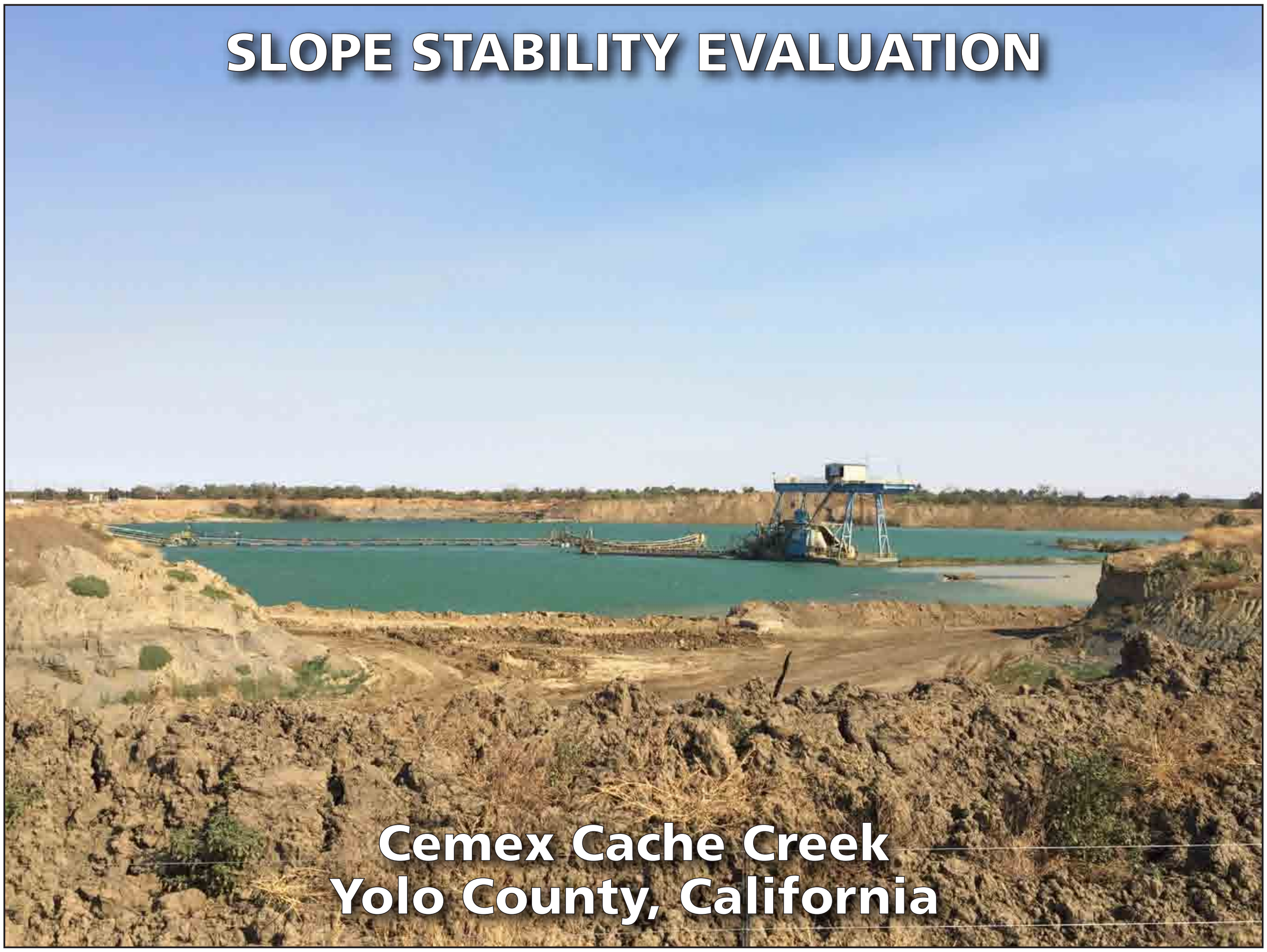
SLOPE STABILITY EVALUATION



Cemex Cache Creek
Yolo County, California

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GEOCON PROJECT NO. S1294-05-01

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GEOCON
CONSULTANTS, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. S1294-05-01
February 22, 2018

VIA ELECTRONIC MAIL

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Subject: SLOPE STABILITY EVALUATION
CEMEX CACHE CREEK MINE
MINING PERMIT AND RECLAMATION PLAN AMENDMENT PROJECT
YOLO COUNTY, CALIFORNIA

Dear Ms. Haldeman:

In accordance with your authorization of our proposal (Geocon proposal No. S1294-05-01P, dated September 27, 2017), we have performed a geotechnical evaluation of the slopes associated with the Cemex Cache Creek Mine in Yolo County, California. Our study will be used to support the *Mining Permit* and *Reclamation Plan Amendment* Project.

The accompanying report presents our findings, conclusions, and recommendations regarding geotechnical aspects of mining and reclamation slope configurations as presently proposed. Based on the results of our study, the proposed perimeter mining and reclamation slopes are anticipated to meet the performance standards set forth in the *Yolo County Off-Channel Surface Mining Ordinance, Yolo County Surface Mining Reclamation Ordinance* and the California *Surface Mining and Reclamation Act*. In our opinion, the proposed project is feasible from a geotechnical viewpoint provided the recommendations of this report are followed.

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

Sincerely,

GEOCON CONSULTANTS, INC.

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1.0 INTRODUCTION

Geocon Consultants, Inc. has prepared this slope stability evaluation in support of the CEMEX Construction Materials Pacific, LLC. (CEMEX) Cache Creek Mining Permit and Reclamation Plan Amendment Project (Project). Specifically, CEMEX proposes to modify Long-Term Off-Channel Mining Permit No. ZF #95-093, Reclamation Plan No. ZF #95-093 and Development Agreement No. 96-287 (as subsequently amended, "Existing Entitlements") with revised mining and reclamation plans and a 20 year time extension. This report presents results of our geotechnical investigation for evaluation of slopes associated with the Cemex Cache Creek Mine (Mine) in Yolo County, California. The approximate site location is shown on the Vicinity Map, Figure 1.

The following geotechnical report was previously prepared for the site: *Slope Stability Analysis, Solano Concrete Madison Plant, Highway 505 and Highway 16, Yolo County, California*, prepared by Kleinfelder, Inc. (File No. 40-2695-01), dated August 1, 1994. The Kleinfelder report was based on 13 exploratory borings performed throughout the site to depths ranging from approximately 45 to 90 feet. The Kleinfelder study also included laboratory testing and numerical slope stability analyses for the proposed mining and reclamation slopes. As part of our study, we have reviewed and incorporated pertinent subsurface and laboratory testing information from the 1994 Kleinfelder report.

The purpose of our study was to further evaluate subsurface conditions, determine pertinent geotechnical parameters, and evaluate slope stability for proposed mining and reclamation slopes under static and dynamic (seismic) conditions with respect to the performance standards outlined in the Yolo County *Off-Channel Surface Mining Ordinance* (OCSMO), Yolo County *Surface Mining Reclamation Ordinance* (SMRO) and California *Surface Mining and Reclamation Act* (SMARA).

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

- Reviewed published geologic maps, geotechnical reports, and other literature pertaining to the site. A list of referenced material is included in Section 11.0 of this report.
- Reviewed available plans for the project to select areas of exploration.
- Performed a site reconnaissance to review project limits, determine access and mark out exploratory excavation locations for subsequent utility clearance.
- Paid required fees and obtained a soil boring permit from Yolo County Environmental Health Department (YCEHD).
- Notified subscribing utility companies via Underground Service Alert (USA) a minimum of 2 business days prior to performing exploratory excavations at the site.
- Retained the services of a California C57-licensed drilling subcontractor to perform exploratory borings using truck-mounted drilling equipment.
- Performed four exploratory borings (B1 through B4) using a truck-mounted drill rig equipped with hollow-stem auger drilling equipment to depths ranging from approximately 5 to 86 feet.
- Logged the borings in accordance with the Unified Soil Classification System (USCS).

- Obtained soil samples from the borings.
- Performed laboratory tests on selected soil samples to evaluate pertinent geotechnical parameters.
- Performed slope stability and seepage analyses for the proposed mining and reclamation slopes considering both static and seismic conditions.
- Prepared this report summarizing our findings, conclusions and recommendations regarding the geotechnical aspects of the proposed project.

Approximate locations of current and previous subsurface explorations are shown on the Site Plan, Figure 2. Details of our field exploration program including exploratory boring logs (current and previous) are presented in Appendix A. Details of our laboratory testing program and test results are summarized in Appendix B. Details of our slope stability and seepage analyses are summarized in Appendix C. Details of our liquefaction analyses are summarized in Appendix D.

2.0 SITE AND PROJECT INFORMATION

The CEMEX property occupies approximately 1,900 acres south of Cache Creek, and north of State Route 16 both on the west and east sides of Interstate 505 (I-505).

2.1 Existing Entitlements

Under Existing Entitlements, mining is allowed on ±586 acres in seven phases. Mining is currently taking place in Phases 3 and 4, while Phase 1 is in various stages of reclamation. Dewatering for mining purposes is not currently permitted, but may be permitted in the future subject to compliance with OCSMO requirements. The site is currently mined dry and "wet-mined" using a dredge (Photo 1). A typical undisturbed portion of the site (currently used for agriculture) is shown in Photo 2.

Existing Entitlements and the supporting 1994 Kleinfelder Report generally conform to the following plans:

1. *Off-Channel Mining Plans, Madison Plant, Yolo County, California* (21 Sheets) prepared by Cunningham Engineering, dated November 1995.
2. *Off-Channel Reclamation Plans, Madison Plant, Yolo County, California* (22 Sheets) prepared by Cunningham Engineering, dated November 1995.

The 1995 mining plans (Ref. 1) generally show that excavated mining slopes are to be inclined at 1.5H:1V (horizontal to vertical) 5 feet below the Average Low Groundwater (ALG) level and 2H:1V above this level. The 1995 reclamation plans (Ref. 2) show the various pit backfill (reclamation) surfaces within each pit, including "alluvial separators" (or berms) between pits.

We understand that mining activities at the site have differed from the 1995 mining plans in limited areas and that the Project will address these deviations through a set of revised mining and reclamation plans. More specifically, one or more of the intended alluvial separators has been removed by mining.

2.2 Proposed Project

The Project proposes to continue to mine on 489± acres in seven phases and reclamation is proposed to occur on 838± acres of the 1,902± acre property. The maximum mining depth is 70 feet. Reclamation will consist of returning the mined areas to agriculture, permanent lakes and wildlife habitat as detailed in a *Revised Reclamation Plan* prepared by Compass Land Group. The Project includes revised mining plans and a reclamation plan that will include a "constructed" alluvial separator between Phases 3 and 4 and the development of a "natural" alluvial separator between an existing and future mining pit (i.e., between Phases 4 and 5). The "constructed" alluvial separator will be comprised of cobble and gravel mixed with clay (Photos 3 and 4) and the "natural" alluvial separator will consist undisturbed, natural ground between existing and future mining pits. The purpose of the constructed alluvial separator is to re-purpose proposed Phase 3 as a silt pond (to accept and settle process wash fines). The purpose of the future developed natural alluvial separator between proposed Phases 4 and 5 is to facilitate backfilling of Phase 4 for a return to agriculture while maintaining a stable separation for the future open water lake in future Phase 5.

Based on the preliminary revised mining plans (Cunningham Engineering, January 2018), the Project includes seven phases as described in Table 2.2.

TABLE 2.2
MINING DETAILS

Phase	Proposed Mining Areas (acres)	Maximum Pit Depth (feet)	Groundwater Elevation (feet MSL)	
			Avg. High	Avg. Low
Phase 1	*Reclaimed Agricultural Land in Progress – No Additional Mining*			
Phase 2	*No Additional Mining – Area to be used for product stockpiling*			
Phase 3	67	70	114	107
Phase 4	137	70	112	107
Phase 5	135	70	111	105
Phase 6	135	70	108	100
Phase 7	15	35	121	116

Under existing conditions, Phases 1, 3 and 4 encompass the area of the current and previous mining pits, immediate south of Cache Creek. Phase 2 was partially mined (pursuant to allowances under Existing Entitlements) and currently supports existing aggregate product stockpiles. Phases 3 and 4 are in various stages of mining and reclamation. Phases 5, 6, and 7 have not been mined.

Under the proposed Project, no further mining is planned in proposed Phases 1 and 2. The revised mining plan focuses primarily on future mining in Phases 3 through 7. The proposed site configuration and phasing are shown on the Site Plan, Figure 2.

Similar to Existing Entitlements, the proposed Project's mining will create slopes of varying height and inclinations. Some of these mining and reclamation slopes will intercept the groundwater potentiometric surface. The OCSMO Section 10-4.431 stipulates that:

> "Except where benches are used, all banks above groundwater level shall be sloped no steeper than 2:1 (horizontal:vertical). Proposed steeper slopes shall be evaluated by a slope stability study, prepared by a Registered Civil Engineer. Slopes below the groundwater level shall be no steeper than 1:1 (horizontal:vertical). Slopes located five (5) feet or less below the summer low groundwater level shall not be steeper than 2:1 (horizontal:vertical)."

The slope inclinations stipulated by the SMRO Section 10-5.530 are generally consistent with these requirements. However, the SMRO Section 10-5.530 also stipulates that:

> "…the minimum factor of safety for all design reclamation slopes located adjacent to levees or below existing structures shall not be less than 1.5 for static and 1.1 for pseudostatic (seismic) conditions. Other reclamation slopes shall meet a minimum factor of safety that is consistent with the post-reclamation use proposed for the mining area."

Consistent with the OCSMO and SMRO, the Project proposes typical slope mining configurations of 2H:1V to 5 feet below the ALG level and up to 1:1 below this level. Typical mining slope configurations are shown on Figures 3-1 through 3-4.

As mining is completed in each phase, reclamation will generally include filling Phase 3 with mostly pond fines (silt) resultant from onsite aggregate processing as well and filling Phase 4 with excavated/stockpiled overburden and topsoil. In general, Phases 1 through 4 will be reclaimed to agriculture whereas Phases 5 and 6 will be reclaimed as "lakes." Phase 7 will also be reclaimed to agriculture. Phases 1 and 2 are generally already at their finish reclamation design elevation. Phases 3 and 4 are planned to be filled to at least 5 feet above the *Average High Groundwater* (AHG) level.

Reclamation will occur in phases and will require the "constructed" alluvial separator between Phases 3 and 4. The "constructed" alluvial separator will be comprised of cobble (generally 3½ to 7 inches) and gravel mixed with clay (Photos 3 and 4) with side slopes of 4H:1V or flatter. Per Cemex, this material will be placed by dumping and pushing out/contouring using a dozer. A typical "constructed" alluvial separator detail is shown on Figure 3-4. No backfill will be required for the developed natural alluvial separator between Phases 4 and 5. Phase 7 will also be reclaimed to an elevation at least 5 feet above the AHG level.

3.0 SOIL AND GEOLOGIC CONDITIONS

We identified soil and geologic conditions by performing exploratory borings, reviewing the boring logs contained in the 1994 Kleinfelder report, and reviewing the referenced geologic literature (Section 11.0). Soil descriptions provided below include the USCS symbol where applicable.

Based on the *Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills* (Helley and Harwood, 1985), the site is underlain by Holocene-aged stream channel deposits. These depositional and erosional deposits are associated with open, active stream channels and generally consist of unweathered gravel, sand, silt, and clay.

The overburden soil at the site consists of an approximate 5- to 15-foot-thick layer of interbedded silty sand (SM), silt (ML), silty clay (CL-ML), sandy clay (CL), clay (CL), and clayey sand (SC). The gravelly soil below the overburden generally consists of loose to very dense poorly graded sand (SP), poorly graded sand with gravel (SP), poorly graded gravel with sand (GP), and silty gravel with sand (GM), with thin (up to 5 feet) interbedded layers of clay (CL) and poorly graded sand with silt (SP-SM) and scattered small cobbles up to 4 inches. The gravel and cobbles include slightly weathered to fresh metavolcanic and metasedimentary rock with some quartz and chert. The strata proposed for mining overlays a very stiff to hard clay layer.

Based on the available subsurface information, top and bottom elevations of the soil layers are relatively consistent suggesting relatively flat stratigraphy with no significant dip, which is consistent with the erosional/depositional geology of the area. The general subsurface profile at the site is shown on Figures 3-1 through 3-4.

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

4.0 GROUNDWATER

We encountered groundwater in Borings B1 and B2 at depths of 25 and 35 feet, respectively, on October 12 and 13, 2017. These depths correspond to approximate groundwater elevations of 105 and 108 feet, which are near the predicted AHG near the boring locations.

Table 4.0 presents the estimated AHG and ALG levels at the site (Luhdorff and Scalmanini, April 2017):

TABLE 4.0
ESTIMATED AVERAGE HIGH AND LOW GROUNDWATER ELEVATIONS

Groundwater Condition	Groundwater Elevation (Feet, MSL)	
	West	East
Average High	113	105
Average Low	108	100

5.0 SEISMICITY AND GEOLOGIC HAZARDS

5.1 Mapped Geologic Hazard Zones

The site is not located in any currently established official geologic hazard zones (e.g. liquefaction, active faulting, landslides) established by the California Geologic Survey (CGS) or the local agency specific plan element.

5.2 Surface Fault Rupture

The numerous faults in Northern California include active, potentially active, and inactive faults. The criteria for these major groups were developed by the CGS for the Alquist-Priolo Earthquake Fault Zone (APEFZ) Program (Bryant and Hart, 2007). By definition, an active fault is one that has had surface displacement within the last 11,000 years. A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years) but has had no known movement within the past 11,000 years. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not located within a currently established APEFZ. Based on our reconnaissance, evidence obtained in exploratory borings, and our review of geologic maps and reports, no active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site is considered low. The site, however, is located in a seismically active area and could be subjected to ground shaking in the event of an earthquake on one of the many active Northern California faults.

5.3 Seismicity

In order to evaluate the distance of closest known active faults to the site, we reviewed geologic maps and used the computer program *EQFAULT*, (Version 3, Blake, 2000). Principal references used within *EQFAULT* are Jennings (1975), Anderson (1984) and Wesnousky (1986). The results of the query indicate the Great Valley Fault System and a segment of the Dunnigan Hills Fault, located approximately 6 miles to the west and northwest, respectively, are the closest known active faults to the site.

