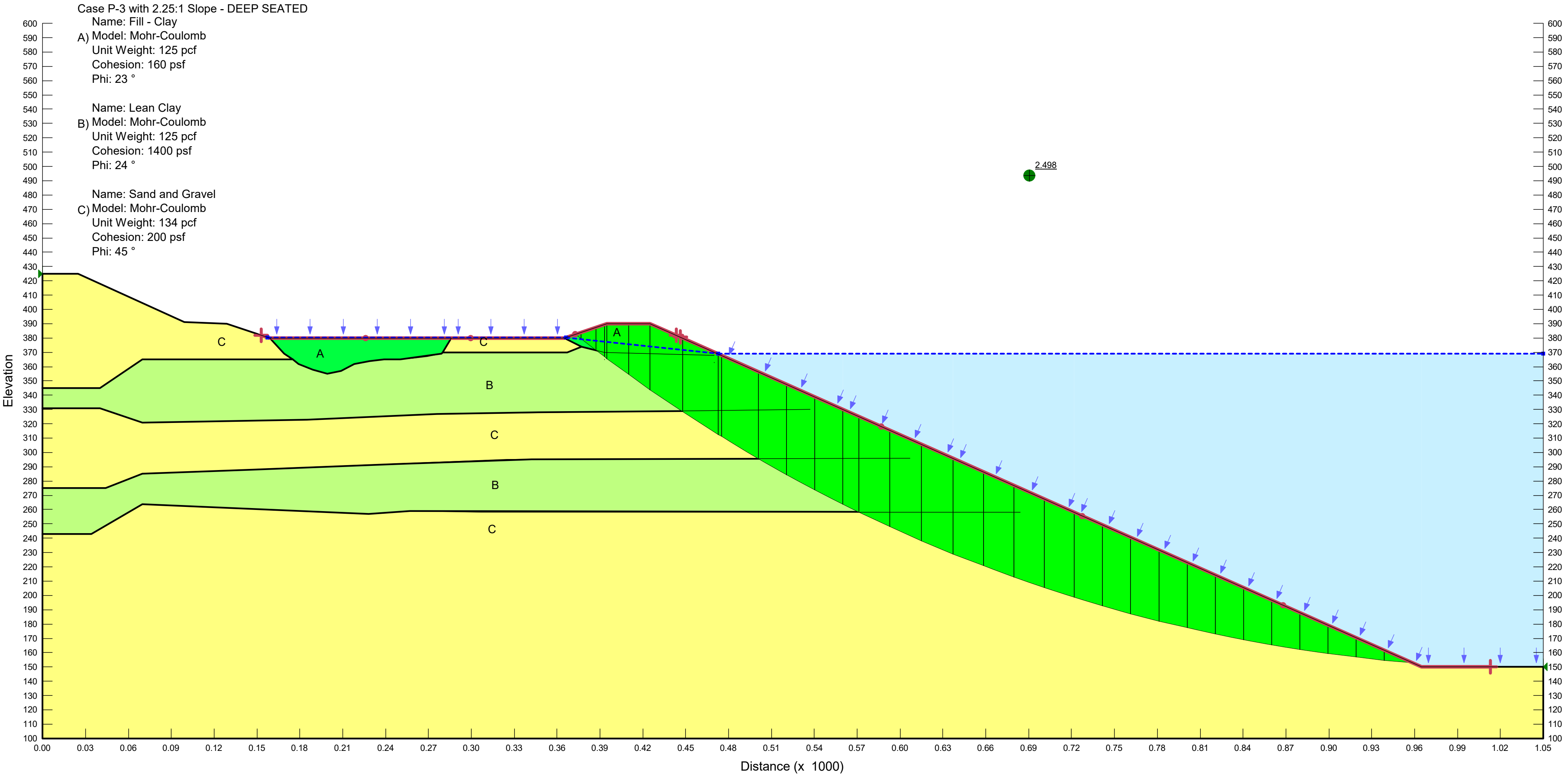
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °



Case P-3 with 2.25:1 Slope - SHALLOW
A)
Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B)
Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C)
Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
2.044
A
A
B
B
C
C
C
C
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)

Case P-3 with 2.25:1 Slope, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC





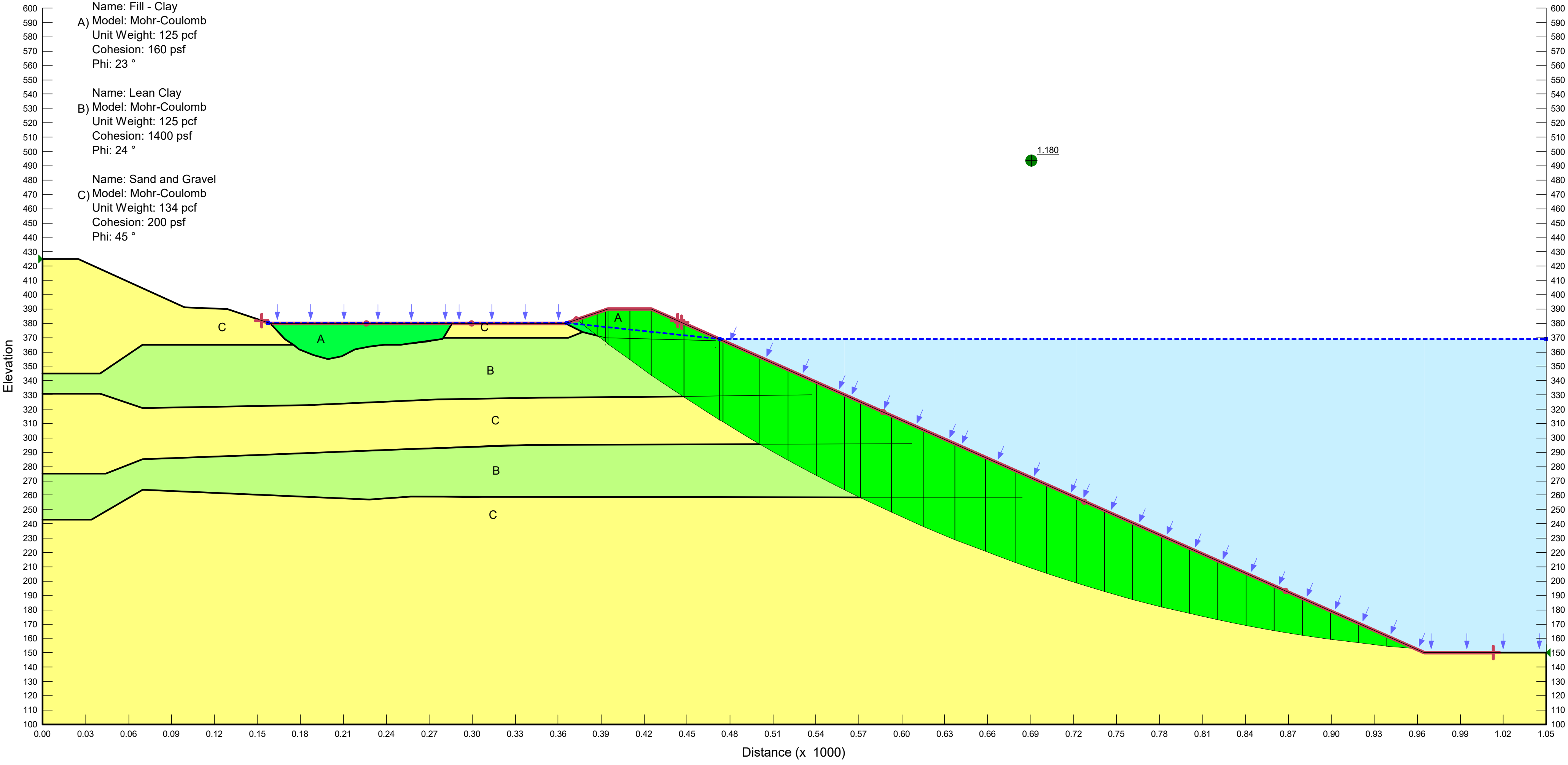
Case P-3 with 2.25:1 Slope - DEEP SEATED