We used the United States Geological Survey (USGS) *Unified Hazard Tool* (https://earthquake.usgs.gov/hazards/interactive/) to determine the deaggregated seismic source parameters including controlling magnitude and fault distance. The USGS estimated modal magnitude is 6.5, the estimated Peak Ground Acceleration (PGA) for the Maximum Considered Earthquake (MCE) with a 2,475-year return period is 0.53g, and the modal distance is 15 km.

We used the online USGS application *Seismic Design Maps* to evaluate the site class modified, design-level Peak Ground Acceleration (PGA_M) for the site, for use in liquefaction and seismic slope stability analysis. The PGA_M for the site is 0.49g.

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. The site could be subjected to ground shaking in the event of a major earthquake along the faults mentioned above or other area faults. However, the seismic risk at the site is not considered to be significantly greater than that of other sites in the area.

5.4 Liquefaction

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary loss of shear strength due to pore pressure buildup under the cyclic shear stresses associated with earthquakes. Primary factors that trigger liquefaction are: strong ground shaking (seismic source), relatively clean, loose granular soils (primarily poorly graded sands and silty sands), and saturated soil conditions.

The site is not located in a currently established State of California Seismic Hazard Zone for liquefaction. In addition, we are not aware of any reported historical instances of liquefaction in the project area. However, soil and groundwater conditions exist at the site that may be susceptible to seismic-induced liquefaction.

We evaluated potential for liquefaction in sandy layers located below groundwater using the Standard Penetration Test (SPT)-based approach following the methodology of Youd et al (2001) as outlined in CGS Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California* (CGS, 2008). We used a site class modified Peak Ground Acceleration, PGA_M of 0.49g, an earthquake moment magnitude (Mw) of 6.5, and the AHG groundwater depth of 30 feet (for Boring B1) and 25 feet (for Boring B2).

Our evaluation indicates that sandy soil below groundwater is sufficiently dense to yield a factor of safety against liquefaction greater than 1.3, which is considered to be sufficient resistance against liquefaction per CGS SP117A. Therefore, no special design measures with respect to liquefaction are necessary for the project. Details of our liquefaction analysis are presented in Appendix D.

6.0 SLOPE STABILITY AND SEEPAGE ANALYSIS

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, slope/strata geometry). The ratio of the summation of driving forces divided by the summation of resisting forces is termed Factor of Safety (FS). A FS of 1.0 indicates that the driving and resisting forces are equal and the slope is a state of impending failure/movement. A FS greater than 1.0 indicates the presence of reserve strength; however, does not guarantee that failure will not occur. Rather, the probability of failure generally decreases as the FS increases. The minimum required FS for slope stability analyses used in this study, consistent with the requirements of the OCSMO and SMRO, are summarized in Table 6.0.

TABLE 6.0
MINIMUM REQUIRED FACTORS OF SAFETY – SLOPE STABILITY ANALYSES

Analysis Condition	Minimum FS[1]
Mining/Temporary Conditions[1]	1.0
Permanent (Reclamation) Conditions - Static	1.5
Permanent (Reclamation) Conditions - Seismic	1.1

Notes:
1. Minimum FS based on OCSMO Section 10-4.431 and SMRO Section 10-5.530.

6.1 Stability Analysis Sections

We evaluated slope stability at four locations considered representative of the anticipated mining and reclamation slope conditions for the project. Details of the analytical sections are summarized in Table 6.1.

TABLE 6.1
STABILITY ANALYSIS SECTIONS

Section ID[1]	Description
S-1	Typical Slope Adjacent to Cache Creek (Phase 4)
S-2	Typical “Natural” Alluvial Separator (Between Phases 4 and 5)
S-3	Typical “Natural” Alluvial Separator at PG&E Easement (Between Phases 5 and 6)
S-4	Typical “Constructed” Alluvial Separator (Between Phases 3 and 4)

Notes:
1. The approximate Section locations are shown on the Site Plan, Figure 2.

6.2 Stability Analysis Material Parameters

To select appropriate material parameters for our slope stability analysis, we used the results of current and previous exploratory borings, laboratory testing, published correlations, engineering judgment, and experience with similar soil conditions on nearby sites. The material parameters used in our analyses are summarized in Table 6.2.

TABLE 6.2
SOIL PARAMETERS FOR SLOPE STABILITY AND SEEPAGE ANALYSIS

Material Type	Total Unit Weight (pcf)	Cohesion, C (psf)	Friction Angle, ϕ (degrees)	Hydraulic Conductivity (ft/sec)	
				Vertical	Horizontal
Overburden Soil	120	250	28	1.5×10^{-7}	1.5×10^{-6}
Gravel	130	50	38	5.2×10^{-4}	5.2×10^{-3}
Clay	120	500	15	1.5×10^{-7}	1.5×10^{-6}
Reclamation Fill – Silt/Fines	120	250	10	n/a	n/a
“Constructed” Alluvial Separator	120	500	15	n/a	n/a

Discussion of the derivation of the parameters shown in Table 6.2 is presented hereinafter.

Overburden Soil. Shear strength parameters for overburden soil were estimated from published correlations based on soil type and our experience with similar soils in the project area. Based on sensitivity analysis, overburden soil parameters (total unit weight, C, ϕ) have a negligible effect on slope stability for this project. Hydraulic conductivity of the overburden soil was estimated using published correlations and laboratory permeability test results previously performed by Geocon on similar soil types.

Gravel. Shear strength parameters for the gravelly soil deposits are based on laboratory direct shear testing and sampling penetration resistance values measured in current and previous borings at the site. The shear strength parameters derived from direct shear test results are considered to be conservative since the materials tested did not include the gravel portion of the samples. To evaluate the appropriate hydraulic conductivity value of the gravelly soil deposits, we compared the hydraulic conductivity values used by Luhdorff and Scalmanini (L&S) in their hydraulic modeling of the site and values based on correlations developed by Alyamani and Sen, *Determination of Hydraulic Conductivity from Complete Grain-Size Distribution Curves*, Groundwater Journal, July-August 1993. Based on the comparison, the L&S hydraulic conductivity values are approximately 2 to 3 times faster than the values estimated using the Alyamani and Sen grain-size correlation method. In a seepage analysis, faster hydraulic conductivity is more likely to result in adverse seepage conditions (e.g. seepage daylighting on a slope above the level of groundwater). Therefore, for consistency with the L&S hydraulic analysis and as a conservative measure, we have used the L&S hydraulic conductivity values for the gravels in our seepage analysis.

Clay. Total and effective shear strength parameters and permeability of the clay are based on the results of our exploratory borings, laboratory triaxial shear strength testing, published index property correlations, comparisons with local data, engineering judgment, and experience. Hydraulic conductivity of the clay soil was estimated using published correlations and laboratory permeability test results previously performed by Geocon on similar soil types.

Reclamation Fill (Silt/Fines). Unit weight of the reclamation fill/pond fines are based on laboratory unit weight and moisture content tests performed on intact samples of these materials located in the Phase 1 area of the site (Boring B4).

"Constructed" Alluvial Separator. Shear strength parameters for the constructed alluvial separator are based on the results of laboratory triaxial shear strength testing on remolded samples of the proposed material provided by Cemex. Given the proposed placement process, we assumed an average relative compaction of approximately 85%.

For the soil layering/stratigraphy, we assumed a generally flat soil layer stratigraphy consistent with the depositional and erosional geology of the site.

6.3 Groundwater/Surface Water Conditions

In limit-equilibrium slope stability analysis, ponded water against a slope tends to increase global slope stability due to the buttressing effect of the mass of water against the slope. As a conservative measure in our analyses of mining slopes, we modeled groundwater conditions using the ALG levels established for the site. For reclamation conditions, we used the AHG levels established for the site. In our seepage analysis of Section 1 (adjacent to Cache Creek), we used the AHG in conjunction with the 200-year water level in Cache Creek. A summary of the groundwater and surface water levels used is presented in Table 6.3.

TABLE 6.3
GROUNDWATER/SURFACE WATER ELEVATIONS FOR ANALYSIS

Section ID	Location	Average High Groundwater Elevation (Feet, MSL)	Average Low Groundwater Elevation (Feet, MSL)	100-Year Water Level in Cache Creek (Feet, MSL)
S-1	Between Phase 4 and Cache Creek	110	104	126.5
S-2	Between Phases 4 and 5	111	105	---
S-3	Between Phases 5 and 6	108	100	---
S-4	Between Phases 3 and 4	111	108	---

6.4 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 an "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 calculated the seismic coefficient using the procedures presented in *Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California* (CGS 2008). In this procedure, the seismic coefficient is equal to a portion of the design-level PGA_M without the risk coefficient

(PGA_M/1.5). Assuming a 15-cm displacement threshold, a PGA_M of 0.49g (PGA_M/1.5 = 0.33), a modal distance of 15 km, and a modal magnitude of 6.5, the calculated seismic coefficient is 0.1.

6.5 High-Voltage Power Transmission Line Towers

The project site is traversed by a high-voltage power transmission line between Phase 5 and 6 (Site Plan, Figure 2). The current mining and reclamation plans show a minimum 25-foot setback from the towers to the mining slopes. Specific information related to the tower structures and/or foundations was not available for our review. The towers consist of typical lattice tower structures and are likely supported on conventional cast-in-drilled-hole (CIDH) concrete foundations. Based on our experience on similar projects, in our stability analyses, we assumed maximum vertical and horizontal foundation reaction loads of 150 kips and 25 kips, respectively.

6.6 Slope Stability Analysis and Results

We analyzed slope stability using the computer program SLOPE/W, Version 7.22 (Geo-Slope International) for static and seismic conditions using the Morgenstern-Price method of limit-equilibrium analysis considering circular and block failure modes. For the mining and reclamation conditions, we analyzed for “global”, deep-seated failure surfaces that would extend significantly into the dedicated setback areas. We did not evaluate FS for “surficial” or shallow failure surfaces, generally considered to not impact the dedicated setback areas.

Tabulated results of our slope stability analysis (FS against failure) for each slope configuration under the conditions of analysis are summarized in Table 6.6. Graphical representations of the potential critical failure surfaces and parameters used for each stability analysis are presented on Figures C2 through C17 in Appendix C. Results are summarized in Table 6.6.

TABLE 6.6
SLOPE STABILITY ANALYSIS RESULTS

Profile	Slope Details	Operational Condition	Calculated FS	
			Static	Seismic
Section S-1	• Natural Ground/Alluvial Separator • 2H:1V slope to 5 feet below ALG • 1H:1V slope below ALG • Maximum slope height = 70 feet • See Figure 3-1 for slope details • See Figures C2 through C7 for stability analysis details	Mining – Average Low Groundwater, Low Water Level in Cache Creek	1.5	1.1
		Mining – Average High Groundwater/100-Year Water Level in Cache Creek	1.5	1.2
		Reclamation – Average High Groundwater/100-Year Water Level in Cache Creek	2.7	2.0
Section S-2	• Natural Ground/Alluvial Separator • 2H:1V slope to 5 feet below ALG • 1H:1V slope below ALG • Maximum slope height = 70 feet • See Figure 3-2 for slope details • See Figures C8 through C11 for stability analysis details	Mining – Low Groundwater	1.5	1.1
		Reclamation – High Groundwater	2.6	2.0
Section S-3	• Natural Ground/Alluvial Separator • 2H:1V slope to 5 feet below ALG • 1H:1V slope below ALG • Maximum slope height = 70 feet • See Figure 3-3 for slope details • See Figures C12 through C15 for stability analysis details	Mining – Low Groundwater – No Tower Present	1.5	1.1
		Mining – Low Groundwater – Tower with 25-foot setback	1.5	1.1
Section S-4	• Constructed Alluvial Separator • 4H:1V slope • Maximum slope height = 70 feet • See Figure 3-4 for slope details • See Figures C16 and C17 for stability analysis details	"Constructed" Alluvial Separator – Low Groundwater – Backfilled One Side	2.9	1.6

6.7 Seepage Analysis and Results

The proposed north mining/reclamation slopes will be separated (set back) from Cache Creek by a minimum of 200 feet. To model seepage conditions in the north mining/reclamation slopes under influence of a potential 100-year flood event in Cache Creek, we used the computer program SEEP/W, Version 7 (Geo-Slope International) using the geometry at Section S-1, the AHG level (Table 6.3), and the soil hydraulic conductivity values listed in Table 6.2. For stratified soil deposits, the horizontal hydraulic conductivity is greater than the vertical hydraulic conductivity. The typical ratio of vertical to horizontal permeability (Ky/kx) may range from 0.5 (2-times) to 0.1 (10-times) or more. For our analyses, we used a Ky/kx ratio of 0.1 (10-times), which is considered conservative. The purpose of our analysis was to determine if the seepage front would daylight on the slope above the AHG, which could adversely impact slope stability due to increased seepage forces in the slope.

We modeled the transient 100-year water surface elevation (126.5 feet MSL, per Cunningham Engineering, 2016) in Cache Creek for steady-state seepage conditions. The results of our analyses indicate that the seepage front does not intercept the proposed north mining slope at an elevation higher than the AHG level, even when sustained indefinitely. Our seepage analysis results are presented graphically on Figure C1 in Appendix C.

7.0 CONCLUSIONS

7.1 Slope Stability

Based on the results of our study, the proposed mining and reclamation slopes are anticipated to meet the performance standards set forth in the Yolo County *Surface Mining and Reclamation Ordinances* and SMARA.

For the temporary mining slope conditions, static FS against failure ranges from 1.5 to 2.9, which is greater than the minimum required FS of 1.0. For the permanent reclamation slope conditions, static FS against failure ranges from 2.6 to 2.7, which is greater than the minimum required FS of 1.5. Seismic FS for both the mining and reclamation conditions ranges from 1.1 to 2.0, which equals or exceeds the minimum required FS of 1.1.

These results indicate that the project slopes should be globally stable under static and seismic conditions for both temporary mining and permanent reclamation slopes.

7.2 Seepage

Seepage analyses indicates that the seepage front does not intercept the proposed north mining slope at an elevation higher than the average seasonal high groundwater condition, even when sustained indefinitely (steady state conditions). Therefore, anticipated subsurface seepage conditions at the proposed north mining slope under a 100-year Cache Creek flood event are not expected to adversely impact slope stability.

7.3 Pit Capture Potential

Cache Creek floodwaters, when present, do not appear to overtop the south bank of the creek adjacent to the site. Hydrologic and hydraulic models developed by the County and summarized by Cunningham Engineering (2016) indicate that floodwaters are below the top of bank elevations on the south side of the creek. These conditions, combined with the 200-foot setback and the lack of adverse seepage and slope stability conditions based on our analyses suggest that the potential for pit capture is low.

8.0 RECOMMENDATIONS

During mining, exposed gravel slopes are subject to erosion and deterioration and shallow surficial failures should be expected. Such surficial failures should be repaired as soon as practicable prior to additional mining in the immediate area. At a minimum, slope conditions should be observed by an engineering professional at least annually.

In addition, the following measures should be considered:

- Reclamation should occur shortly after mining is complete. Slopes exposed to rain and surface runoff are susceptible to erosion and surficial degradation. Appropriate erosion control measures and best management practice (BMP) devices should be installed to reduce long-term slope degradation.
- Cemex should train onsite workers regarding seismic safety issues, including appropriate actions to be taken during a seismic event.
- During mining operations, Cemex should have sufficient materials and equipment available to repair slopes due to surficial sloughing and/or erosion.

9.0 FURTHER GEOTECHNICAL SERVICES

9.1 Plan Review

We should review the final mining and reclamation plans prior to implementation to ensure that our recommendations have been properly incorporated. If changes are made to the plan during the permitting process or at time of permit approval, then geotechnical re-evaluation may be warranted.

9.2 Future Services

If, during the course of mining and reclamation, sloughing or rills greater than 12 inches deep develop, Geocon should be consulted for mitigation recommendations, as appropriate.

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 mining and reclamation, or if the proposed mining and reclamation will differ from that anticipated herein, we 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 our scope of services.

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering and engineering geology principles and practices used in the site area at this time. No warranty is provided, express or implied. This report is subject to review and should not be relied upon after a period of three years.