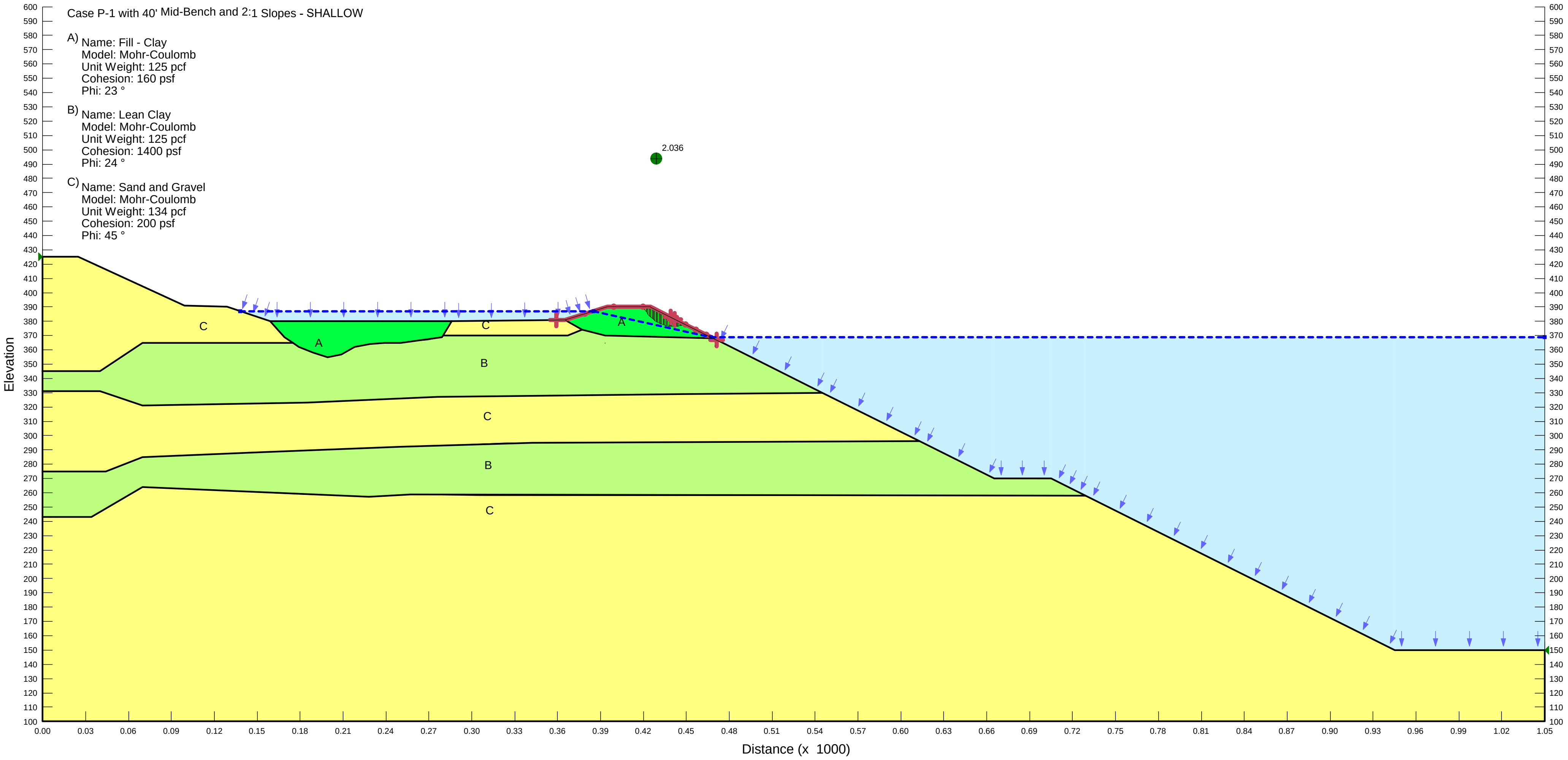
A)
Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B)
Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C)
Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

Case P-3 with 2.25:1 Slope, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC



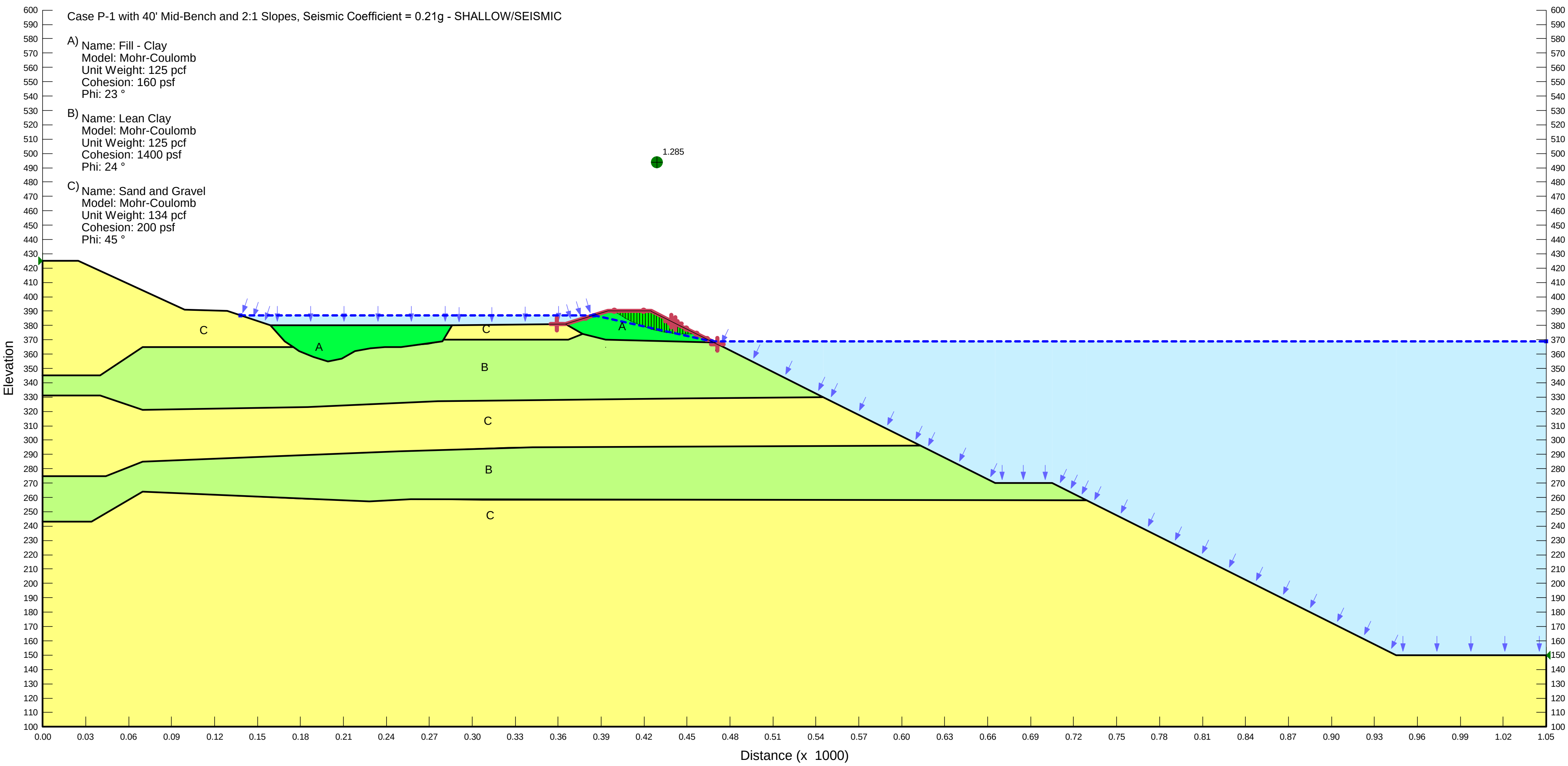


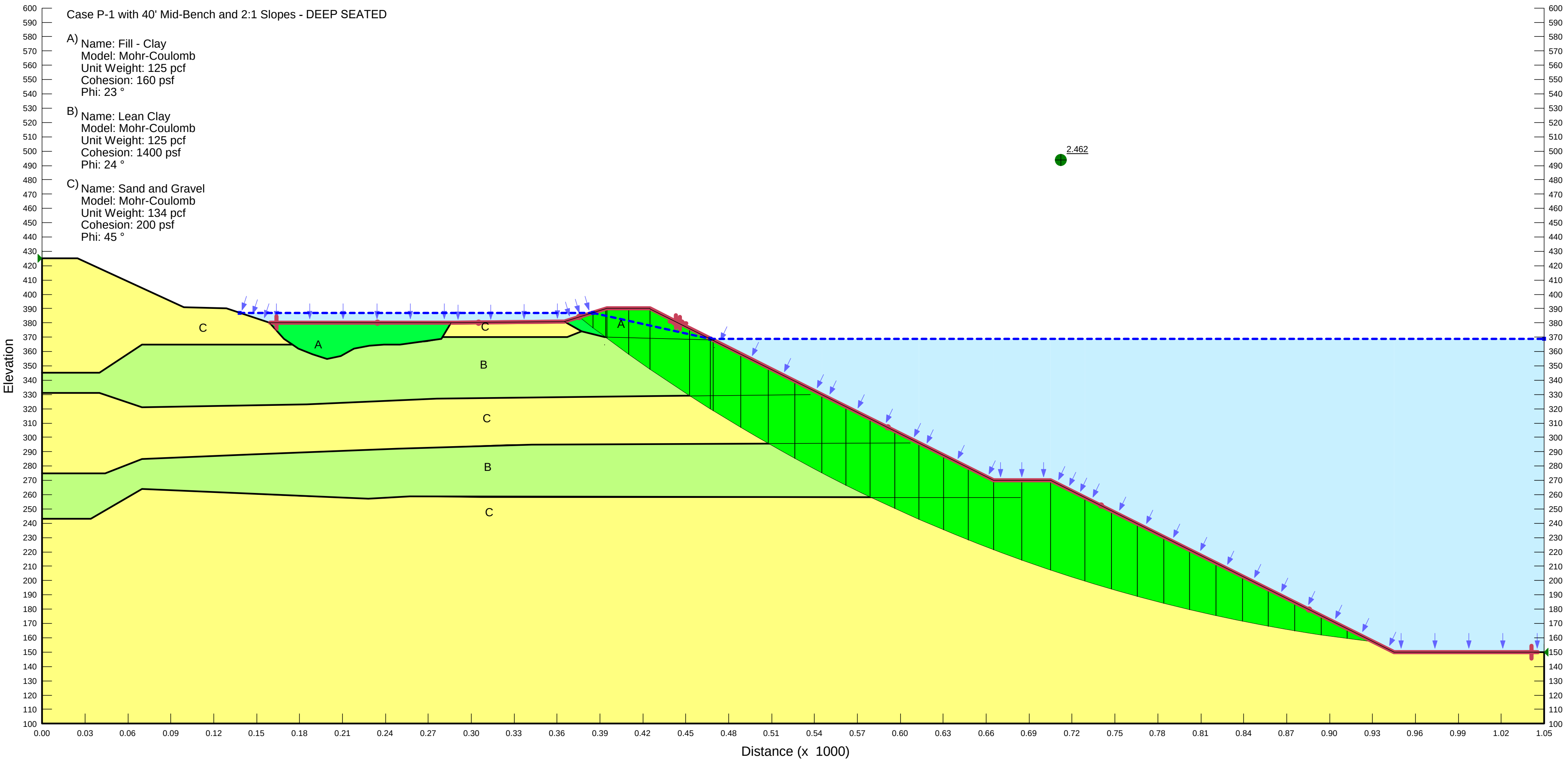
Case P-1 with 40' Mid-Bench and 2:1 Slopes - SHALLOW

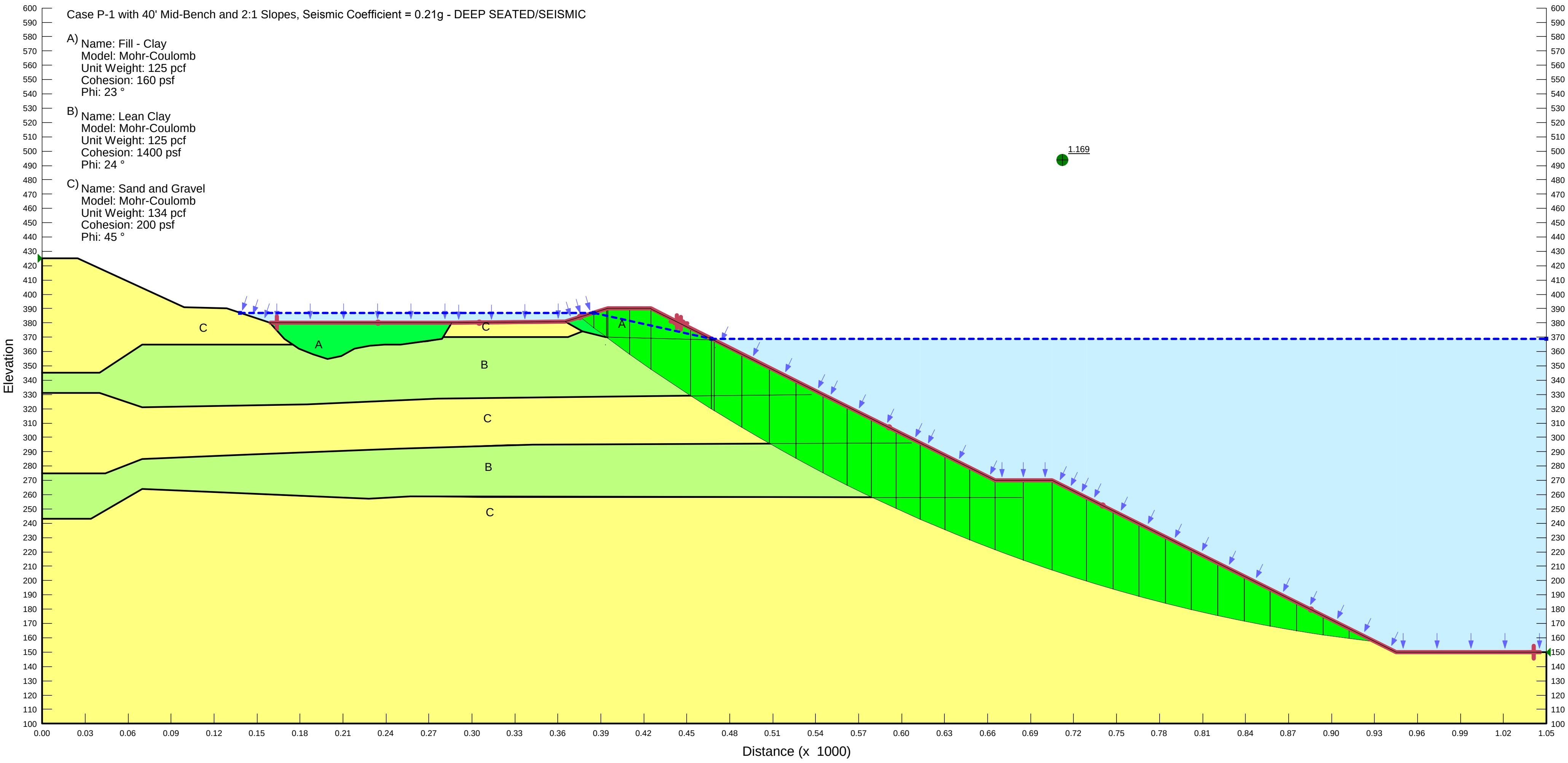
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °


Case P-1 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.285
A
A
B
B
C
C
C
C
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
Distance (x 1000)
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

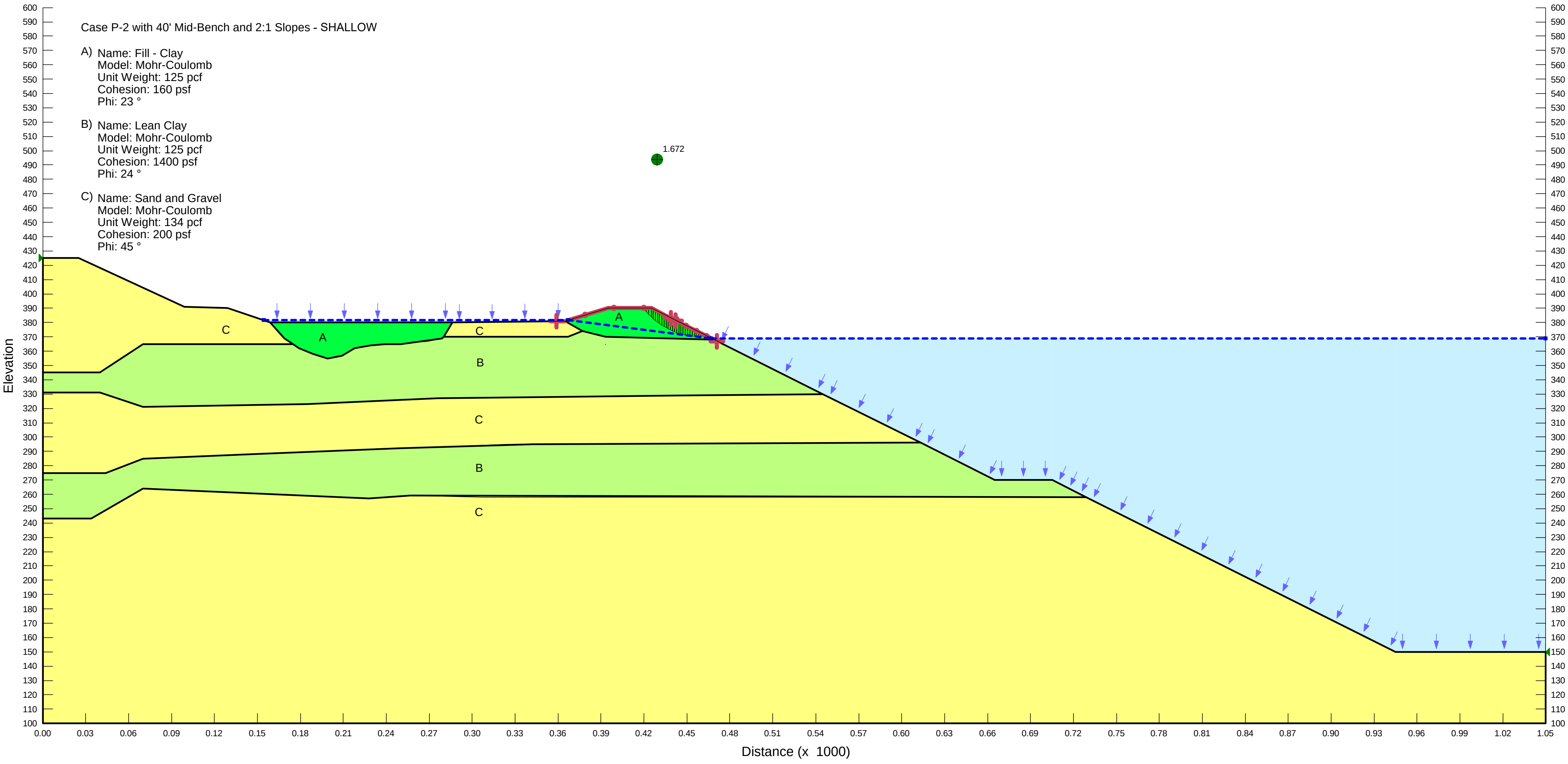

Case P-1 with 40' Mid-Bench and 2:1 Slopes - DEEP SEATED
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
2.462
A
B
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
Distance (x 1000)
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