11.0 REFERENCES

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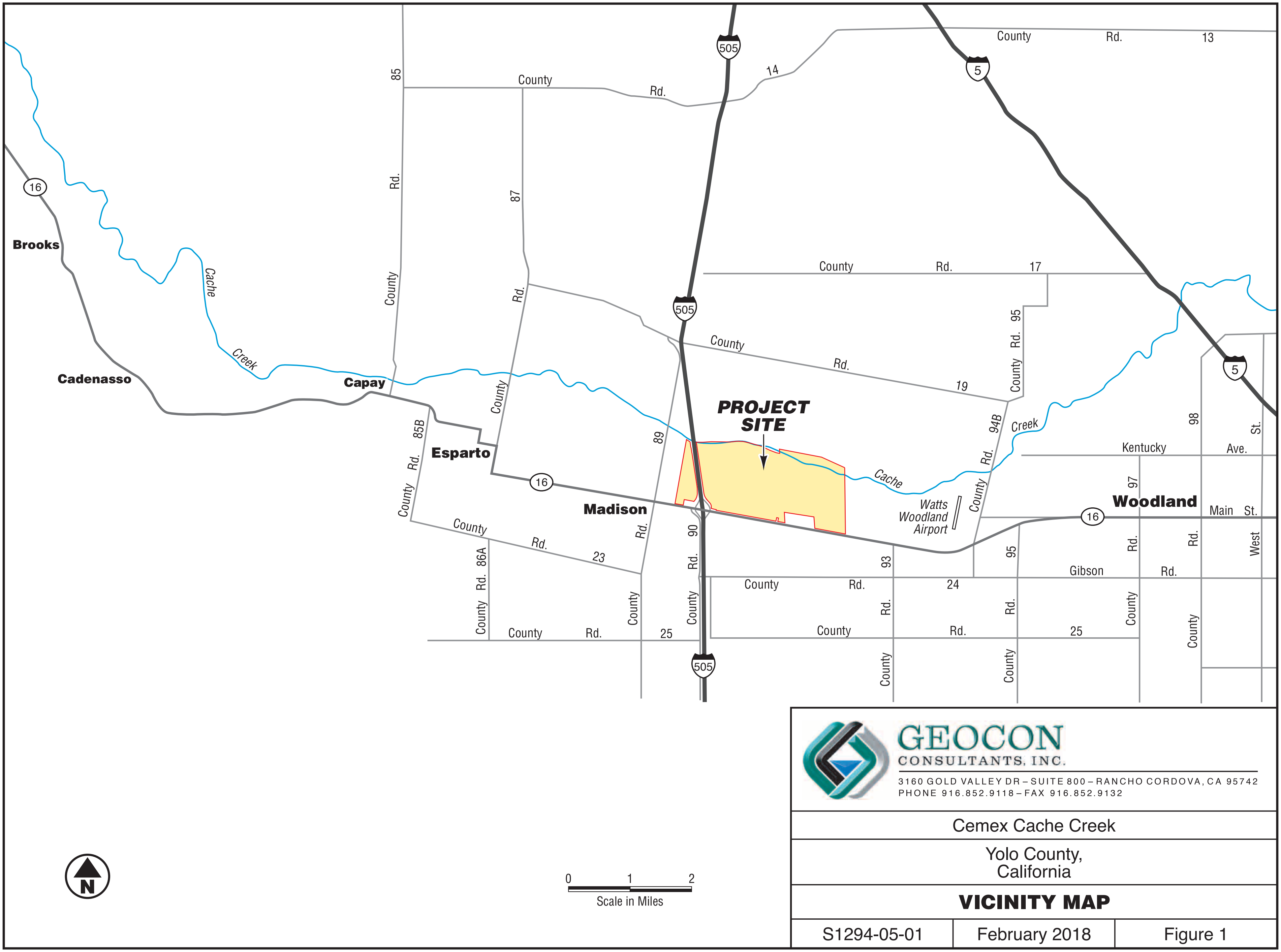

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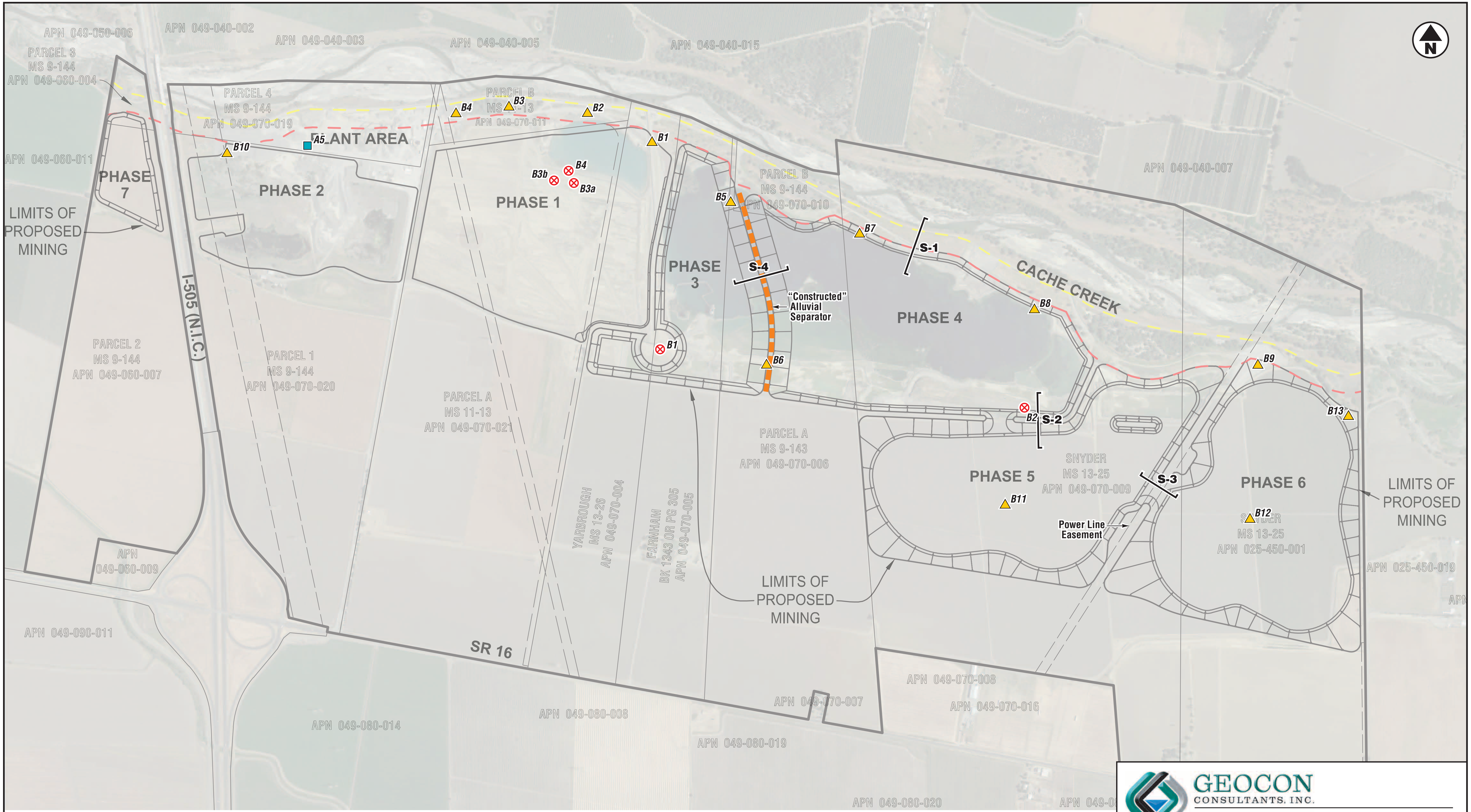
VICINITY MAP

S1294-05-01 | February 2018 | Figure 1



Ref: *Off-Channel Mining Plan for Cemex Cache Creek, Yolo County, California, October 2017, Sheet M-01*, Cunningham Engineering, 01/17/2018

LEGEND:

B4 ⊗ Approximate Boring Location (Geocon, 2017)

B13 △ Approximate Boring Location (Kleinfelder, 1994)

A5 ■ Approximate Bulk "Alluvial Separator" Material Sample

▬ ▬ ▬ Constructed Alluvial Separator

S-1 Stability Analysis Sections (Figs. 3-1 through 3-4)

0 1000
Scale in Feet

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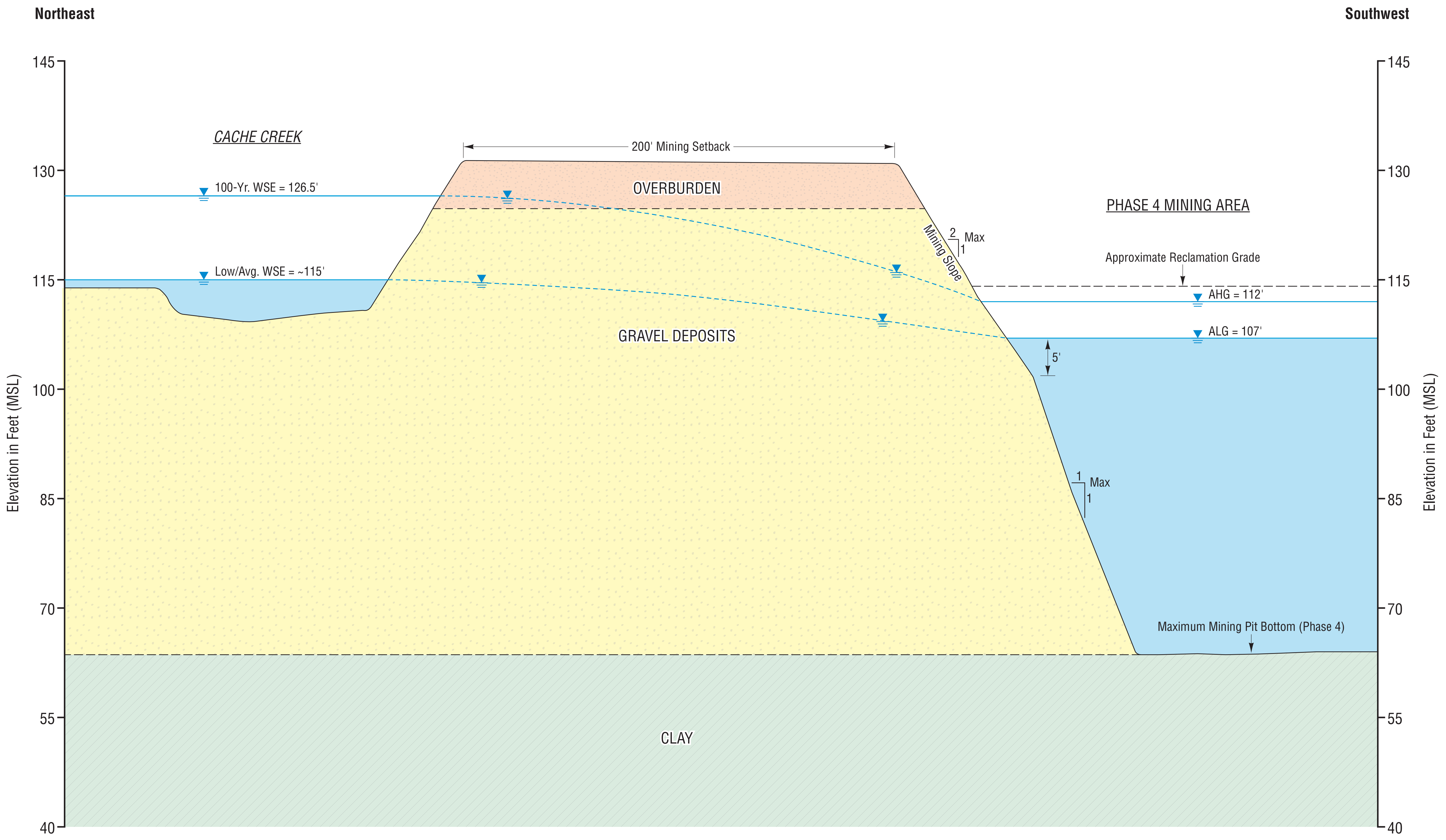
SITE PLAN

S1294-05-01	February 2018	Figure 2



🟧	OVERBURDEN
🟨	GRAVEL DEPOSITS
🟩	CLAY

AHG = Average High Groundwater Elevation

ALG = Average Low Groundwater Elevation

WSE = Water Surface Elevation

Vertical Scale in Feet 0 – 15

Horizontal Scale in Feet 0 – 50

Note: 3.33X Vertical Exaggeration

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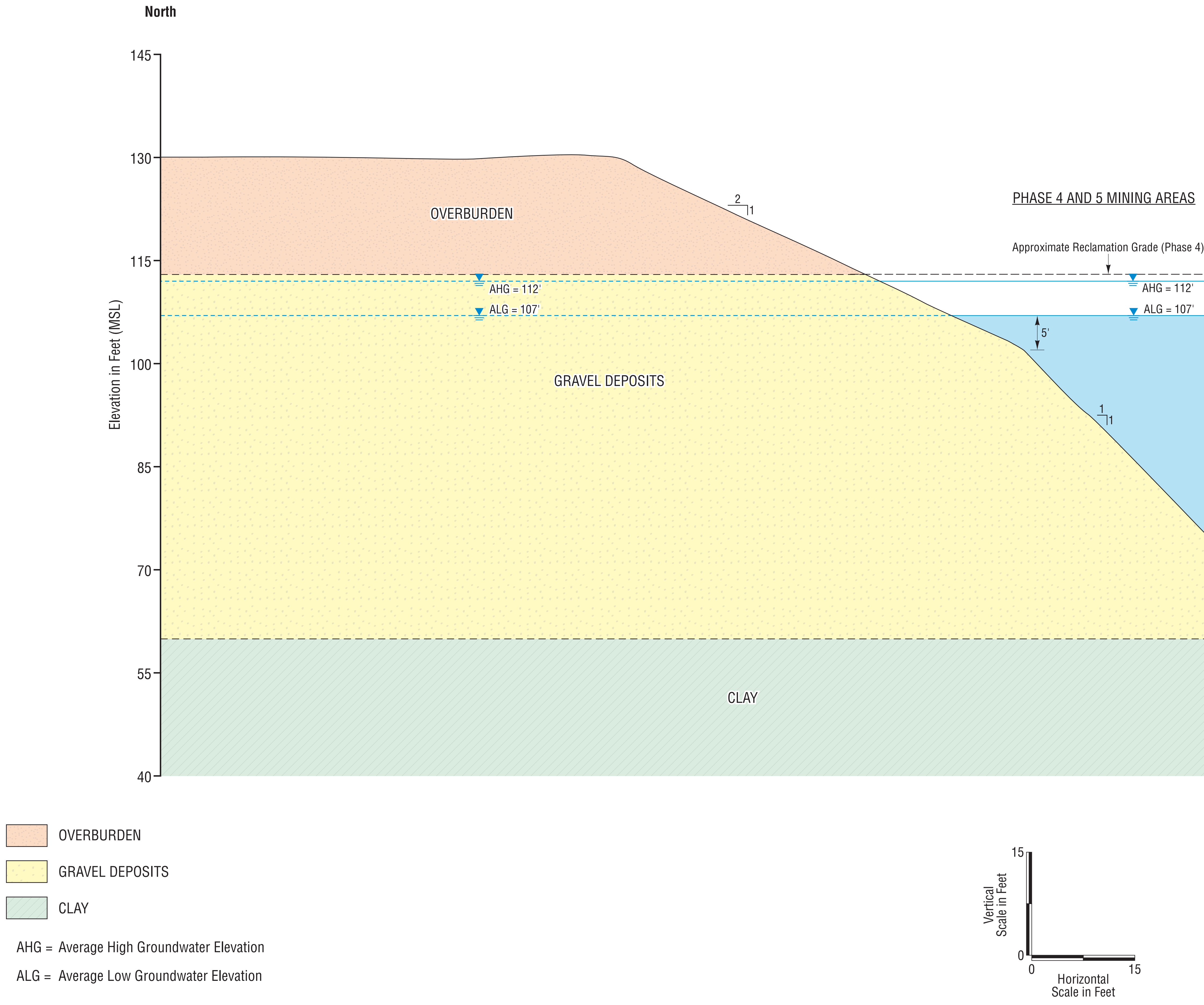
Stability Analysis Section 1

S1294-05-01 | February 2018 | Figure 3-1



🟧 OVERBURDEN

🟨 GRAVEL DEPOSITS

🟩 CLAY

AHG = Average High Groundwater Elevation

ALG = Average Low Groundwater Elevation

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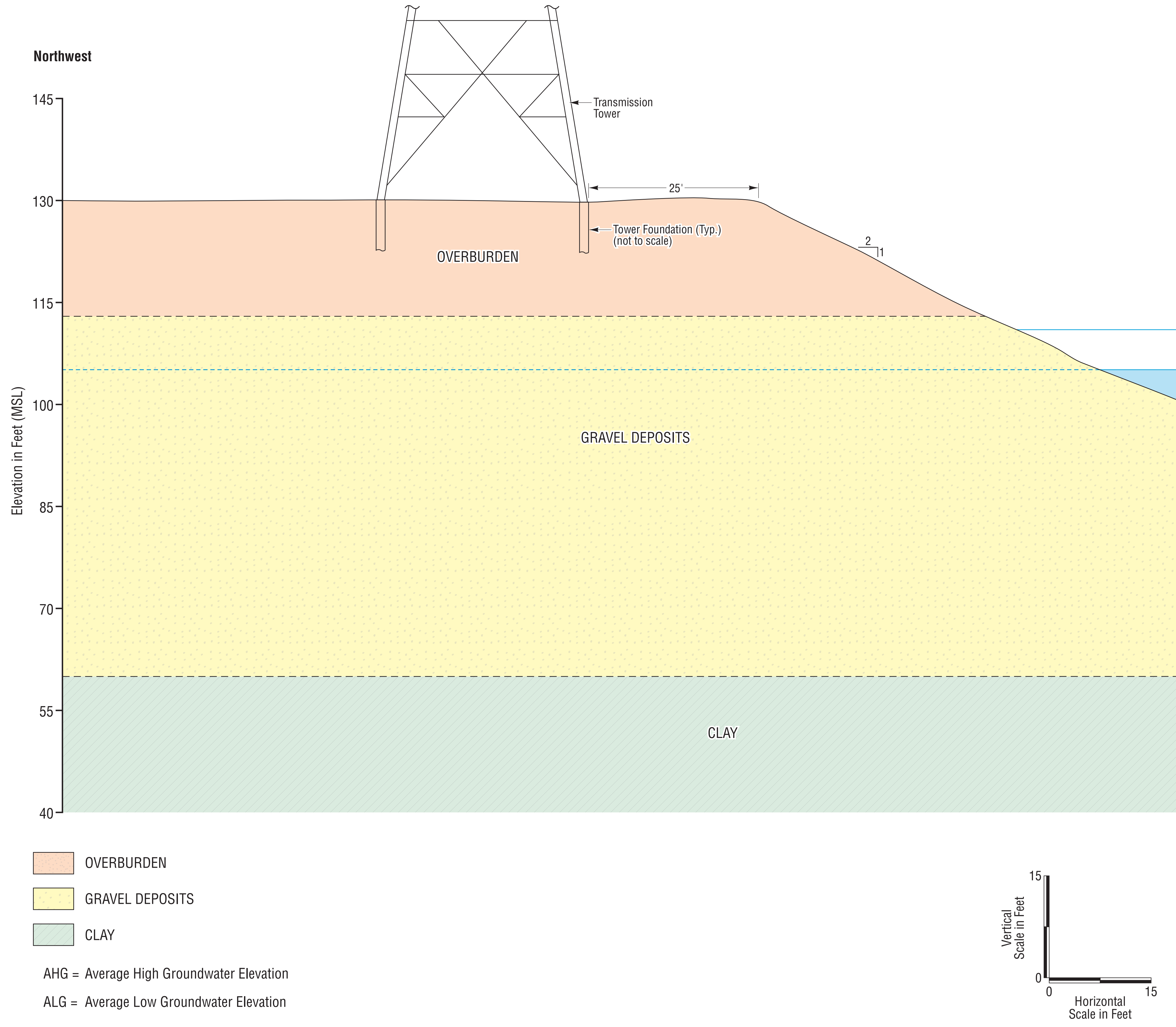
Stability Analysis Section 2