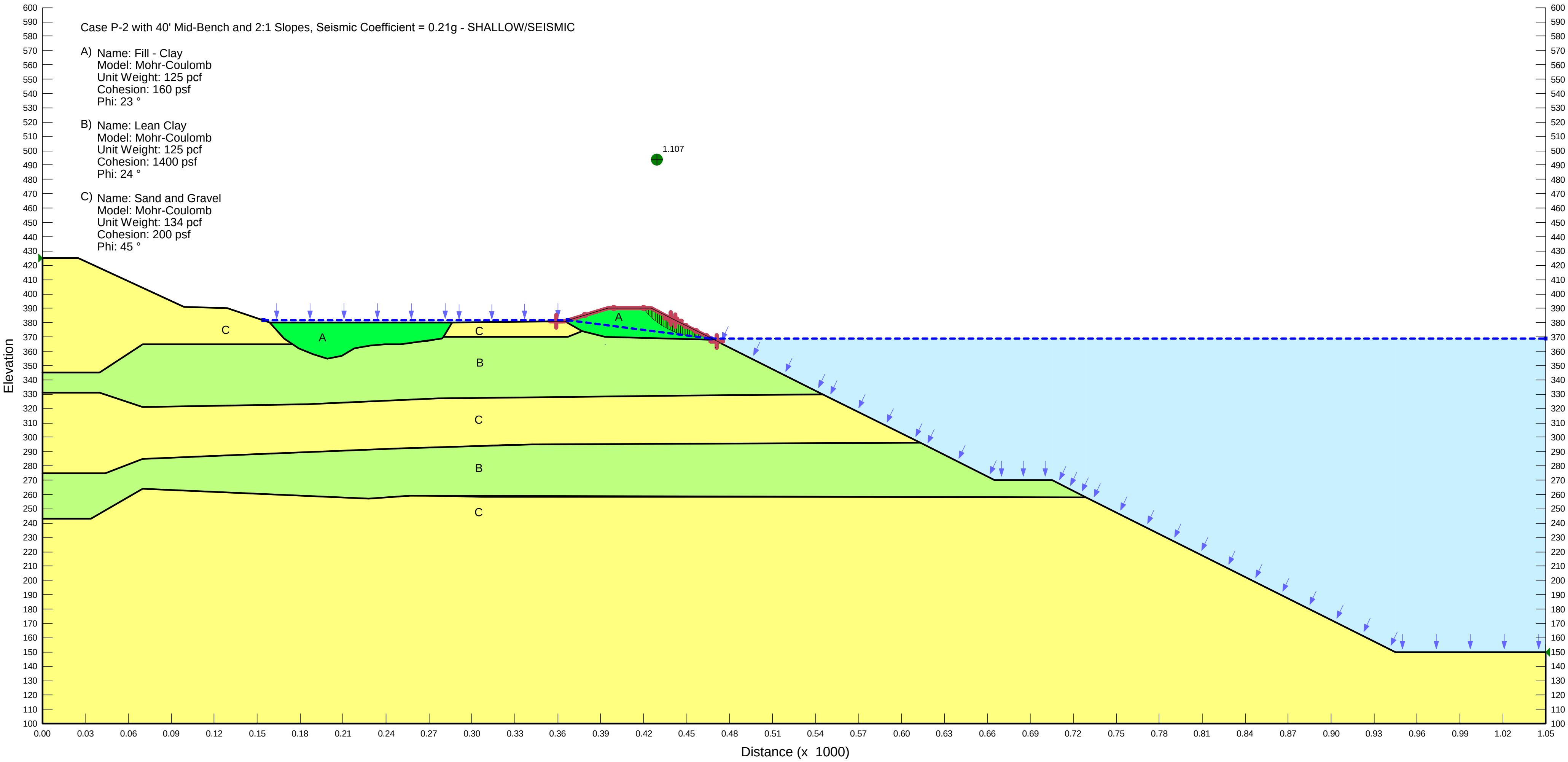

Case P-1 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °


Case P-2 with 40' Mid-Bench and 2:1 Slopes - SHALLOW
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.672
A
B
C
Elevation
Distance (x 1000)
100
150
200
250
300
350
400
450
500
550
600
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