S1294-05-01	February 2018	Figure 3-2



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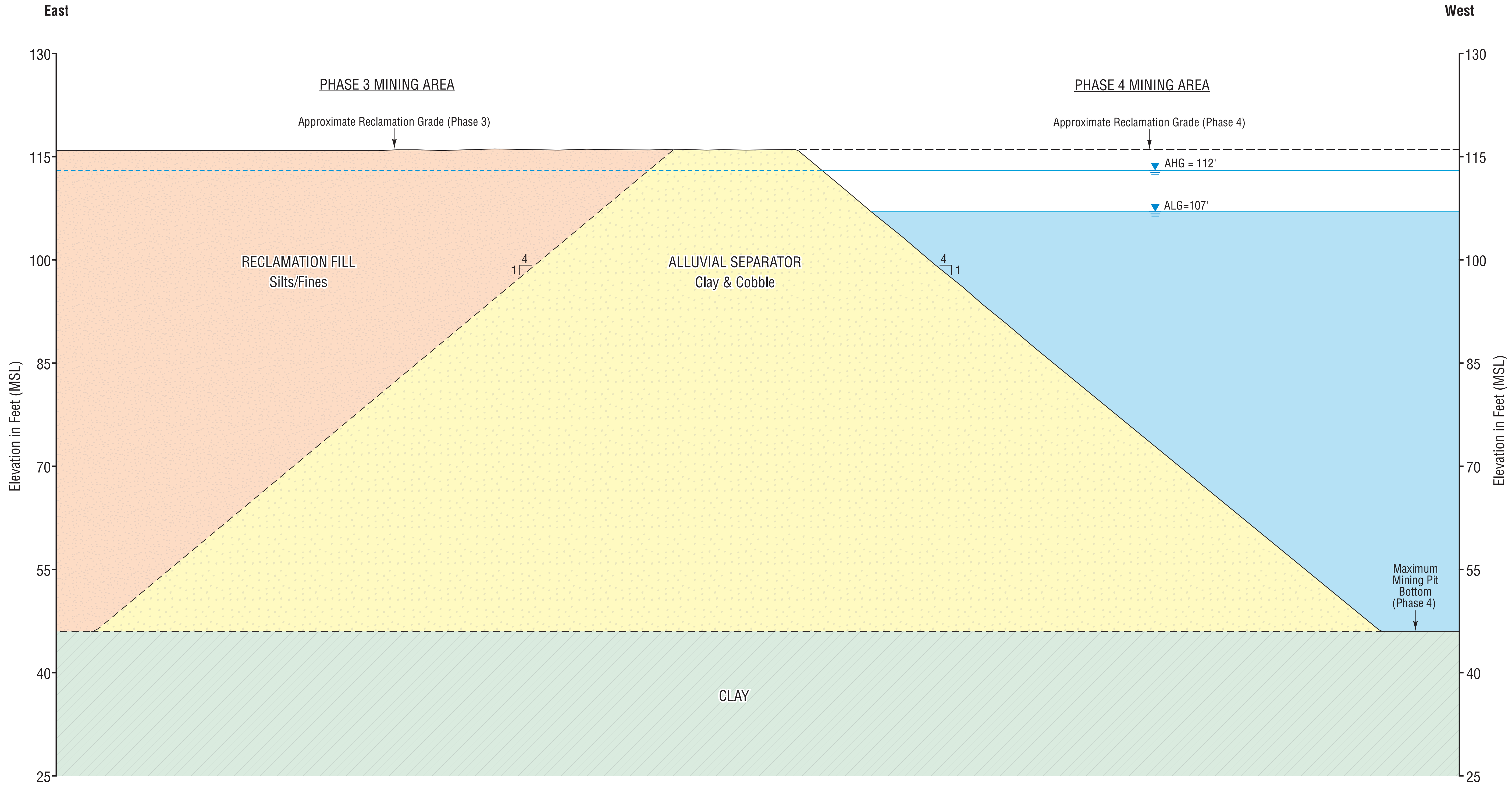
Stability Analysis Section 3

S1294-05-01 | February 2018 | Figure 3-3



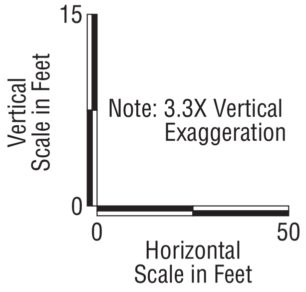
🟧 RECLAMATION FILL

🟨 "CONSTRUCTED" ALLUVIAL SEPARATOR

🟩 CLAY

AHG = Average High Groundwater Elevation

ALG = Average Low Groundwater Elevation



Note: 3.3X Vertical Exaggeration

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Stability Analysis Section 4

S1294-05-01 | February 2018 | Figure 3-4

Photo No. 1   Active Mining Pit

Photo No. 2   High Voltage Transmission Line Easement (between Phases 5 and 6)

PHOTOS NO. 1 & 2

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Photo No. 3 Proposed “Alluvial Separator” Material

Photo No. 4 Proposed “Alluvial Separator” Material

PHOTOS NO. 3 & 4

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February 2018

APPENDIX A

APPENDIX A

FIELD EXPLORATION PROGRAM

Our field exploration program was performed on October 12 and 13, 2017, and consisted of drilling four exploratory borings (B1 through B4) at the approximate locations shown on the Site Plan, Figure 2.

Exploratory borings were performed using a truck-mounted, CME 75 drill rig equipped with 6-inch outside diameter (OD) hollow-stem augers. Soil sampling was accomplished using an automatic 140-pound hammer with a 30-inch drop. Samples were obtained with a 3.0-inch OD, split spoon (California Modified) sampler and a 2-inch OD Standard Penetration Test (SPT) sampler. The number of blows required to drive the samplers the last 12 inches (or portion thereof) of the 18-inch sampling interval were recorded on the boring logs.

Subsurface conditions encountered in the exploratory borings 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 Unified Soil Classification System (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, drill rig penetration rates, 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 borings 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
— Bulk Sample
— SPT Sample
— Modified California Sample
— 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

PROJECT NO. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B1

ELEV. (MSL.) **143**
DATE COMPLETED **10/12/17**
ENG./GEO. **Victor Guardado**
DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**
HAMMER TYPE **140 lb | Automatic**

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0	B1-Bulk		CL	**ALLUVIUM** Medium stiff, damp, light yellow-brown, Lean CLAY, trace silt (Overburden)				
1								
2								
3	B1-3.5				12			
4								
5	B1-5.5				7			
6	B1-6.0					100.6	19.0	
7								
8	B1-8.0 B1-8.5			- white to tan mottling	8			
9			CL-ML	Medium stiff, damp, light yellow-brown, Silty CLAY				
10	B1-10.5 B1-11.0				9			
11								
12								
13			SP	Medium dense, damp to moist, black and gray-brown with red mottling, Poorly-graded SAND, few gravel of 2-inch maximum dimension				
14								
15	B1-15.5 B1-16.0				26			
16								
17								
18				- becomes gravelly and silty				
19			SW-SM	Medium dense, moist, gray-brown with white and black, Well-graded SAND with silt and gravel, fine to medium-grained				
20	B1-20.5 B1-21.0				34			
21								
22				- rig chatter, grinding				
23								
24								

Figure A2, Log of Boring, page 1 of 4

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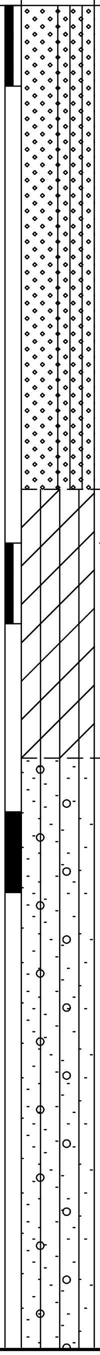
SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B1

ELEV. (MSL.) **143**
DATE COMPLETED **10/12/17**
ENG./GEO. **Victor Guardado**
DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**
HAMMER TYPE **140 lb | Automatic**



DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
25	SPT1-25.0			- becomes silty	25			
26								
27				- rig chatter				
28								
29								
30								
31								
32								
33								
34			ML	Stiff, moist, yellow-brown with white to tan and black mottling, SILT with Clay, few gravel, trace fine sand				
35	SPT1-35.0	▽			10			
36								
37								
38								
39			GP	Very dense, wet, gray-brown with white, red, and black, Poorly-graded GRAVEL with fine to medium-grained sand, trace silt				
40	B1-40.5				75/11"			
41	B1-41.0							
42								
43								
44								
45								
46								
47								
48								
49								

Figure A3, Log of Boring, page 2 of 4

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.

BORING B1

ELEV. (MSL.) **143**
DATE COMPLETED **10/12/17**
ENG./GEO. **Victor Guardado**
DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**
HAMMER TYPE **140 lb | Automatic**

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
50	SPT-50.0				- no sample, soil heaving				
51									
52									
53									
54				SC-SM	Dense, wet, gray-brown with dark brown and reddish orange mottling, Silty clayey SAND with gravel, fine to medium-grained				
55	SPT-55.0					34			
56									
57									
58									
59				SM	Dense, wet, brown with white, gray, and black, fine to medium-grained Silty SAND				
60	SPT-60.0			GP	Dense, wet, gray-brown with white and black, Poorly-graded GRAVEL with fine to medium-grained sand, few to little silt	49			
61									
62									
63									
64									
65									
66									
67									
68									
69				SP	Dense, wet, yellowish gray-brown with white and red, Poorly-graded SAND with little gravel of 1-inch maximum dimension, few to little clay and silt				
70	SPT-70.0					40			
71									
72									
73									
74									

Figure A4, Log of Boring, page 3 of 4

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. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B1

ELEV. (MSL.) **143**
DATE COMPLETED **10/12/17**
ENG./GEO. **Victor Guardado**
DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**
HAMMER TYPE **140 lb | Automatic**

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
75									
76									
77									
78									
79									
80	SPT-80.0					32			
81				SC	Dense, moist, yellow-brown with white and black and orange mottling, Clayey SAND				
82									
83									
84				CL	Hard, moist to wet, yellowish olive-brown with orange mottling, Lean CLAY				
85	B1-85.0					50/5"			

BORING TERMINATED AT 85.5 FEET
GROUNDWATER ENCOUNTERED AT 35 FEET
BACKFILLED WITH NEAT CEMENT GROUT

Figure A5, Log of Boring, page 4 of 4

GEOCON

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

PROJECT NO. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B2

ELEV. (MSL.) **130**

DATE COMPLETED **10/13/17**

ENG./GEO. **Victor Guardado**

DRILLER **Taber Drilling**

EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**

HAMMER TYPE **140 lb | Automatic**

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	B2-Bulk ☒			CL	**ALLUVIUM** Medium stiff, damp, yellowish light brown with orange and tan mottling, CLAY with silt (Overburden)				
1	☒								
2	☒								
3	B2-3.0 B2-3.5 ■					11			
4	☒								
5	B2-5.5 B2-6.0 ■					9			
6					- trace black mottling				
7									
8									
9					- weak cementations				
10	B2-10.5 B2-11.0 ■				- micaceous, trace fine sand	8			
11					- becomes medium stiff			20.7	
12									
13									
14									
15	B2-15.5 B2-16.0 ■					8			
16					- becomes yellowish bluish gray-brown with orange, dark brown, and black mottling, trace mica		87.7	33.6	
17				GW	Medium dense, damp to moist, gray-brown with white and black, Well-graded GRAVEL of 1.5-inch maximum dimension, few clay				
18									
19									
20	B2-20.5 B2-21.0 ■					27			
21				SP	Medium dense, damp to moist, gray-brown, fine to medium-grained Poorly-graded SAND, trace silt, few gravel - becomes yellow-brown, fine				
22									
23									
24			▽						

Figure A6, Log of Boring, page 1 of 4

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. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B2

ELEV. (MSL.) 130
DATE COMPLETED 10/13/17
ENG./GEO. Victor Guardado
DRILLER Taber Drilling
EQUIPMENT Truck-mounted D120 Diedrich w/6" HSA
HAMMER TYPE 140 lb | Automatic

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
25	B2-25.5				- trace clay	31			
26	B2-26.0				- becomes coarse, trace white and red gravel				
27					- rig chatter				
28					- few to little clay				
29									
30	SPT2-30.0			CL	Medium stiff, moist, yellow-brown with gray and reddish orange mottling, Lean to Fat CLAY, trace silt	6			
31									
32									
33									
34									
35	B2-35.5					13			
36	B2-36.0			ML	Medium stiff, moist to wet, yellow-brown with reddish orange and gray mottling, SILT with clay				
37									
38					- harder drilling, becomes stiffer				
39									
40									
41									
42				SP	Dense, moist to wet, gray-brown with white, red, and gray, Poorly-graded SAND, fine to coarse, some gravel				
43									
44									
45	SPT2-45.0					37			
46									
47				GP	Dense, wet, gray-brown with white and orange, Silty Clayey Poorly-graded GRAVEL				
48									
49									

Figure A7, Log of Boring, page 2 of 4

GEOCON

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

BORING B2

ELEV. (MSL.) **130**
DATE COMPLETED **10/13/17**
ENG./GEO. **Victor Guardado**
DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**
HAMMER TYPE **140 lb | Automatic**

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
50									
51				SP	Dense, moist to wet, gray-brown with white, red, and gray, Poorly-graded SAND, fine to coarse, some gravel				
52									
53									
54									
55	SPT-55.0					50			
56				GW	Dense, moist to wet, gray-brown with white and black, Silty Clayey Well-graded GRAVEL with sand				
57									
58									
59				SP	Very dense, moist to wet, gray-brown with white, red, and gray, Poorly-graded SAND, fine to coarse, some gravel				
60	SPT2-60.0			SW-SM	Very dense, moist to wet, gray-brown with white and black, Well-graded SAND with silt and gravel	53			
61									
62									
63					- rig chatter				
64									
65									
66									
67				CH	Very stiff, moist, gray with reddish orange mottling, micaceous, Fat CLAY, trace silt				
68									
69									
70	B2-70.5					41			
71	B2-71.0						97.1	26.1	
72					- hard drilling				
73									
74									

Figure A8, Log of Boring, page 3 of 4

GEOCON

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

PROJECT NO. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B2

ELEV. (MSL.) **130**
DATE COMPLETED **10/13/17**
ENG./GEO. **Victor Guardado**
DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**
HAMMER TYPE **140 lb | Automatic**

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
75	B2-75.5 ■	▨				38			
76	B2-76.0 ■	▨			- becomes bluish-gray with reddish orange mottling				

BORING TERMINATED AT 76.5 FEET
GROUNDWATER ENCOUNTERED AT 25 FEET
BACKFILLED WITH NEAT CEMENT GROUT

Figure A9, Log of Boring, page 4 of 4

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. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B3a

ELEV. (MSL.) **121**

DATE COMPLETED **10/13/17**

ENG./GEO. **Victor Guardado**

DRILLER **Taber Drilling**

EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**

HAMMER TYPE **140 lb | Automatic**

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				ML	**FILL (SILT/FINES)** Soft, dry, yellow-brown, gravelly SILT				
1									
2									
3	B3a-3.0				- becomes medium stiff to stiff				
4									
					BORING TERMINATED AT 4.5 FEET NO GROUNDWATER ENCOUNTERED BACKFILLED WITH SOIL CUTTTINGS				

Figure A10, Log of Boring, 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. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B3b

ELEV. (MSL.) **121**
DATE COMPLETED **10/13/17**
ENG./GEO. **Victor Guardado**
DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA**
HAMMER TYPE **140 lb | Automatic**

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	B3b-Bulk ☒			ML	**FILL (SILT/FINES)** Soft, dry, yellow-brown, gravelly SILT				
1									
2									
3					- few gravel, becomes medium stiff to stiff				
4	B3b-4.0 ◧								
5									

BORING TERMINATED AT 5.5 FEET
NO GROUNDWATER ENCOUNTERED
BACKFILLED WITH SOIL CUTTTINGS

Figure A11, Log of Boring, 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. **S1294-05-01** PROJECT NAME **Cemex Cache Creek**

BORING B4

ELEV. (MSL.) **128** DATE COMPLETED **10/13/17**
ENG./GEO. **Victor Guardado** DRILLER **Taber Drilling**
EQUIPMENT **Truck-mounted D120 Diedrich w/6" HSA** HAMMER TYPE **140 lb | Automatic**

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	B4-Bulk ⊠			ML	**FILL (SILT/FINES)** Medium stiff, dry to damp, yellow-brown with orange mottling, SILT, trace gravel				
1	⊠								
2	⊠								
3	⊠								
4	⊠								
5	■ B4-5.5					18			
6	■ B4-6.0								
7									
8					- becomes damp to moist				
9									
10									
11									
12									
13									
14					- wood fragments and branches - becomes clayey				
15					BORING TERMINATED AT 15.0 FEET NO GROUNDWATER ENCOUNTERED BACKFILLED WITH SOIL CUTTINGS				

Figure A12, Log of Boring, 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

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	ID	DESCRIPTIONS	MAJOR DIVISIONS		LTR	ID	DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	○	Well-graded gravels, or gravel sand mixture, little or no fines	FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	ML	▥	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		GP	○	Poorly-graded gravels, or gravel sand mixture, little or no fines			CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		GM	○	Silty gravels, gravel-sand-silt mixtures			OL	▥	Organic silts and organic silt-clays of low plasticity
		GC	▨	Clayey gravels, gravel-sand-clay mixtures		SILTS AND CLAYS LL > 50	MH	▥	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic soils
	SAND AND SANDY SOILS	SW	░	Well-graded sands or gravelly sands, little or no fines			CH	▨	Inorganic clays of high plasticity, fat clays
		SP	░	Poorly-graded sands or gravelly sands, little or no fines			OH	▨	Organic clays of medium to high plasticity
		SM	░	Silty sands, sand and silt mixtures	HIGHLY ORGANIC SOILS		PT	⩊	Peat and other highly organic soils
		SC	▨	Clayey sands and clay mixtures					

◧	Standard penetration split spoon sample	LL	Liquid limit
■	Modified California sample: 2.5" O.D. 2.0" I.D.	PI	Plasticity index
▯	Shelby tube sample	%-#200	Percent of soil passing the #200 sieve
⊠	Disturbed bag or bulk sample	R-Value	Resistance value
∇	Water level observed in boring (at time of drilling)	EI	Percent of swell as measured by UBC Standard No. 29-2
▼	Water level observed in boring (at given post-drilling time)	C	Soil cohesion in psf
		phi	Angle of internal friction

NOTES: Blow counts represent the number of blows of a 140-pound hammer falling 30 inches required to drive a sampler through the last 12 inches of an 18-inch penetration, unless otherwise noted.

The lines seperating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

The equivalent SPT blow count values can be estimated by multiplying the Modified California Sample blows by 0.6.

KLEINFELDER

PROJECT NO. 40-2695-01

BORING LEGEND
Solano Concrete Madison Plant

Yolo County, California

PLATE

3

Date Completed: 6/7/94

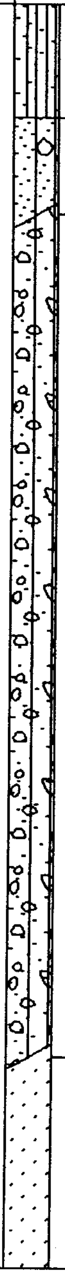
Logged By: Danea Gemmell

Total Depth: 91.5 feet

Surface Conditions: Alfalfa Crop

Groundwater: Approximately 30' during drilling

Approximate Surface Elevation (ft): 133



Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		
	■	21						SANDY SILT/SILTY SAND (ML-SM): brown to dark brown, very fine to fine, medium stiff, slightly moist
								SAND WITH SOME GRAVEL (SM): light brown, slightly silty, fine to coarse, medium dense, slightly moist
5	■	31						GRAVEL WITH SAND (GM): light gray to gray, slightly silty, fine to coarse sand, well rounded gravel to 3/4", medium dense, moist
10	■	26						very moist with 1/2" to 3/4" gravel
15	■	41						
20	■	42						very moist, grades siltier, occasional 2" gravel
25	■	25						SAND (SW): light brown to gray, medium dense, wet
30			▽					

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-1
Solano Concrete Madison Plant
Yolo County, California

PLATE
1 of 3

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength ksf	LABORATORY Other Tests	PID Reading ppm	DESCRIPTION
								(Continued from previous plate)
	■	32						some gravel
								SAND AND GRAVEL (SM): light brown, slight trace of silt, fine to coarse sand with 1/4" to 1/2" gravel, dense, wet
35	■	37						
40	■	24						grades sandier, gravel to 1"
								SAND (SW): brown, medium dense, wet
45	■	22				c = 400 psf phi = 37°		some gravel
50	■	90						GRAVEL WITH SILTY SAND (GM): brown, well rounded gravel to 2" with silty sand, very dense, wet
55	■	53						SAND (SW): brown, fine to coarse, trace of pea gravel with interbedded sandy seams, dense, wet
60	■	50/ 3"						more gravel

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-1
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

4

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		(Continued from previous plate)
65	■	26						some pea gravel and sand SANDY CLAY (CL-SC): yellow to light brown, fine to very fine, low plasticity, stiff, wet
70	■	26				c = 1100 psf		
75	■	10						SAND (SW): brown to gray, loose, wet
80	■	33						CLAY (CL): light brown, very stiff, low plasticity, wet
85	■	26				c = 500 psf		
90	■	50/ 4"						SILTY SAND (SM): brown, silty sand, very dense, wet Terminate boring at 91.5'
95								

KLEINFELDER

PROJECT NO. **40-2695-01**

LOG OF BORING B-1
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

4

Date Completed: 6/8/94

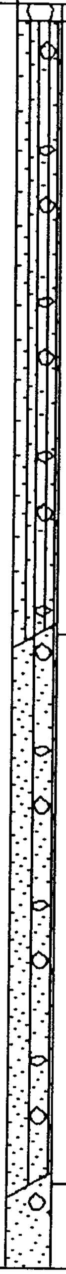
Logged By: Danea Gemmell

Total Depth: 81.5 feet

Surface Conditions: Gravel Roadway

Groundwater: Approximately 25' during drilling

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength ksf	LABORATORY Other Tests	PID Reading ppm	DESCRIPTION Approximate Surface Elevation (ft): 130
								2" of GRAVEL
								SANDY SILTY/SILTY SAND (ML-SM): brown to dark brown, very fine to fine with 1/4" subangular gravel, stiff, slightly moist
	■	40						
5	■	26						medium stiff with 1/4" to 1/2" gravel
10	■	14						
15	■	50						SILTY SAND (SM): brown to dark brown, coarse, with 1/4" to 3/4" subangular and subrounded gravel, dense, slightly moist occasional 1" to 2" gravel
20	■	50/ 5"						light brown to brown, very dense, subrounded gravel to 2", moist
25	■	46	▽					grades siltier, wet
30								



KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-2
Solano Concrete Madison Plant

Yolo County, California

PLATE 1 of 3

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION (Continued from previous plate)
	■	50						SAND (SW): gray, coarse, some subrounded gravel to 1/4", dense, wet
35	■	68						some occasional fines and pea sized gravel, very dense
40								no sample - heaving sands
45	■	41						
50	■	40						same as above
55	■	36						
60	■	19				c = 0.4 ksf phi = 34°		medium dense

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-2
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

	FIELD		LABORATORY						
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm		DESCRIPTION (Continued from previous plate)
65								░	no sample - heaving sands
70	■	40						▨	CLAY (CL): light olive with slight dark orange mottling, very stiff, low plasticity, wet
75	■	30				c = 0.7 ksf		▨	
80	■	28						▨	no mottling
									Terminate boring at 81.5'
85									
90									
95									

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-2
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

Date Completed: 6/10/94

Logged By: Danea Gemmell

Total Depth: 81.5 feet

Surface Conditions: Gravel Roadway

Groundwater: Approximately 25' during drilling

Approximate Surface Elevation (ft): 132

	FIELD		LABORATORY					
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	DESCRIPTION
								2" of GRAVEL
	■	10						SANDY SILTY/SILTY SAND (ML-SM): brown to dark brown, very fine to fine with subangular and subrounded gravel to 1/2", stiff, slightly moist
5	■	20						
10	■	50/ 5"						grades sandier, gravel to 2"
15	■	50/ 5"						SILTY SAND (SM): brown to dark brown, coarse, with subangular and subrounded gravel to 1/2", very dense, slightly moist occasional 2" gravel
20	■	35						SAND (SW): brown to gray, coarse with subrounded and subangular gravel to 1/2", dense, very moist
25	■	58	▽					SILTY SAND (SM): light brown to brown, coarse sand with 1" subangular and subrounded gravel, dense, wet
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-3
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3

6

	FIELD		LABORATORY					
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	DESCRIPTION (Continued from previous plate)
	■	34						SAND (SW): brown to gray, coarse sand, with subrounded gravel to 1/2", dense, wet
35	■	54						trace of silty fines
40	■	72						No more fines, very dense
45	■	36						layered fine to coarse
50								no sample - heaving sands
55	■	37						same as above
60	■	25						CLAY (CL): light olive to brown, low to medium plasticity, very stiff, wet

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-3
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		(Continued from previous plate)
65	■	41						▨
70	■	44						▨ same as above
75	■	40						▨ mottled orange and brown
80	■	31						▨
								Terminate boring at 81.5'
85								
90								
95								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-3
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

6

Date Completed: 6/10/94

Logged By: Steve Mahnke

Total Depth: 76.5 feet

Surface Conditions: Gravel Roadway

Groundwater: Approximately 25' during drilling

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION Approximate Surface Elevation (ft): 134
	■	58						SILTY/SANDY GRAVEL (GM): brown to gray, fine gravel, fine to coarse sand, medium dense, slightly moist
5	■	50/ 5"						very dense
10	■	14						SILTY SAND (SM): gray to brown, very fine, stiff, slightly moist
15	■	54/ 11"						SILTY/SANDY GRAVEL (GM): gray, with silt and trace of clay, fine to coarse, very dense, moist
20	■	27						SILTY SAND (SM): brown, fine to coarse, with subrounded and subangular gravel to 1/2", medium dense, very moist
25	■	36	▽					SILTY GRAVEL (GM): gray, fine to coarse sand, subangular to subrounded gravel, with some silt, medium dense, wet
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-4
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3
7

	FIELD		LABORATORY					
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	DESCRIPTION
								(Continued from previous plate)
	■	43						interbedded silty/sandy lenses with traces of fine gravel
35	■	30						SILTY SAND (SM): gray to brown, coarse sand, with fine subangular to subrounded gravel, medium dense, wet
40	■	22						
45	■	14						grades brown, loose, flowing sands
50	■	11						
55	■	32						medium dense, some clay
60	■	18						

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-4
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

7

	FIELD		LABORATORY				PID Reading ppm		DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests			(Continued from previous plate)
65	■	47						▨	CLAY (CL): light brown, trace of fine sand, hard, wet
70	■	46						▨	mottled light brown and orange
75	■	34						▨	
									Terminate boring at 76.5'
80									
85									
90									
95									

KLEINFELDER

LOG OF BORING B-4
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

7

PROJECT NO. 40-2695-01

Date Completed: 7/11/94

Logged By: Danea Gemmell

Total Depth: 70 feet

Surface Conditions: Dirt Road

Groundwater: Approximately 30' during drilling

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	**Approximate Surface Elevation (ft):** 135
	■	27						SANDY SILT/SILTY SAND (ML-SM): light brown, very fine to fine, some subrounded and subangular gravel 1/2" to 1", medium dense, dry
5	■	30						
								SAND WITH SOME GRAVEL (SW): light brown, medium to coarse, trace of fines, with 1/2" to 1" subrounded and subangular gravel, medium dense, dry
10	■	44						SAND AND GRAVEL WITH SILT (SW-SM): light brown to gray, medium to coarse, with subrounded gravel to 1 1/2", brown silty fines, dense, slightly moist
15	■	32						medium dense, moist
20	■	20						
25	■	27						SAND (SW): brown and gray, medium to coarse, medium dense, very moist
30			▽					

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-5
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3

8

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION
								(Continued from previous plate)
	■	61		▽				SILTY GRAVEL AND SAND (GM): gray, medium to coarse sand, light brown silty, fines, fine to coarse, subrounded gravel, dense, wet
35	■	31						some gravel to 3"
40	■	50/ 5"						
45	■	13						SILTY CLAY (CL-ML): light brown to olive with orange mottling, very fine to fine, low plasticity, stiff, wet
50	■	34						CLAYEY SAND (SC): gray, fine to coarse, with subangular and subrounded gravel to 1", dense, wet
55								grades as clayey pea gravel, wet
60								no sample - flowing sands

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-5
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

Depth, ft	FIELD		LABORATORY				PID Reading ppm		DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests			(Continued from previous plate)
65	■	30						▨	CLAYEY GRAVEL AND SAND (GM): gray pea gravel, medium to coarse sand, with clayey fines, dense, wet
70									Terminate boring at 70' clay present on drill tip
75									
80									
85									
90									
95									

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-5
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

8

Date Completed: 7/13/94

Logged By: Danea Gemmell

Total Depth: 76.5 feet

Surface Conditions: Dirt Road/Field

Groundwater: Approximately 40' during drilling

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	**Approximate Surface Elevation (ft):** 135
								SANDY SILT/SILTY SAND (ML-SM): light brown, very fine to fine, loose, dry
	■	11						
5	■	13						slightly moist
10	■	20						grades slightly sandier
15	■	20						SAND (SW): gray, fine to coarse, medium dense, moist
20	■	58						with well rounded gravel to 2"
25	■	32						CLAYEY GRAVELLY SAND (SC): light brown clay, gray, subangular and subrounded gravel to 1", medium to coarse sand, dense, very moist
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-6
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION (Continued from previous plate)
	■	23						CLAY (CL): light brown to olive with dark gray mottling, very fine to fine, low to medium plasticity, very stiff, moist
35	■	64						no mottling, some cementation
40	■	14		▽				slight cementation, wet
45	■	27						very wet, grades sandy
50	■	79						SILTY SAND (SM): gray, medium to coarse sand, with subangular and subrounded gravel to 3/4", light brown silty fines, very dense, wet
55	■	33						grades cleaner, with gravel to 1/2"
60								no sample - flowing sands

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-6
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	(Continued from previous plate)
65	■	52						occaisional gravel to 1 1/2", grades siltier
70								no sample - flowing liquid clay/silt out of auger
75	■	22						CLAY (CL): light brown, trace of gray mottling, medium plasticity, very stiff, wet
								Terminate boring at 76.5'
80								
85								
90								
95								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-6
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

Date Completed: 7/14/94

Logged By: Danea Gemmell

Total Depth: 81.5 feet

Surface Conditions: Dirt Road

Groundwater: Approximately 30' during drilling

Approximate Surface Elevation (ft): 129

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION
	■	28						SANDY SILT/SILTY SAND (ML-SM): light brown to brown, very fine to fine, medium dense, dry
5	■	9						slightly moist
								SILTY CLAY/CLAYEY SILT (ML-CL): mottled gray and yellow, low plasticity, slightly moist
10	■	24						
								SILTY SAND (SM): gray to brown, fine to medium, medium dense, slightly moist
15	■	38						with subangular gravel to 3/4", grades cleaner
20	■	42						SILTY GRAVEL AND SAND (GM): gray subrounded and subangular gravel to 3/4", medium to coarse sand, dense, slightly moist
25	■	31						with gravel to 2", very moist
30				▽				

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-7
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	(Continued from previous plate)
	■	60		▽				wet
35	■	44						
40	■	71						grades siltier
45								no sample - flowing sand and gravel
50								
55								no sample - flowing sand and gravel
60								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-7
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

10

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		(Continued from previous plate)
65								no sample - flowing sand and gravel
70								
75	■	35				c = 560 psf		SILTY CLAY (CL): light olive to light brown, very fine to fine, low plasticity, very stiff, wet
80	■	40						
								Terminate boring at 81.5'
85								
90								
95								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-7
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

Date Completed: 7/14/94

Logged By: Danea Gemmell

Total Depth: 61.5 feet

Surface Conditions: Dirt Road/Creek Levee

Groundwater: Approximately 25' during drilling

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION Approximate Surface Elevation (ft): 126
	■	70						SILTY SAND/SANDY SILT (SM-ML): light brown, fine to medium silty sand, some subangular and subrounded gravel to 1", very dense, dry
5	■	41						SAND AND GRAVEL (SW): dark brown, fine to medium sand, subrounded and subangular gravel to 1", trace of silty fines, dense, slightly moist
10	■	40						sand grades coarser
15	■	36						
								SILTY SAND AND GRAVEL (SM): dark brown to gray, medium to coarse sand, light brown silty fines, subangular pea gravel to 3/4", occasional 2" gravel, slight cementation, very dense, moist
20	■	77						
25	■	40		▽				wet, grades gravelly
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-8
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 2

11

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION (Continued from previous plate)
								no sample - flowing sands
35	■	44						CLAY (CL): light brown, trace of gray mottling, low to medium plasticity, hard, wet
40	■	42						grades sandy
45	■	40						no more sand, trace of orange mottling
50	■	49						
55	■	38						
60	■	41						grades olive gray with slight orange mottling
								Terminate boring at 61.5'

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-8

Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 2

11

Date Completed: 7/15/94

Logged By: Danea Gemmell

Total Depth: 56.5 feet

Surface Conditions: Creek Levee

Groundwater: Approximately 20' during drilling

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION Approximate Surface Elevation (ft): 124
	■	69						SILTY SAND/SANDY SILT (ML-SM): light brown, fine to medium fine silty sand, with subangular and subrounded gravel to 1 1/2", very dense, dry
5	■	50/ 5"						SILTY SAND AND GRAVEL (SM): dark brown, fine to medium silty sand, subangular and subrounded gravel to 1 1/2", very dense, slightly moist
10	■	50/ 5"						
15	■	50/ 5"						SILTY GRAVEL AND SAND (GM): brown silty fines, dark brown to gray, fine to medium coarse sand, gray, subangular and subrounded gravel to 3", very dense, moist
20	■	19		▽				wet
25	■	66						subrounded gravel grades to 1"
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-9
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 2

	FIELD		LABORATORY					
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	DESCRIPTION
								(Continued from previous plate)
	■	46				c = 50 psf phi = 40.5°		silty fines and sand grades gray
35	■	38				c = 679 psf		CLAY (CL): blue-gray, slight orange mottling, strong cementation, hard, wet
40	■	47						CLAY (CL): gray-brown, low to moderate plasticity, hard, wet
45	■	50/ 5"						
50	■	55						same as above
55	■	59						
								Terminate boring at 56.5' Drill bit had clay on end
60								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-9
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 2

12

Date Completed: 7/18/94

Logged By: Danea Gemmell

Total Depth: 81.5 feet

Surface Conditions: Disked Field

Groundwater: Approximately 36' during drilling

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION Approximate Surface Elevation (ft): 144
		22						SANDY SILT/SILTY SAND (SM-ML): light brown, very fine to fine, medium dense, dry
5		28						SILTY SAND AND GRAVEL (SM): light brown to brown, fine to medium sand, gray subangular pea gravel, occasional 3/4", medium dense, slightly moist
10		32						more subrounded and subangular gravel, grades dense, moist
15		49						SILTY GRAVEL AND SAND (GM): brown to gray, fine to coarse sand, gray, subrounded gravel to 2", dense, moist
20		50/ 5"						occasional cobble
25		28						dark orange sand lenses
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-10
Solano Concrete Madison Plant
Yolo County, California

PLATE
1 of 3

13

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		(Continued from previous plate)
	■	45						SAND AND GRAVEL (SW): brown to gray, medium to coarse, dense, very moist
35	■	34	▽					SILTY GRAVEL AND SAND (GM): brown fines, gray-brown, medium to coarse sand, subrounded gravel to 2", medium dense, wet
40	■	21						CLAY (CL): brown to olive, very fine, low plasticity, very stiff, wet
45	■	12				c = 502 psf		trace of yellow mottling, grades stiff
50	■	20						slight gray mottling
55	■	54						CLAYEY SAND AND GRAVEL (SC): olive-brown fines, gray, medium to coarse sand, gray pea gravel, dense, wet
60	■	20				c = 285 psf phi = 23° slightly disturbed		SAND AND GRAVEL (SW): dark brown, medium to coarse sand, trace of silty fines, medium dense, wet