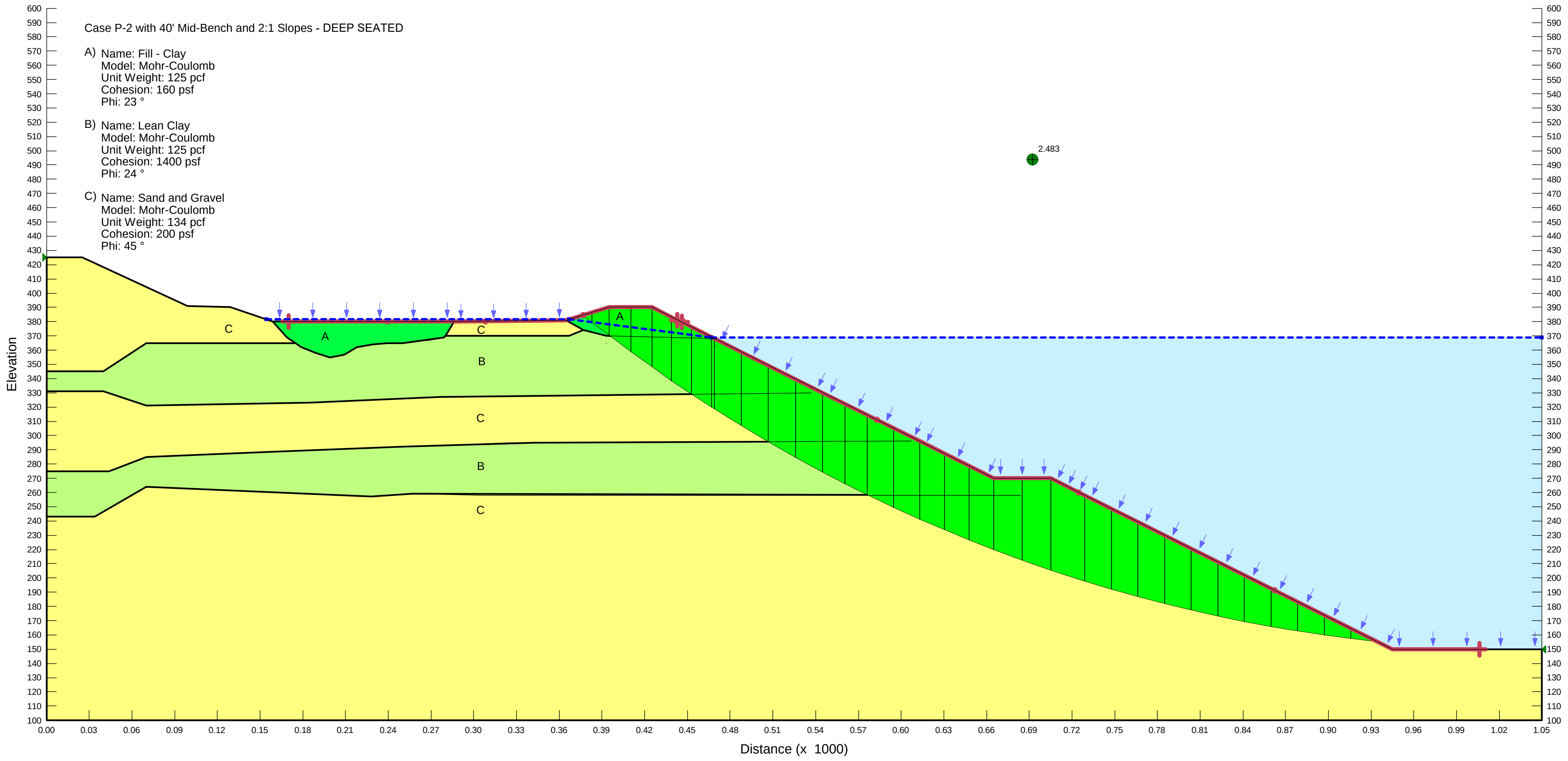


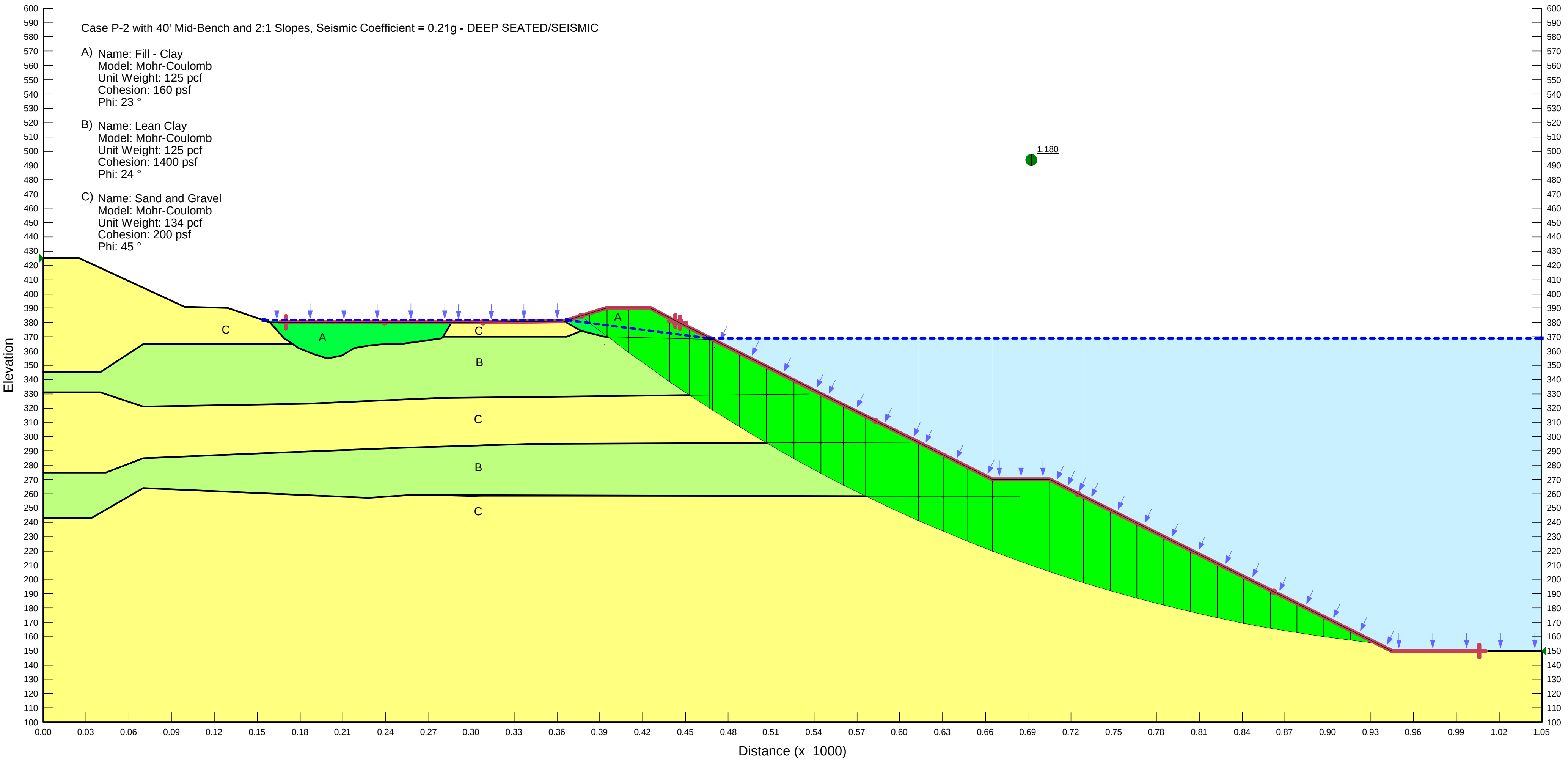
Case P-2 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

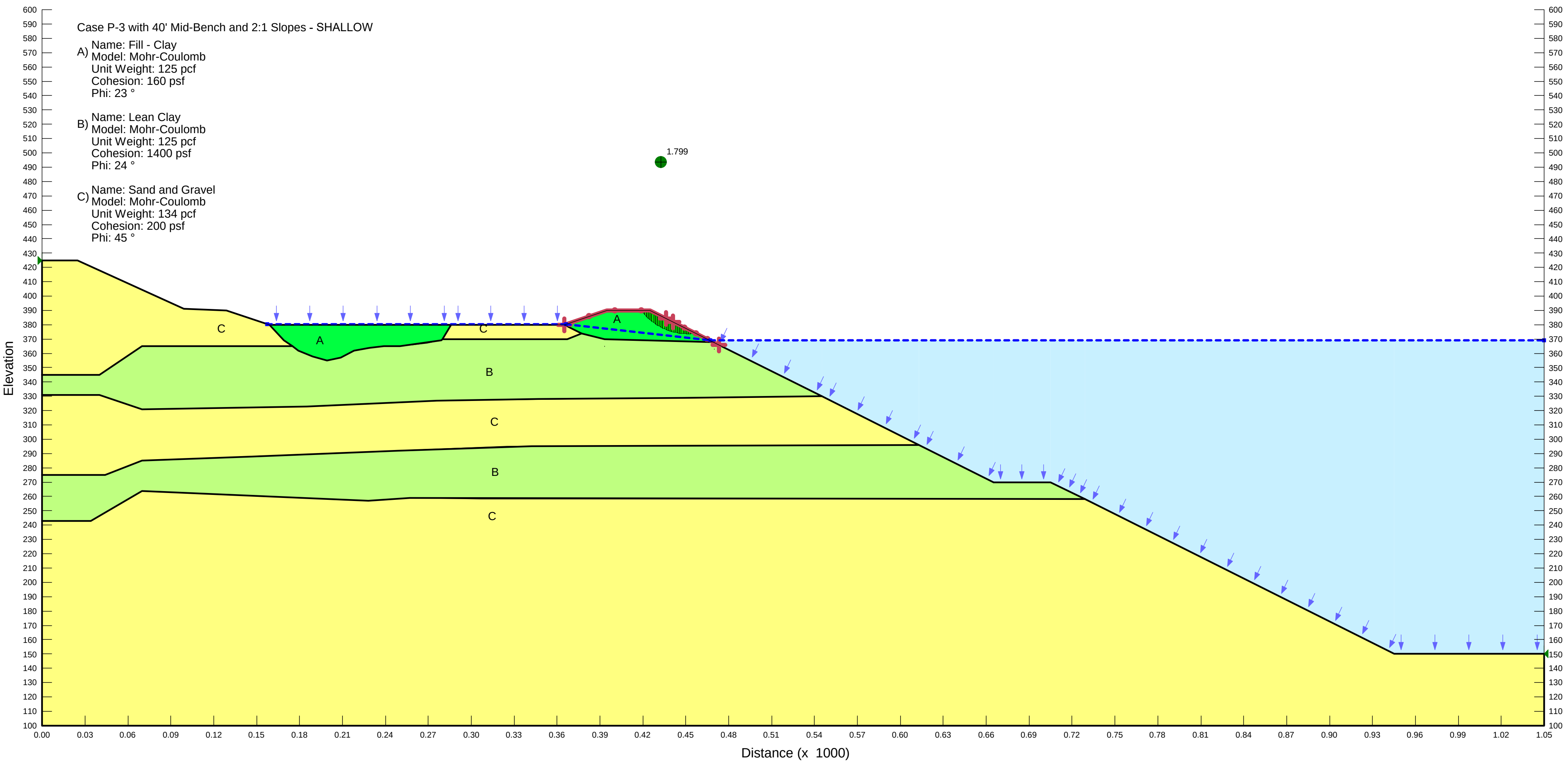
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

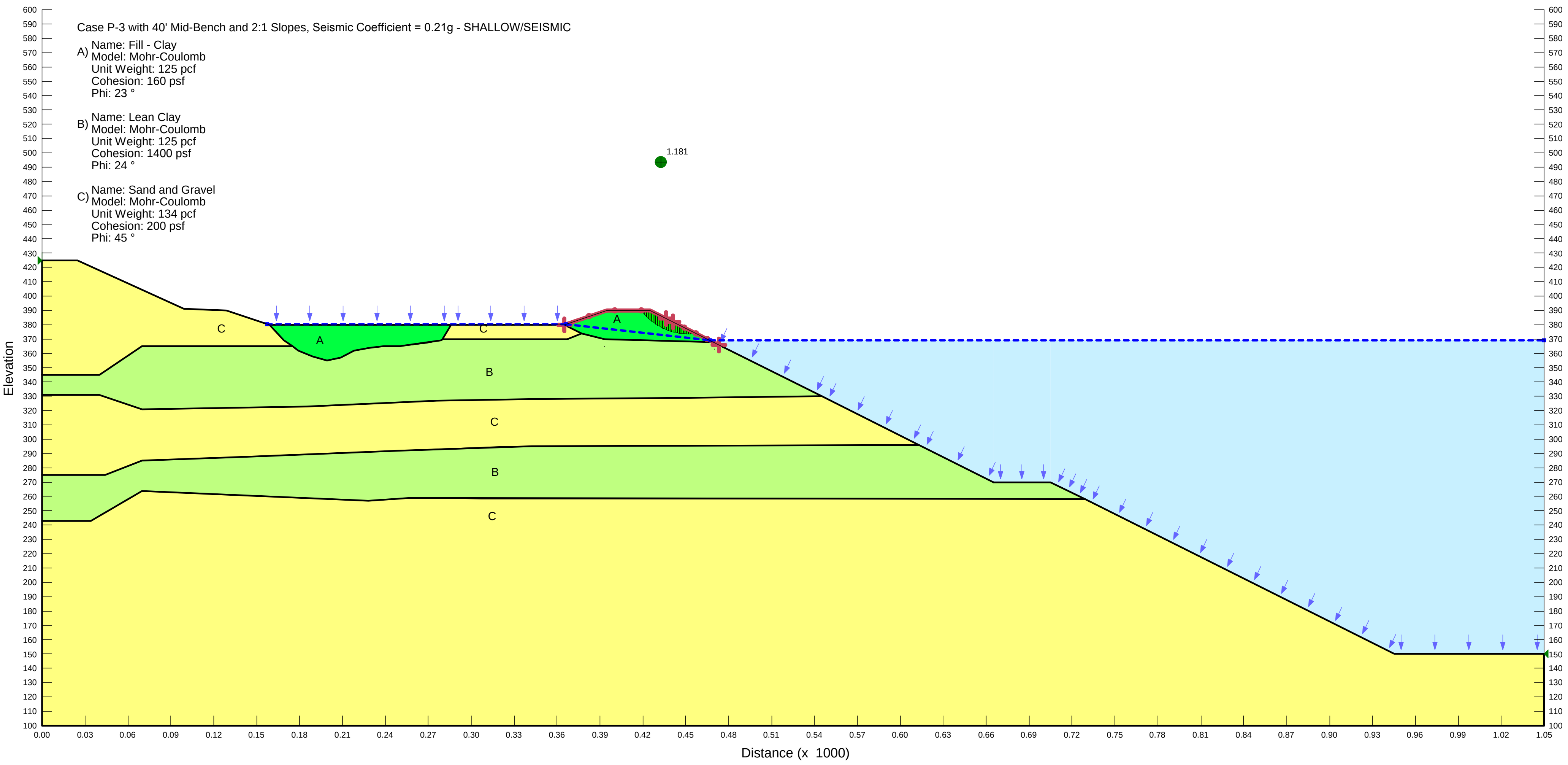
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

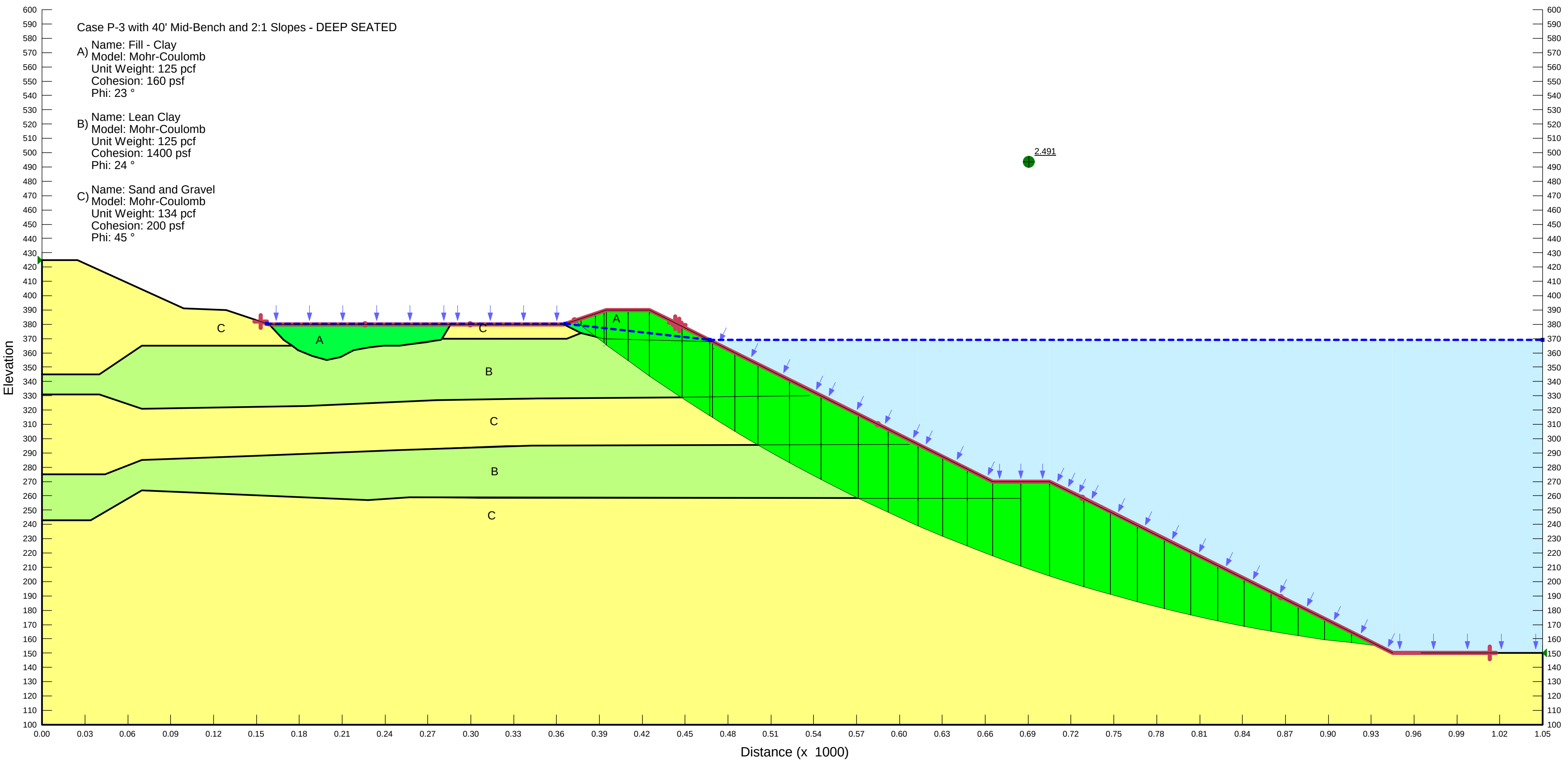

Case P-2 with 40' Mid-Bench and 2:1 Slopes - DEEP SEATED
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
2.483
A
B
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
Distance (x 1000)
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05

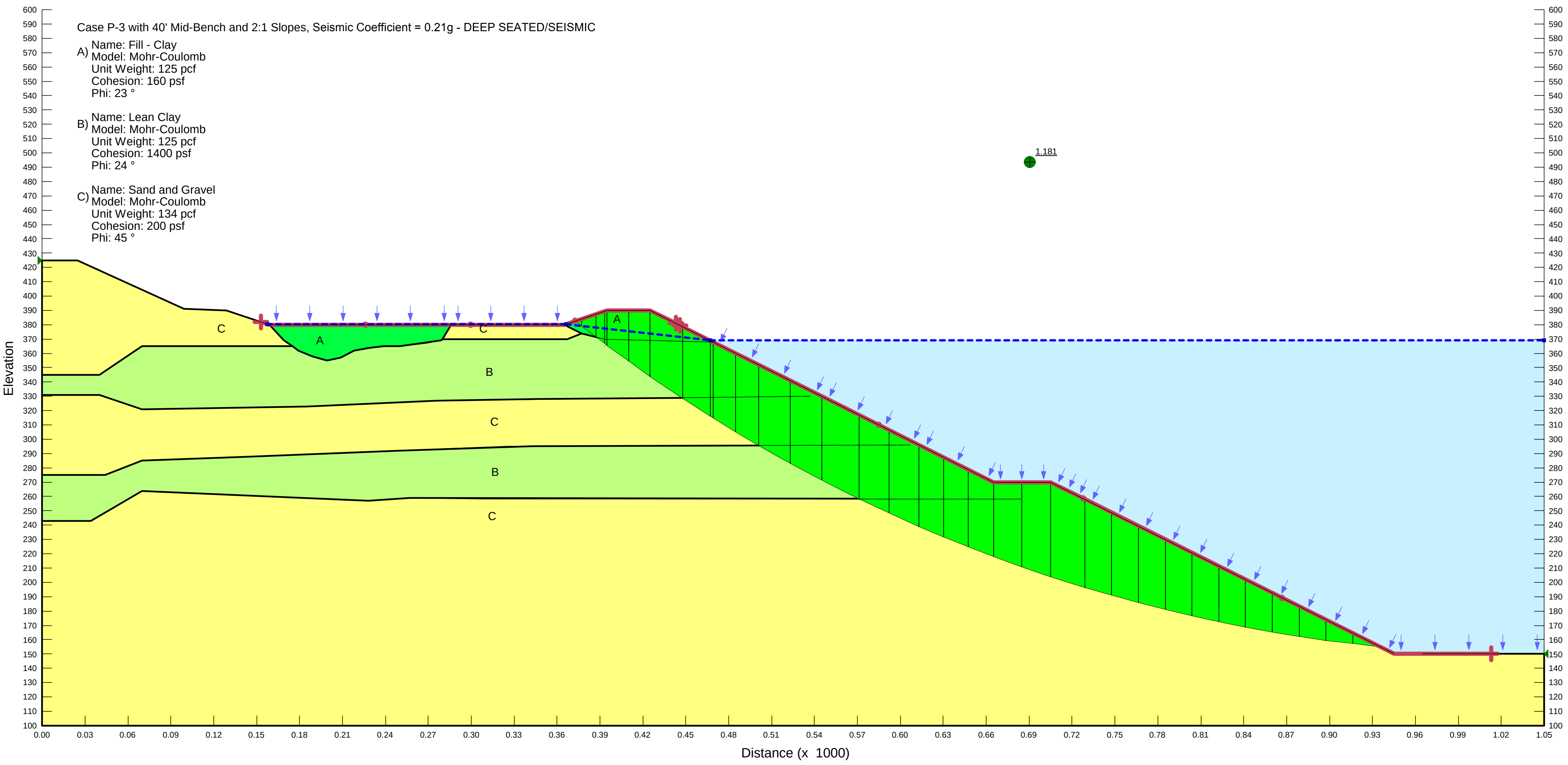


Case P-2 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC


Case P-3 with 40' Mid-Bench and 2:1 Slopes - SHALLOW
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.799
A
A
B
B
C
C
C
C
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)