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-10
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

	FIELD		LABORATORY					
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	DESCRIPTION (Continued from previous plate)
65	■	81						
70								no sample - flowing sands
75	■	50/ 5"						CLAYEY SAND (SC): olive clayey fines, brown to gray, medium to coarse sand, very dense, wet
80	■	50/ 5"						GRAVELLY CLAY (GC-CL): olive clay, gray pea gravel, very dense, wet
								Terminate boring at 81.5'
85								
90								
95								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-10
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

Date Completed: 7/19/94

Logged By: Danea Gemmell

Total Depth: 86.5 feet

Surface Conditions: Farm Road

Groundwater: Approximately 35' during drilling

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	Approximate Surface Elevation (ft): 130
	■	29						SANDY SILT/SILTY SAND (SM-ML): light brown, very fine to fine, very stiff, dry
5	■	8						slightly moist, trace of subangular pea gravel
								SILTY GRAVEL/GRAVELLY SILT (GM-ML): dark brown, very fine to fine, gray subangular pea gravel, low plasticity, dense, moist
10	■	58						more subrounded and subangular gravel, grades dense, moist
15	■	39						SAND AND GRAVEL (SW): dark brown to gray, medium to coarse sand, gray, subangular gravel to 3/4", dense, moist
20	■	50/ 5"						
25	■	41						GRAVEL AND SAND (GW): brown, medium to coarse sand, gray subrounded gravel to 1 1/2", occasional cobble, dense, moist
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-11
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3
14

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		(Continued from previous plate)
	■	28						SILTY GRAVEL AND SAND (GM): mottled olive and dark orange fines, gray, subangular and subrounded gravel to 2", fine to medium sand, medium dense, moist
35	■	45		▽				very moist to wet
40	■	70						
45								
50	■	86						GRAVEL AND SAND (GW): brown, medium to coarse sand, gray, subrounded gravel to 1", very dense, wet
55	■	50/ 5"						grades gray
60								

KLEINFELDER

LOG OF BORING B-11
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

PROJECT NO. 40-2695-01

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	(Continued from previous plate)
65	■	50/ 5"				c = 150 psf phi = 32° slightly disturbed		SAND (SW): gray, medium to coarse sand, trace of silty fines, very dense, wet
70								no sample - flowing sands
75	■	34						CLAY (CL): olive, trace of dark orange mottling, very fine, low plasticity, very stiff, wet CLAYEY SAND (SC): olive clayey fines, brown to gray, medium to coarse sand, very dense, wet
80	■	74						some dark orange mottling, grades silty
85	■	56						CLAY (CL): gray,very fine, low plasticity, hard, wet Terminate boring at 86.5'
90								
95								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-11
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

14

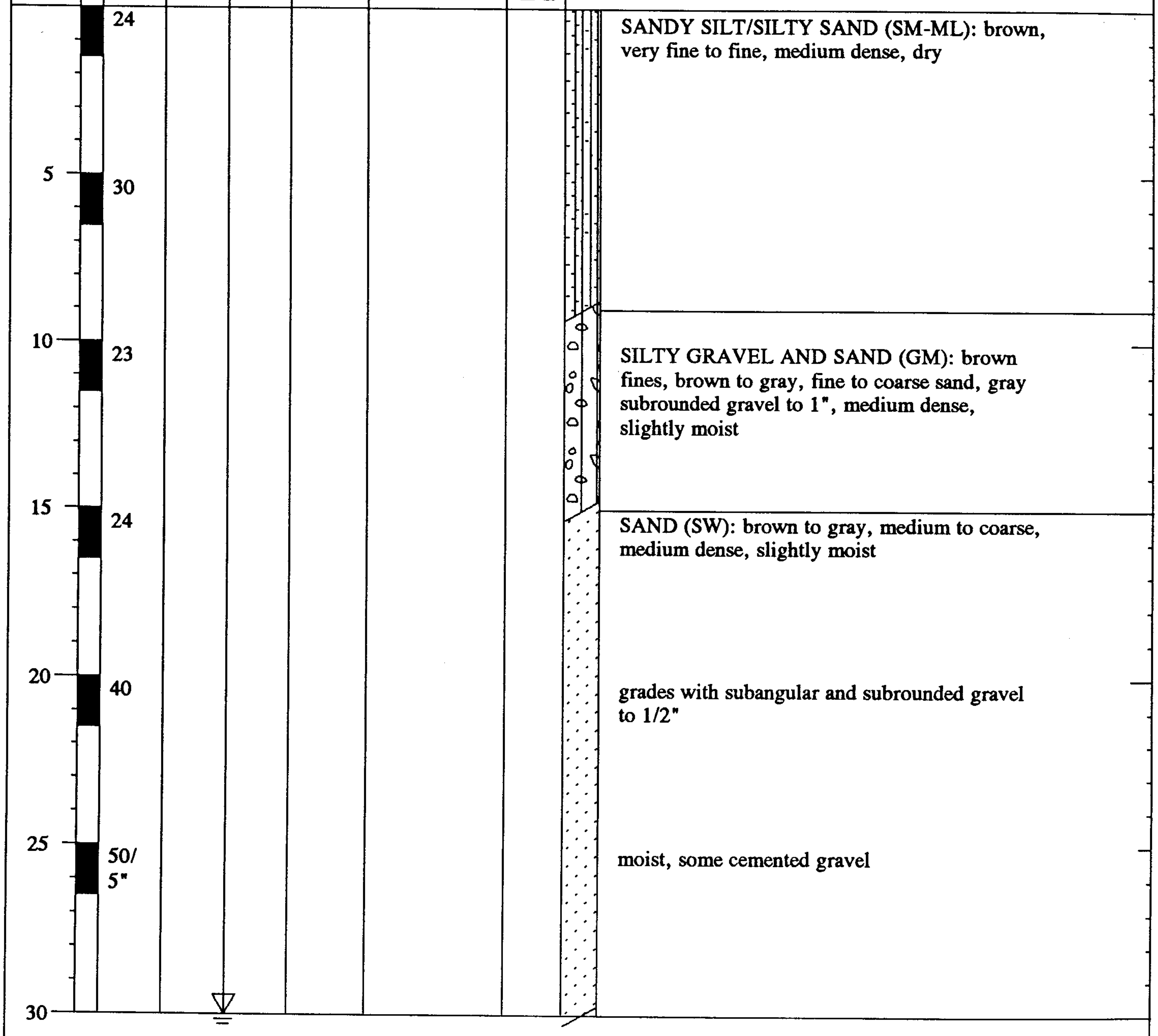
Date Completed: 7/20/94

Logged By: Danea Gemmell

Total Depth: 71.5 feet

Surface Conditions: Farm Field

Groundwater: Approximately 30' during drilling



Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength ksf	 Other Tests	PID Reading ppm	DESCRIPTION Approximate Surface Elevation (ft): 127
0		24						SANDY SILT/SILTY SAND (SM-ML): brown, very fine to fine, medium dense, dry
5		30						
10		23						SILTY GRAVEL AND SAND (GM): brown fines, brown to gray, fine to coarse sand, gray subrounded gravel to 1", medium dense, slightly moist
15		24						SAND (SW): brown to gray, medium to coarse, medium dense, slightly moist
20		40						grades with subangular and subrounded gravel to 1/2"
25		50/ 5"						moist, some cemented gravel
30								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-12
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		(Continued from previous plate)
		50/ 5"						SILTY GRAVEL AND SAND (GM): brown silty fines, brown to gray, fine to coarse sand, gray subangular and subrounded gravel to 1", very dense, wet
35		60						grades siltier, gravel to 1 1/2"
40		63				c = 50 psf phi = 46°		INTERBEDDED CLAY (CL)/SILTY SAND AND GRAVEL (SM): approximately 6" thick beds - olive clay with dark orange mottling, low plasticity, stiff, wet/brown silty fines, gray, medium to coarse sand, gray, subangular pea gravel, very dense, wet
45		43						
50		53				c = 665 psf		CLAY (CL): dark gray, low to moderate plasticity, hard, moist
55		74						grades dark gray-olive
60		85						grades olive, wet

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-12
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

Depth, ft	FIELD		LABORATORY				PID Reading ppm		DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests			(Continued from previous plate)
65	■	83						▨	strong cementation
70	■	50/ 5"						▨	grades silty, very fine to fine
									Terminate boring at 71.5'
75									
80									
85									
90									
95									

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-12

Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

Date Completed: 7/21/94
Logged By: Danea Gemmell
Total Depth: 71.5 feet
Surface Conditions: Gravel Road
Groundwater: Approximately 30' during drilling

Approximate Surface Elevation (ft): 127

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		
0	■	37						SILTY SANDY GRAVEL (GM): brown, very fine to medium sand, gray subangular and subrounded gravel to 1", dense, dry
5	■	6						CLAYEY SILT (ML): brown, very fine to fine, low plasticity, medium stiff, moist
10	■	20						SAND (SW): brown, fine to coarse, some subangular pea gravel, medium dense, moist
15	■	67						GRAVEL AND SAND (GW): gray pea gravel to 3/4", brown to gray, fine to coarse sand, trace of brown silt, very dense, moist
20	■	50/ 5"						grades with silt
25	■	64						SILTY GRAVEL AND SAND (GM): brown silty/sandy fines, fine to medium, gray subangular gravels to 3/4", very dense, very moist
30				▽				

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-13
Solano Concrete Madison Plant

Yolo County, California

PLATE
1 of 3

16

Depth, ft	FIELD		LABORATORY				PID Reading ppm	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests		(Continued from previous plate)
	■	39						fines grade to coarse, subrounded gravels, wet
35	■	50/ 5"						possible interbedded silt lenses and sand lenses
40	■	55				c = 340 psf phi = 21° totally remolded		SAND (SW): brown to gray, fine to coarse, dense, wet
45								no sample - flowing sand
50	■	51						CLAY (CL): yellow-brown, low plasticity, hard, wet
55	■	50/ 5"						
60	■	50/ 4"						grades olive-gray

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-13
Solano Concrete Madison Plant

Yolo County, California

PLATE
2 of 3

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength ksf	Other Tests	PID Reading ppm	(Continued from previous plate)
65	■	76						
70	■	50/ 5"						grades olive-brown
								Terminate boring at 71.5'
75								
80								
85								
90								
95								

KLEINFELDER

PROJECT NO. 40-2695-01

LOG OF BORING B-13
Solano Concrete Madison Plant

Yolo County, California

PLATE
3 of 3

APPENDIX B

APPENDIX B
LABORATORY TESTING PROGRAM

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their grain size distribution, plasticity characteristics, maximum dry density/optimum moisture content, and shear strength parameters. Laboratory test results are presented on the following pages.

Sheet 1 of 1

Sample ID	Depth (feet)	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)
B1-Bulk (0-5')	0				---			
B1-6	6				---		19.0	100.6
SPT1-25.0	25				---	5.1		
SPT1-55.0	55				---	21.7		
B2-3	3	41	20	21	---			
B2-10.5	10.5				---		20.7	
B2-16	16				---		33.6	87.7
B2-25.5	25.5				---	1.5		
SPT2-60.0	60				---	6.2		
B2-70.5	70.5				---		26.1	97.1

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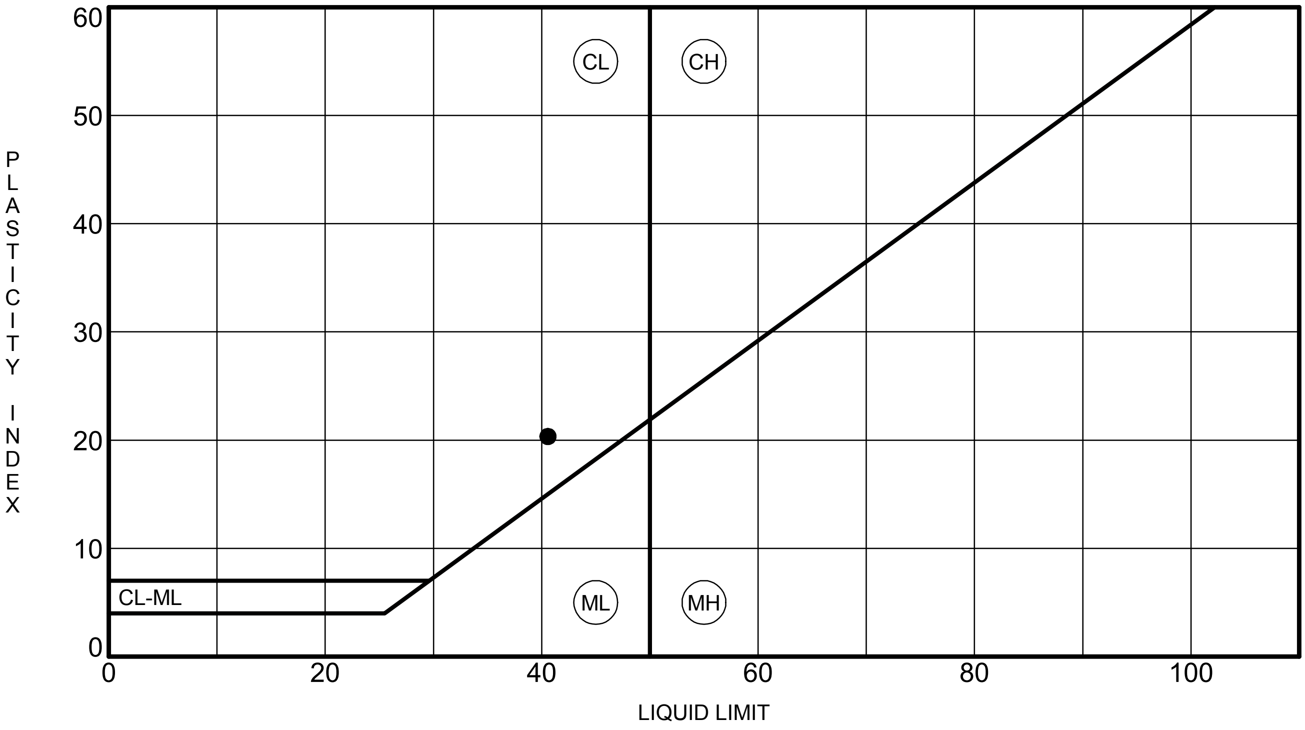
Summary of Laboratory Results

Project: Cemex Cache Creek
Location: Madison, California
Number: S1294-05-01
Figure: B1



	Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	% Pass #200 Sieve	Unified Soil Classification Description	Preparation Method
●	**B2-3**	**41**	**20**	**21**		**Lean CLAY (CL)**	**dry**

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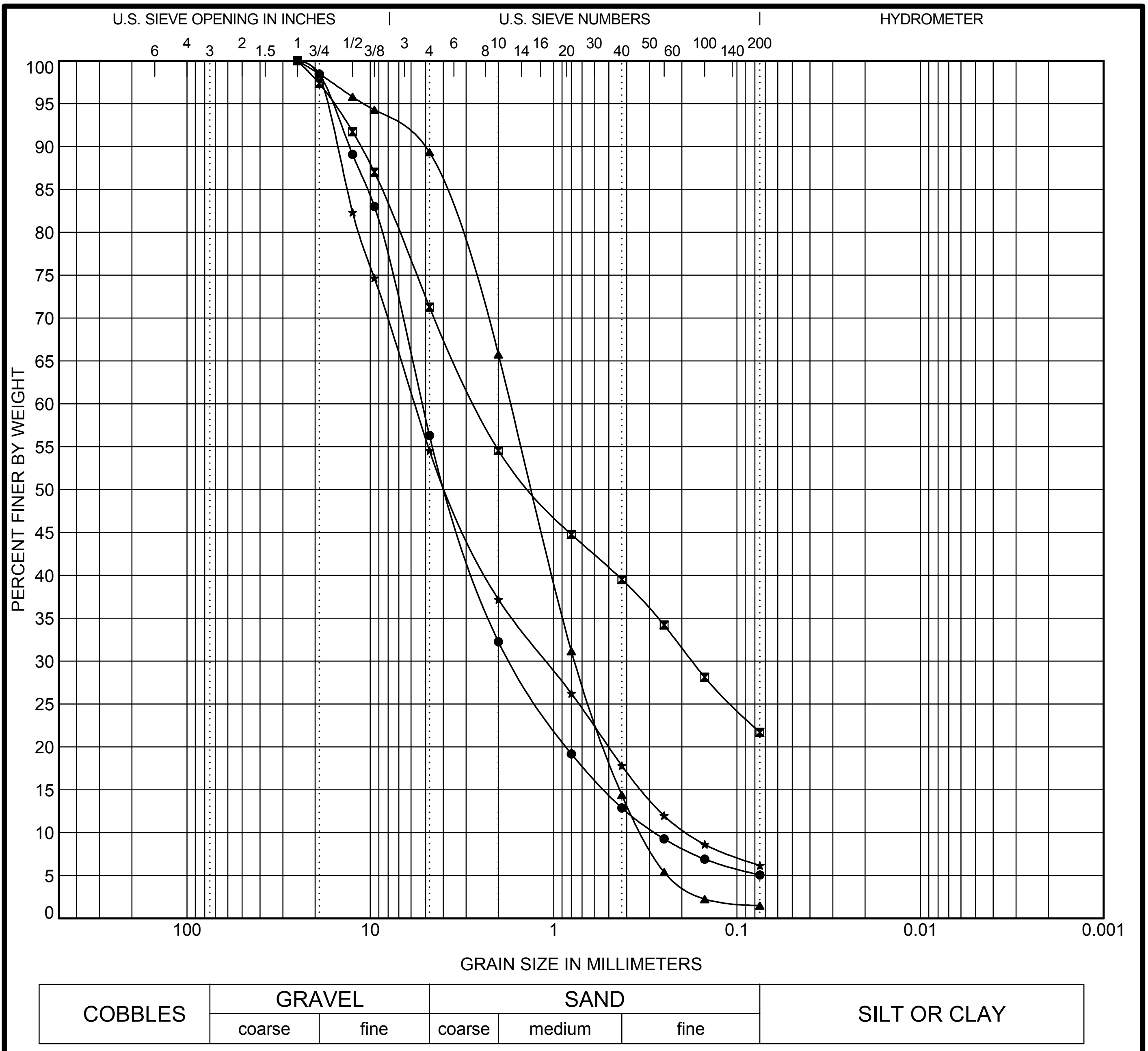
ATTERBERG LIMITS (ASTM D4318)