Case P-3 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - SHALLOW/SEISMIC
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
1.181
A
B
C
Elevation
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370
380
390
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
Distance (x 1000)
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05


Case P-3 with 40' Mid-Bench and 2:1 Slopes - DEEP SEATED
A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °
B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °
C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °
2.491
A
A
B
B
C
C
C
C
C
Elevation
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
0.45
0.48
0.51
0.54
0.57
0.60
0.63
0.66
0.69
0.72
0.75
0.78
0.81
0.84
0.87
0.90
0.93
0.96
0.99
1.02
1.05
Distance (x 1000)

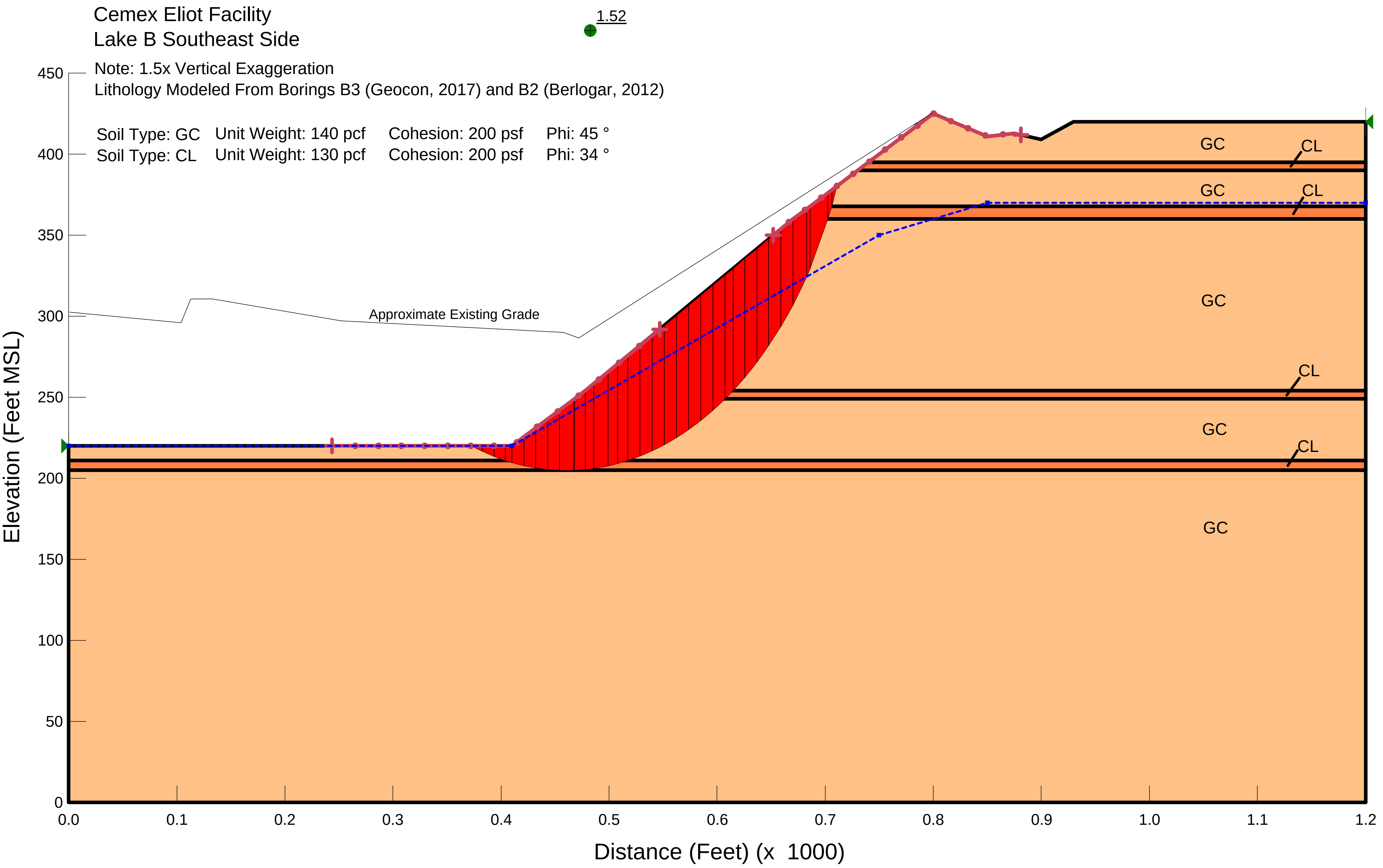


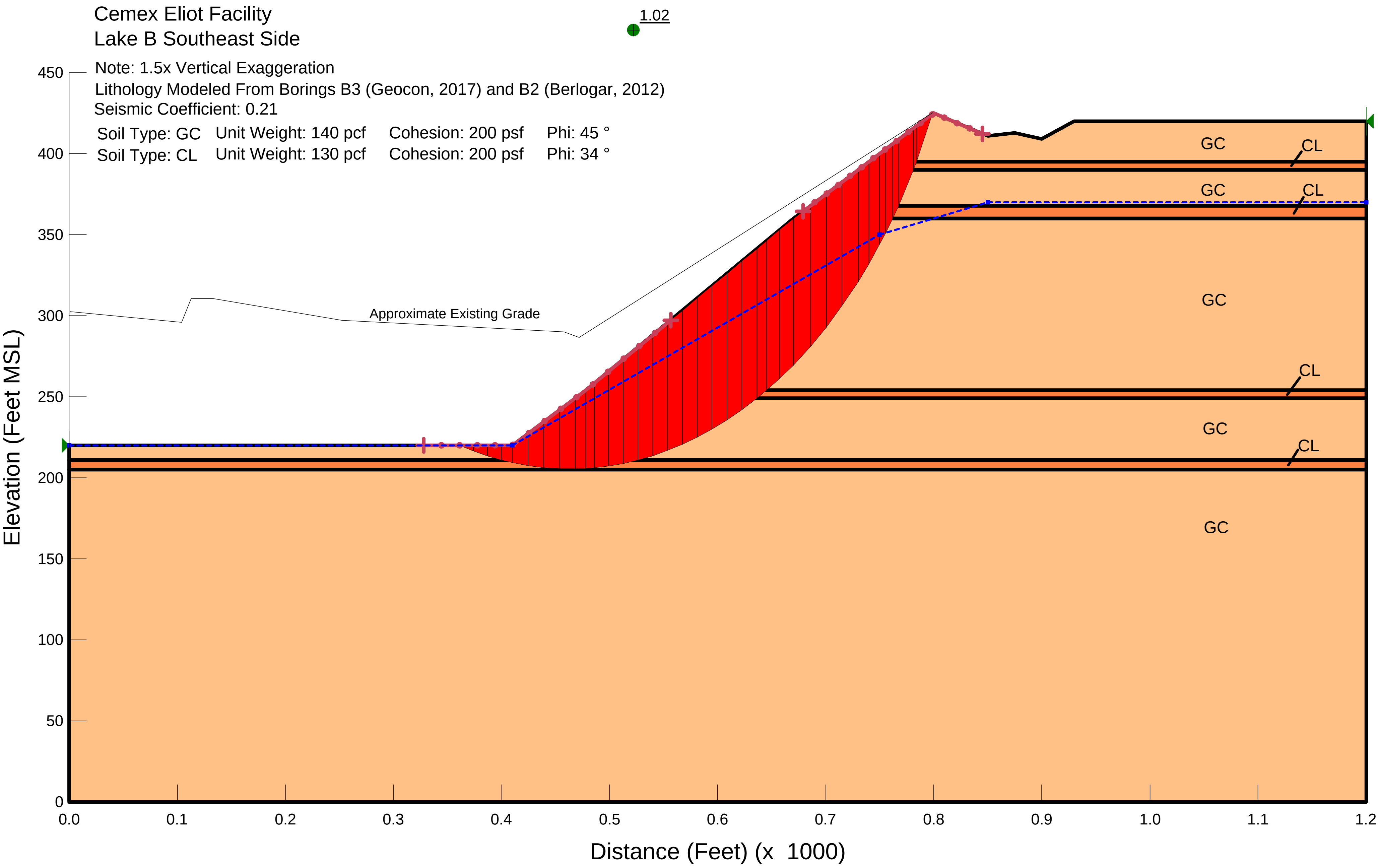
Case P-3 with 40' Mid-Bench and 2:1 Slopes, Seismic Coefficient = 0.21g - DEEP SEATED/SEISMIC

A) Name: Fill - Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 160 psf
Phi: 23 °

B) Name: Lean Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 1400 psf
Phi: 24 °

C) Name: Sand and Gravel
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion: 200 psf
Phi: 45 °

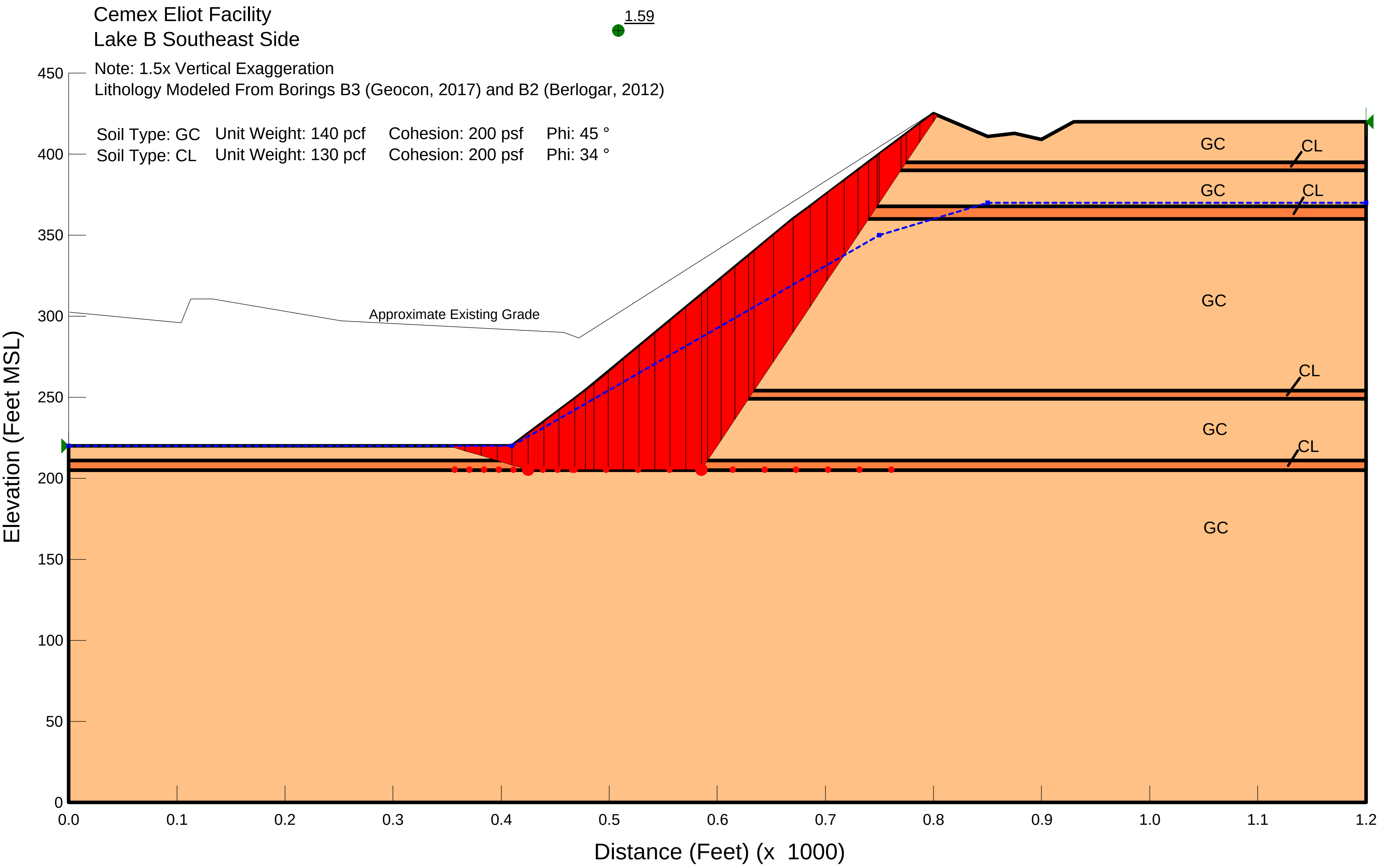

Cemex Eliot Facility
Lake B Southeast Side
1.52
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3 (Geocon, 2017) and B2 (Berlogar, 2012)
Soil Type: GC Unit Weight: 140 pcf Cohesion: 200 psf Phi: 45 °
Soil Type: CL Unit Weight: 130 pcf Cohesion: 200 psf Phi: 34 °
Approximate Existing Grade
GC
CL
GC
CL
GC
CL
GC
CL
GC
Elevation (Feet MSL)
450
400
350
300
250
200
150
100
50
0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
Distance (Feet) (x 1000)



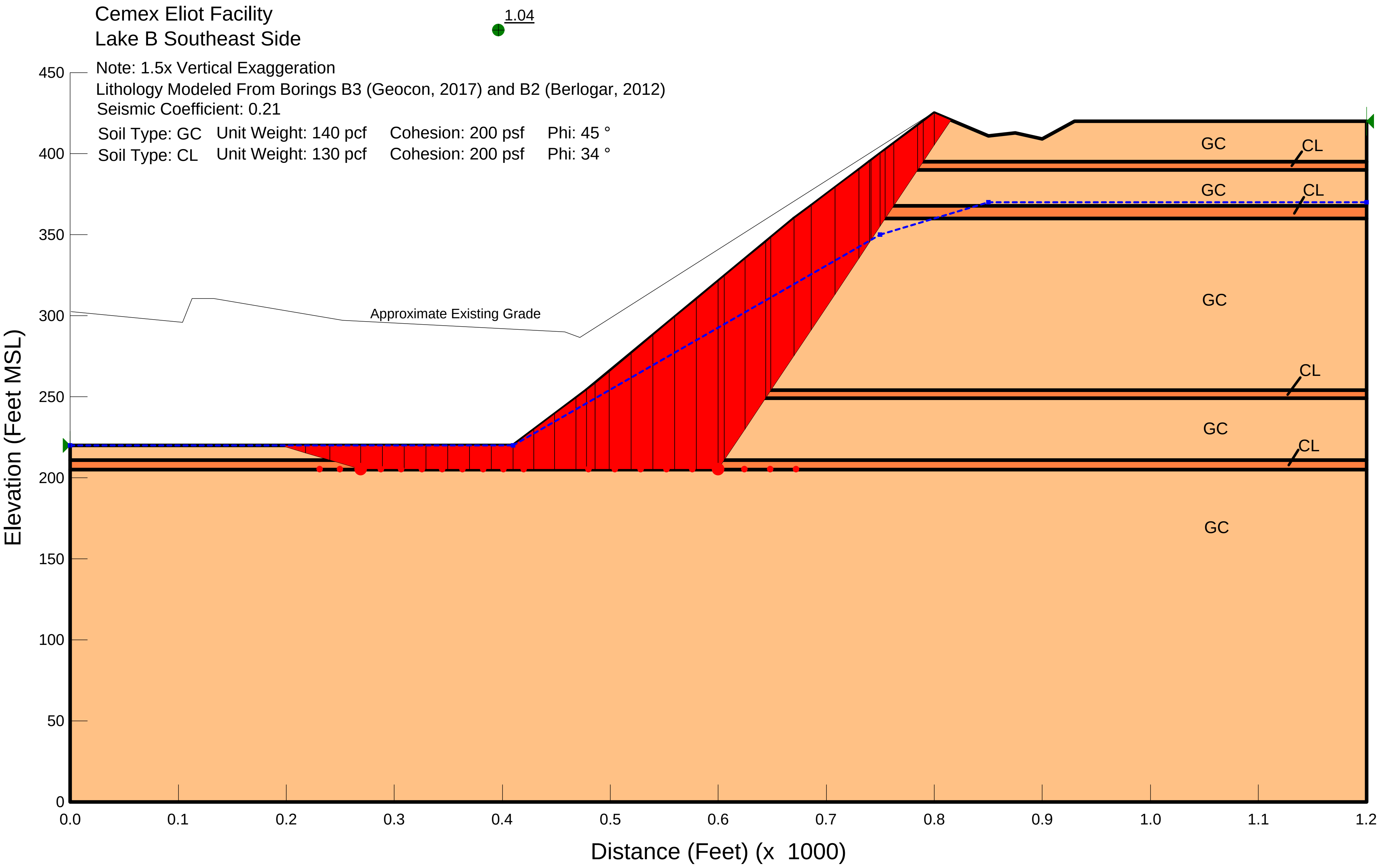
Cemex Eliot Facility
Lake B Southeast Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3 (Geocon, 2017) and B2 (Berlogar, 2012)
Seismic Coefficient: 0.21

Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °



Cemex Eliot Facility
Lake B Southeast Side
1.59
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3 (Geocon, 2017) and B2 (Berlogar, 2012)
Soil Type: GC Unit Weight: 140 pcf Cohesion: 200 psf Phi: 45 °
Soil Type: CL Unit Weight: 130 pcf Cohesion: 200 psf Phi: 34 °
Approximate Existing Grade
GC
CL
GC
CL
GC
CL
GC
CL
GC
Elevation (Feet MSL)
450
400
350
300
250
200
150
100
50
0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
Distance (Feet) (x 1000)


Cemex Eliot Facility
Lake B Southeast Side
1.04
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3 (Geocon, 2017) and B2 (Berlogar, 2012)
Seismic Coefficient: 0.21
Soil Type: GC Unit Weight: 140 pcf Cohesion: 200 psf Phi: 45 °
Soil Type: CL Unit Weight: 130 pcf Cohesion: 200 psf Phi: 34 °
Approximate Existing Grade
GC
CL
GC
CL
GC
CL
GC
CL
GC
Elevation (Feet MSL)
450
400
350
300
250
200
150
100
50
0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
Distance (Feet) (x 1000)