Project: Cemex Cache Creek
Location: Madison, California
Number: S1294-05-01
Figure: B2



	Sample No.	Classification	LL	PL	PI	Cc	Cu
●	**SPT1-25.0**	**Well-graded SAND with silt and gravel (SW-SM)**				**2.01**	**18.8**
☒	**SPT1-55.0**	**Silty, clayey SAND with gravel (SC-SM)**					
▲	**B2-25.5**	**Poorly-graded SAND (SP)**				**1.04**	**5.2**
★	**SPT2-60.0**	**Well-graded SAND with silt and gravel (SW-SM)**				**1.13**	**31.0**

	Sample No.	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SPT1-25.0**	**25**	**5.23**	**1.708**	**0.278**	**43.7**	**51.2**	**5.1**	
☒	**SPT1-55.0**	**25**	**2.651**	**0.176**		**28.7**	**49.6**	**21.7**	
▲	**B2-25.5**	**25**	**1.718**	**0.766**	**0.328**	**10.7**	**87.8**	**1.5**	
★	**SPT2-60.0**	**25**	**5.735**	**1.097**	**0.185**	**45.5**	**48.4**	**6.2**	

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GRAIN SIZE DISTRIBUTION (ASTM D422, D6913)

Project: Cemex Cache Creek
Location: Madison, California
Number: S1294-05-01
Figure: B3

CURVE NO. 1

Source of Material: **B1-Bulk (0-5')**

Description of Material: **Brown Lean CLAY (CL)**

Test Method: **D1557A**

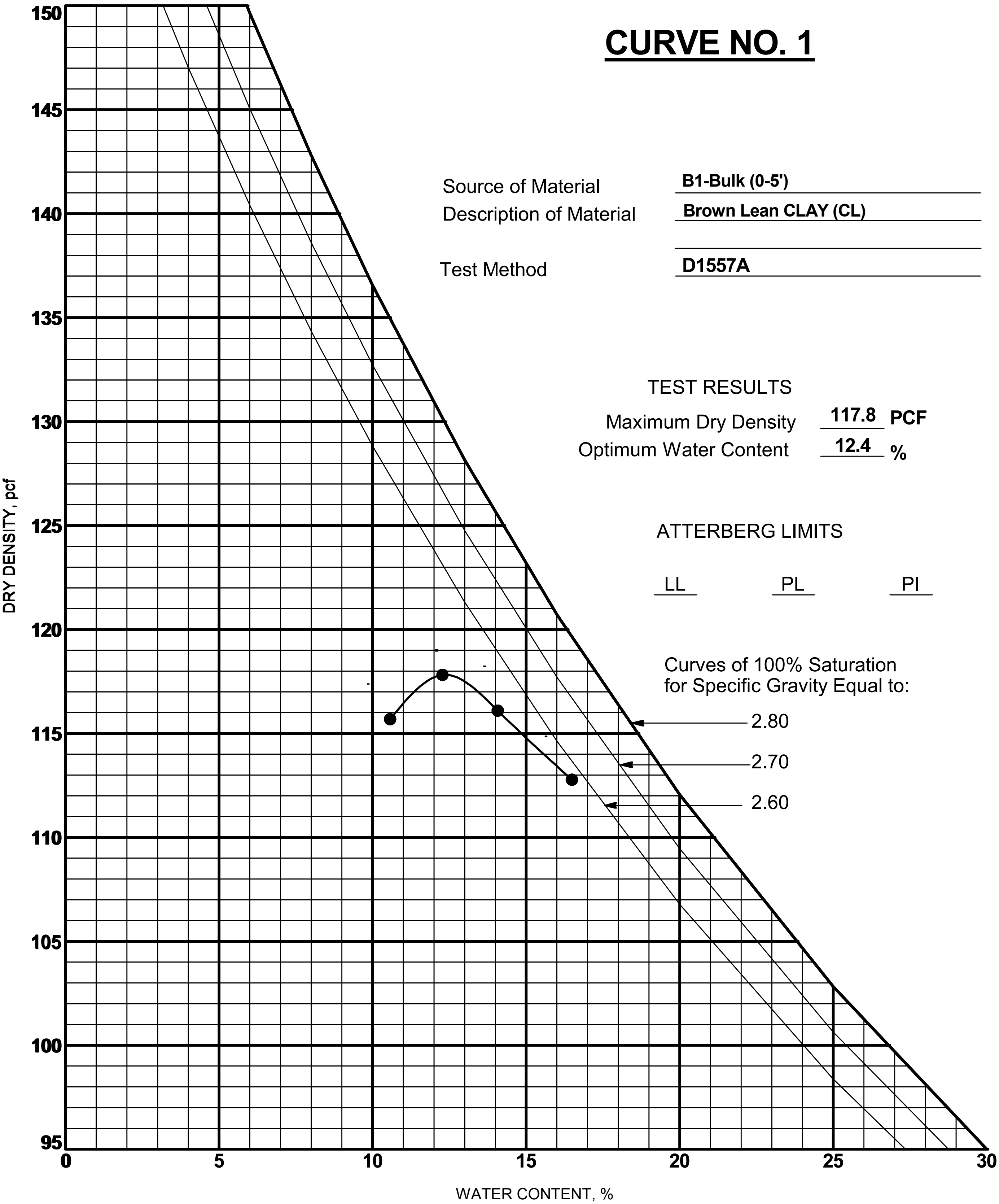
TEST RESULTS

Maximum Dry Density **117.8** **PCF**

Optimum Water Content **12.4** **%**

ATTERBERG LIMITS

LL	PL	PI



MOISTURE-DENSITY RELATIONSHIP

Project: Cemex Cache Creek

Location: Madison, California

Number: S1294-05-01

Figure: B4

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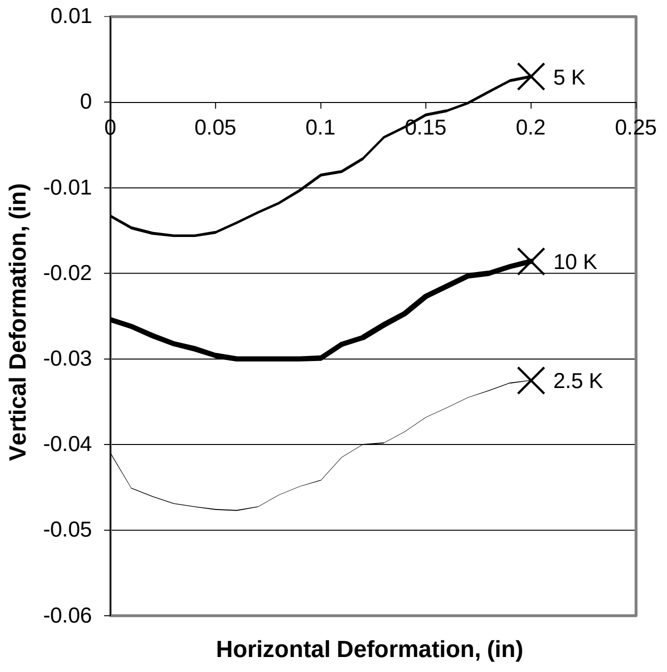
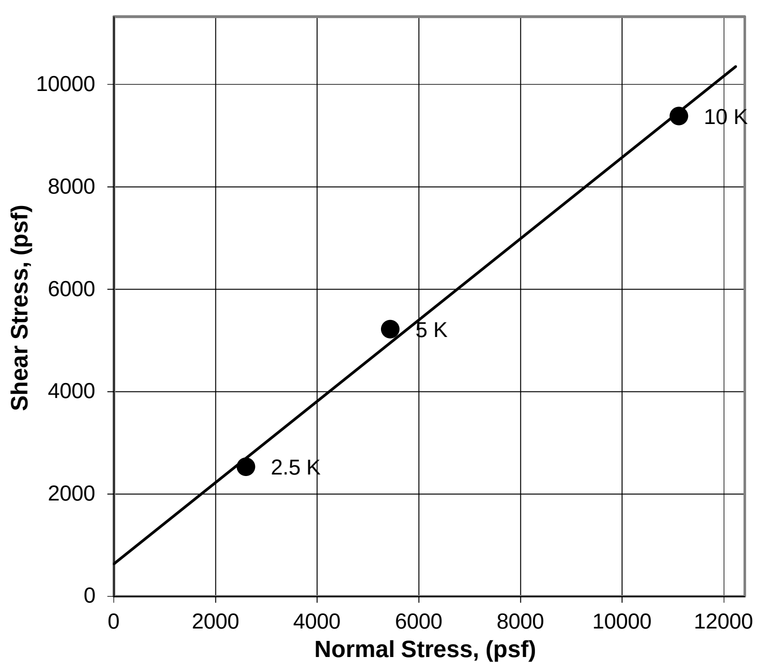
GEOCON
INCORPORATED

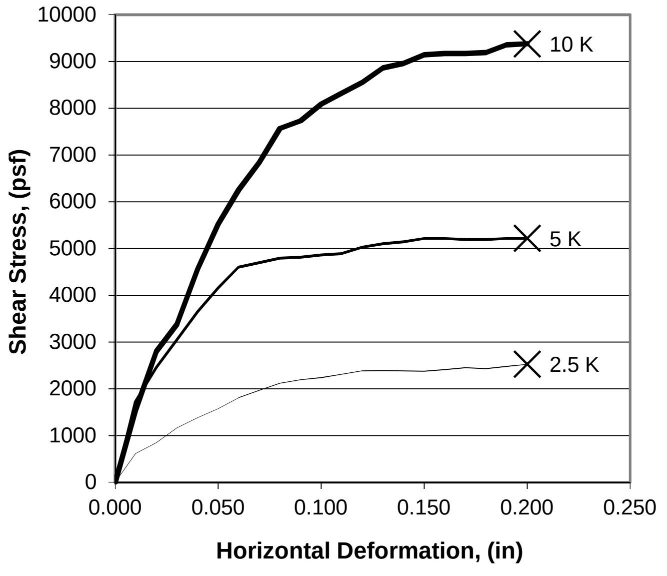
DIRECT SHEAR TEST REPORT

CEMEX CACHE CREEK PLANT

G1294-52-01 **Date:** Thursday, October 19, 2017 **By:** TG
Sample No.: B1 @ 40.5 **Natural or Remold:** Natural
Description: SW-GRAY (F-C) SAND WITH A TRACE OF FINE
Remarks: GRAVEL AND SILT



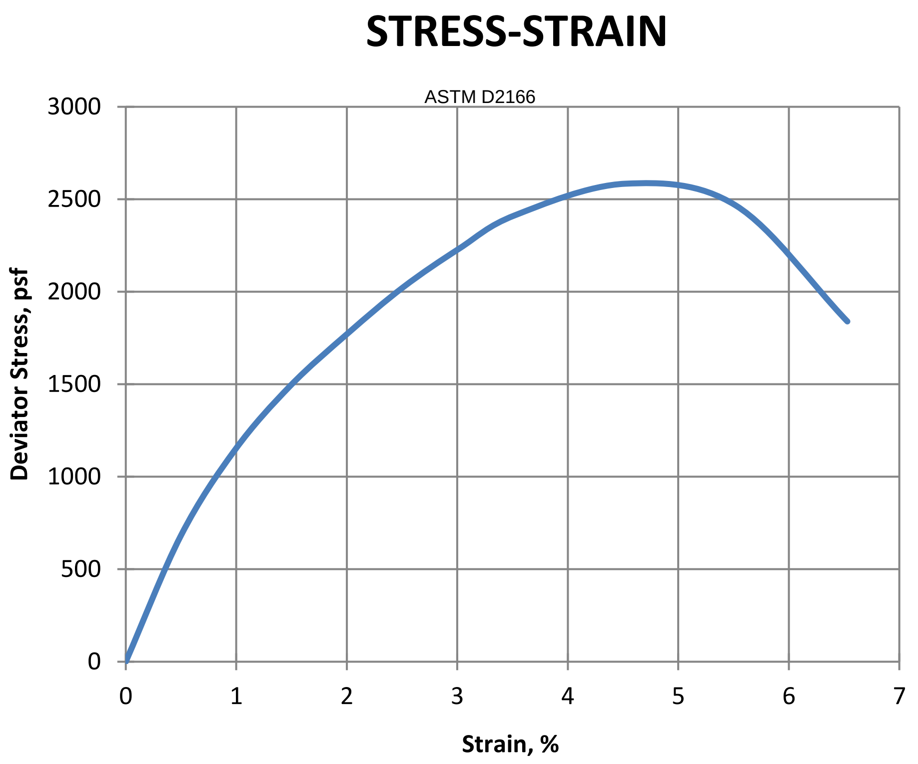




ϕ (Degrees)	**38.5**
c (psf)	**635**
Tan ϕ	**0.794**
Method	**Calc**

Load	2.5 K	5 K	10 K
INITIAL			
Water Content	12.4%	13.2%	10.4%
Dry Density (pcf)	108.3	107.6	105.0
Saturation*	62.4%	65.1%	48.1%
Height (inches)	1.00	1.00	1.00
AFTER TEST			
Water Content	15.6%	15.4%	13.6%
Dry Density (pcf)	111.9	107.3	107.0
FAILURE			
Normal Stress (psf)	2600	5440	11120
Failure Stress (psf)	2525	5216	9379
Failure Deffinition	User	User	User
Displacement (in)	0.20	0.20	0.20
Rate (in/min)	0.0100	0.0100	0.0100

* Degree of saturation calculated with a specific gravity of 2.65



Failure Photo

Sample Description	
Boring Number	B1
Sample Depth (feet)	10.00
Material Description	Dark Yellowish Brown Sandy lean CLAY
Initial Conditions at Start of Test	
Height (inch) average of 3	4.93
Diameter (inch) average of 3	2.37
Moisture Content (%)	19.9
Dry Density (pcf)	101.4
Estimated Specific Gravity	2.7
Saturation (%)	81.1
Shear Test Conditions	
Strain Rate (%/min)	1.0004
Major Principal Stress at Failure (psf)	2580
Strain at Failure (%)	4.5
Test Results	
Unconfined Compressive Strength (tons/ft^2)	1.3
Unconfined Compressive Strength (lbs/ft^2)	2584
Shear Strength (tons/ft^2)	0.6
Shear Strength (lbs/ft^2)	1292

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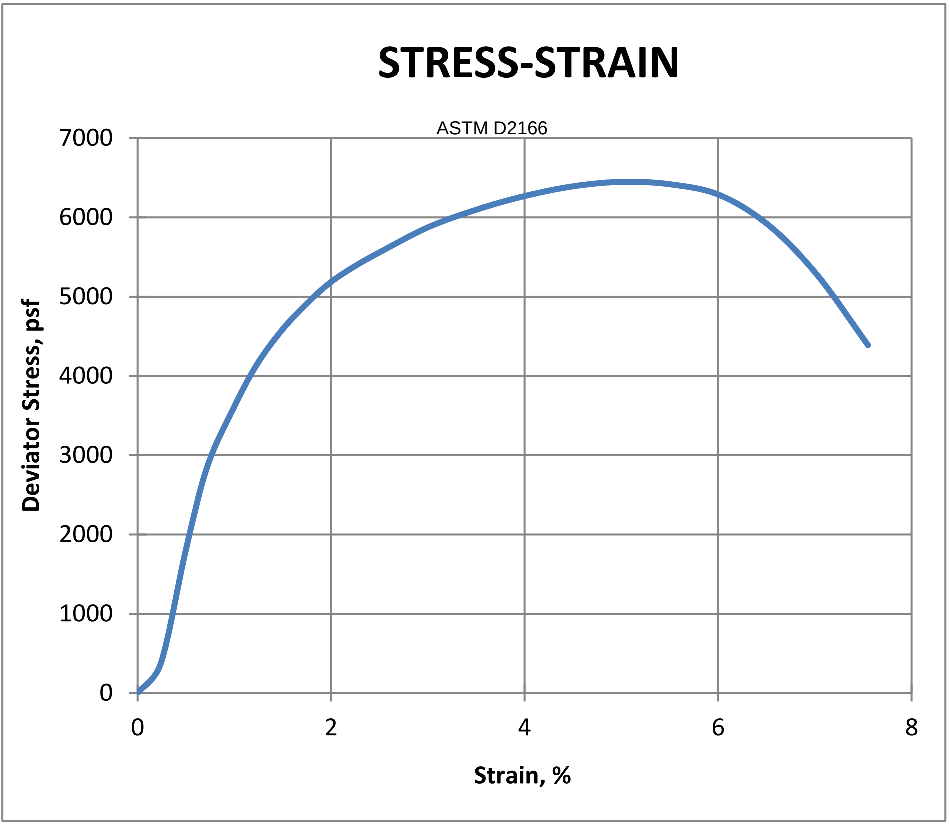
Unconfined Compressive Strength (ASTM D2166)

Project:	Cemex Cache Creek
Location:	Yolo County, California
Number:	S1294-05-01
Figure:	B6



Failure Photo

Sample Description

Boring Number	B1
Sample Depth (feet)	71.00
Material Description	Dark greenish gray lean CLAY

Initial Conditions at Start of Test

Height (inch) average of 3	4.89
Diameter (inch) average of 3	2.40
Moisture Content (%)	27.6
Dry Density (pcf)	97.1
Estimated Specific Gravity	2.8
Saturation (%)	98.9

Shear Test Conditions

Strain Rate (%/min)	0.9991
Major Principal Stress at Failure (psf)	6450
Strain at Failure (%)	5.0

Test Results

Unconfined Compressive Strength (tons/ft^2)	3.2
Unconfined Compressive Strength (lbs/ft^2)	6448
Shear Strength (tons/ft^2)	1.6
Shear Strength (lbs/ft^2)	3224

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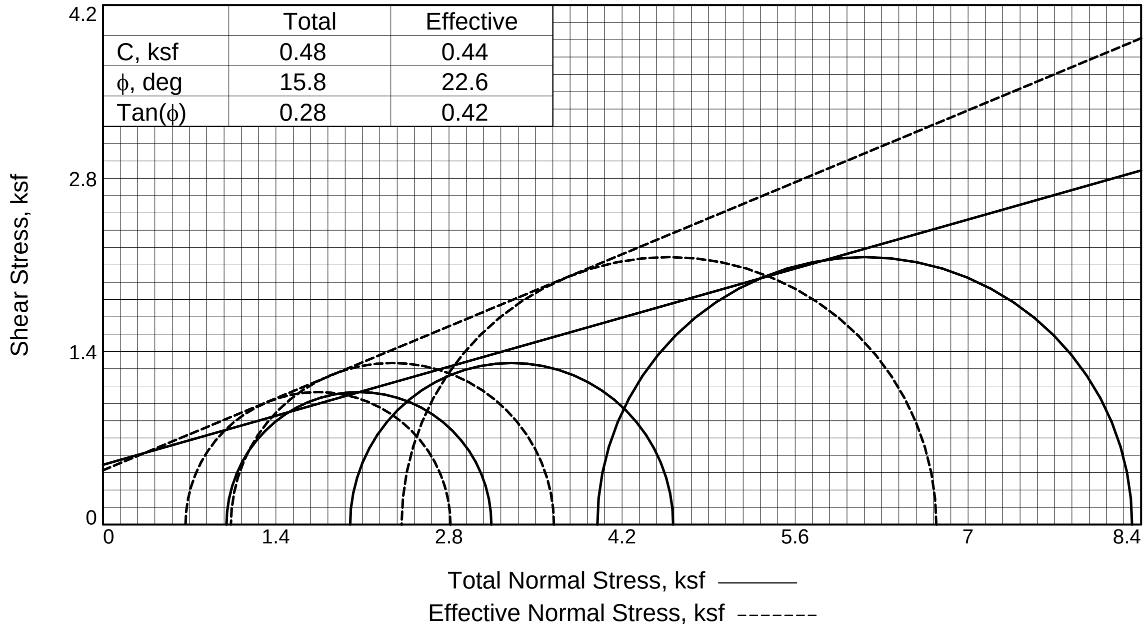
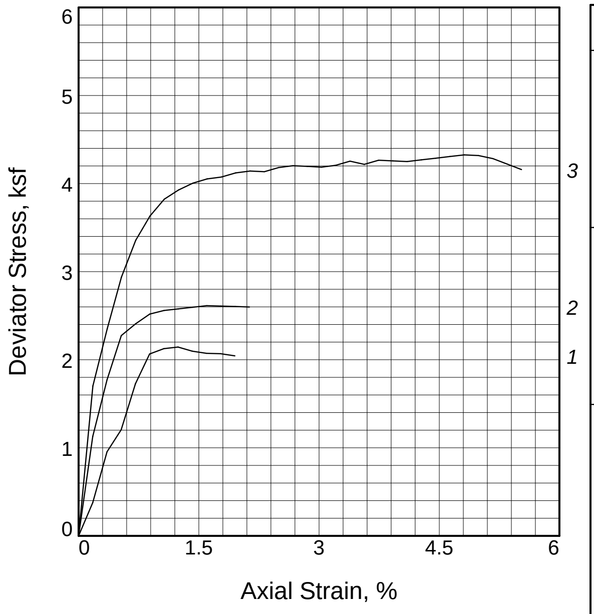
Unconfined Compressive Strength (ASTM D2166)

Project: Cemex Cache Creek
Location: Yolo County
Number: S1294-05-01
Figure: B7



	Total	Effective
C, ksf	0.48	0.44
ϕ, deg	15.8	22.6
Tan(ϕ)	0.28	0.42



	Sample No.	1	2	3
Initial	Water Content, %	11.5	11.6	11.5
	Dry Density, pcf	109.9	109.8	109.9
	Saturation, %	58.1	58.4	58.1
	Void Ratio	0.5333	0.5345	0.5333
	Diameter, in.	2.81	2.81	2.81
	Height, in.	5.66	5.66	5.66
At Test	Water Content, %	19.8	19.8	19.7
	Dry Density, pcf	109.9	109.8	109.9
	Saturation, %	100.0	100.0	99.9
	Void Ratio	0.5333	0.5345	0.5333
	Diameter, in.	2.81	2.82	2.82
	Height, in.	5.64	5.63	5.61
	Strain rate, in./min.	0.120	0.013	0.011
	Back Pressure, psi	50.00	50.00	50.00
	Cell Pressure, psi	56.94	63.89	77.78
	Fail. Stress, ksf	2.14	2.61	4.33
	Total Pore Pr., ksf	7.53	8.16	8.78
	Ult. Stress, ksf			
	Total Pore Pr., ksf			
	$\bar{\sigma}_1$ Failure, ksf	2.81	3.65	6.74
	$\bar{\sigma}_3$ Failure, ksf	0.67	1.04	2.42

Type of Test:
CU with Pore Pressures

Sample Type: Remold

Description:

Specific Gravity= 2.7

Remarks: Test specimen remolded to approximate 90% of an ASTM D1557 proctor at +2% over optimum moisture content.

Figure B8

Client: Geocon, Inc.

Project: CEMEX - Cache Creek Plant

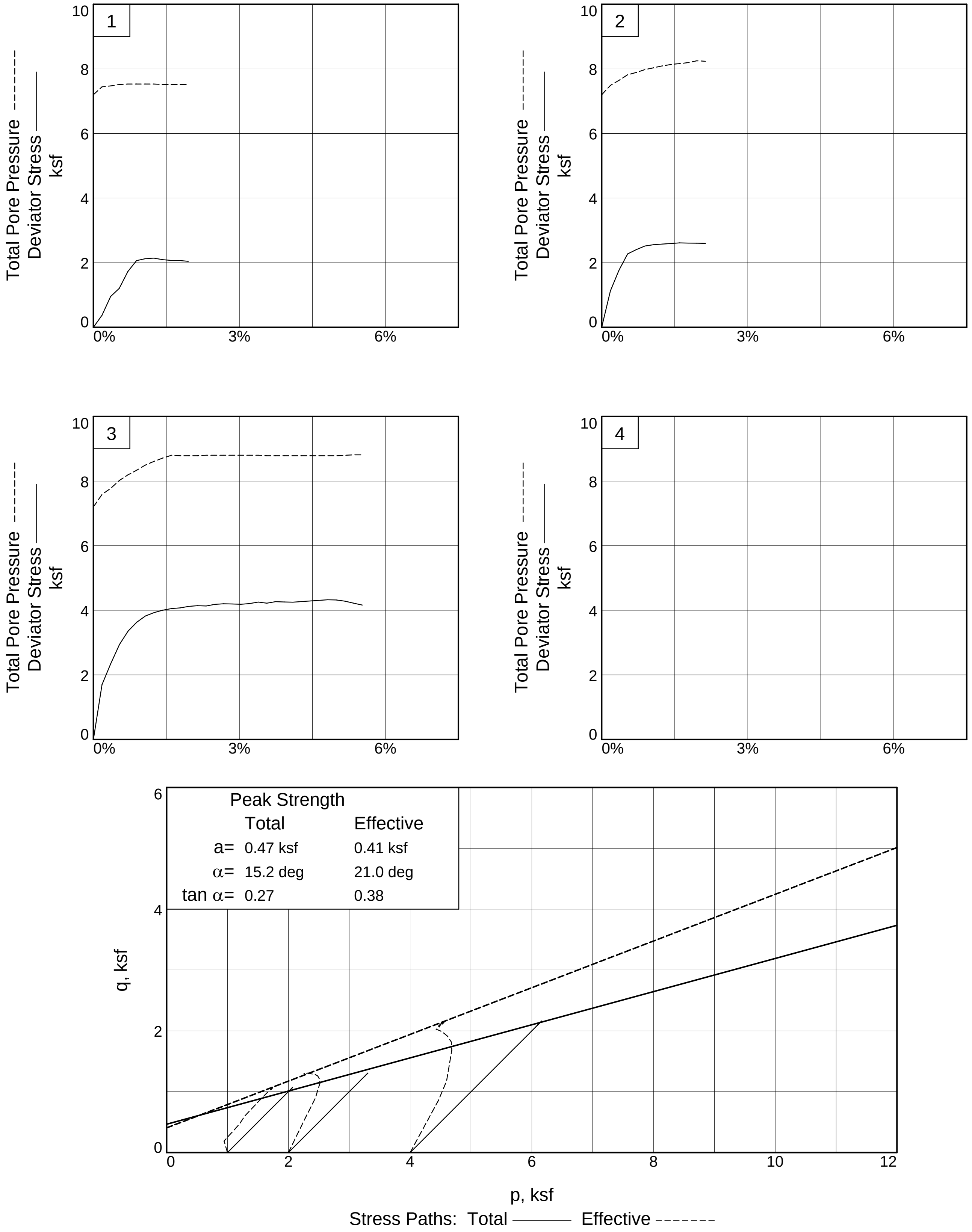
Location: B2-Bulk

Sample Number: 28093

Proj. No.: 17-250 **Date Sampled:** Rec. 10/31/17

GS GULF SHORE
EXPLORATION AND TESTING

Tested By: MPW **Checked By:** CMW



Client: Geocon, Inc.

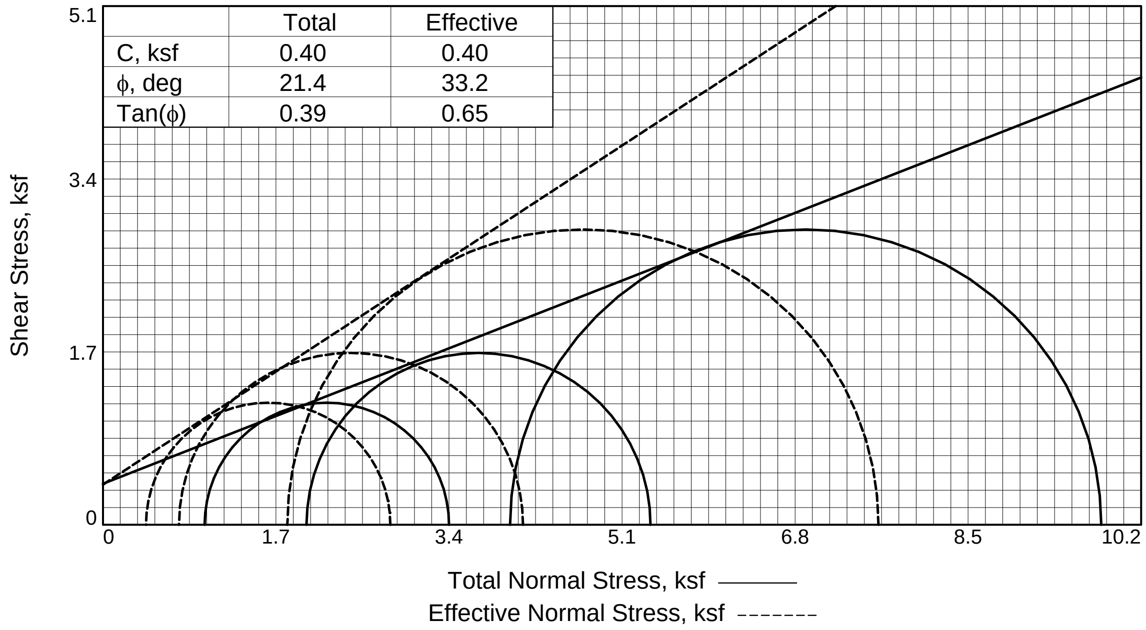
Project: CEMEX - Cache Creek Plant

Location: B2-Bulk **Sample Number:** 28093

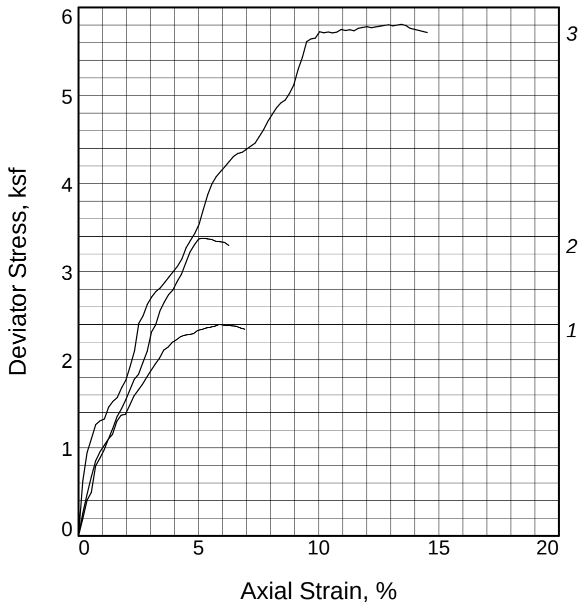
Project No.: 17-250 **Figure** B9

Gulf Shore Construction Services, LLC

Tested By: MPW **Checked By:** CMW



	Total	Effective
C, ksf	0.40	0.40
ϕ, deg	21.4	33.2
Tan(ϕ)	0.39	0.65



	Sample No.	1	2	3
Initial	Water Content, %	12.8	12.8	12.8
	Dry Density, pcf	112.9	112.9	112.9
	Saturation, %	70.1	70.1	70.1
	Void Ratio	0.4930	0.4930	0.4930
	Diameter, in.	2.81	2.81	2.81
	Height, in.	5.66	5.66	5.66
At Test	Water Content, %	18.3	17.7	17.7
	Dry Density, pcf	112.9	114.1	114.1
	Saturation, %	100.0	100.0	99.9
	Void Ratio	0.4930	0.4772	0.4772
	Diameter, in.	2.81	2.81	2.82
	Height, in.	5.64	5.60	5.58
	Strain rate, in./min.	0.012	0.013	0.120
	Back Pressure, psi	50.00	50.00	50.00
	Cell Pressure, psi	56.94	63.89	77.78
	Fail. Stress, ksf	2.40	3.38	5.81
	Total Pore Pr., ksf	7.78	8.45	9.39
	Ult. Stress, ksf			
	Total Pore Pr., ksf			
	$\bar{\sigma}_1$ Failure, ksf	2.82	4.13	7.62
	$\bar{\sigma}_3$ Failure, ksf	0.42	0.75	1.81

Type of Test:
CU with Pore Pressures

Sample Type: Remold

Description:

Specific Gravity= 2.7

Remarks: Test specimen remolded to approximate 90% of an ASTM D1557 proctor at +2% over optimum moisture content.

Figure B10

Client: Geocon, Inc.

Project: CEMEX - Cache Creek Plant

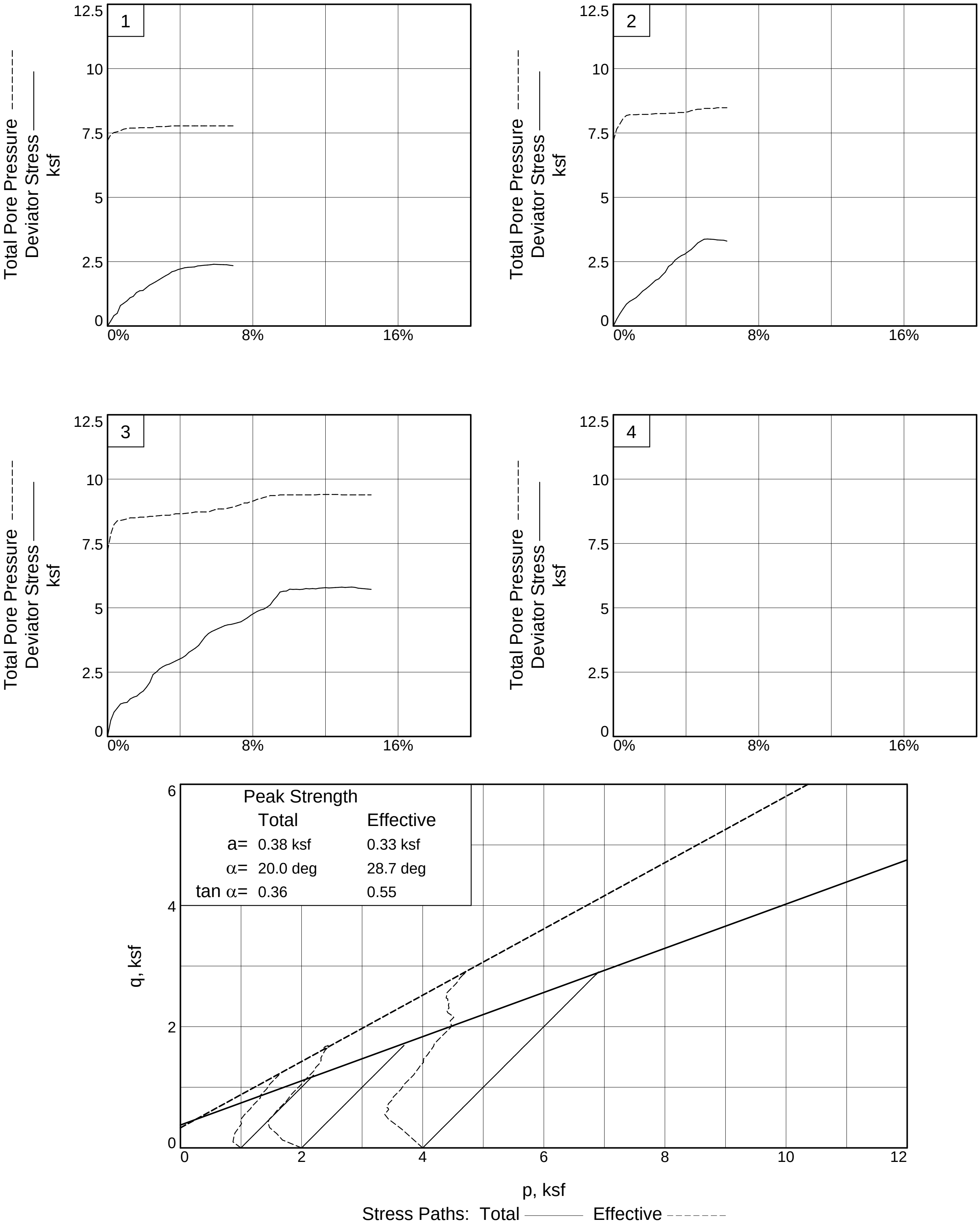
Location: A5-Bulk

Sample Number: 27920

Proj. No.: 17-250 **Date Sampled:** Rec. 10/25/17

GS GULF SHORE
EXPLORATION AND TESTING

Tested By: MPW **Checked By:** CMW



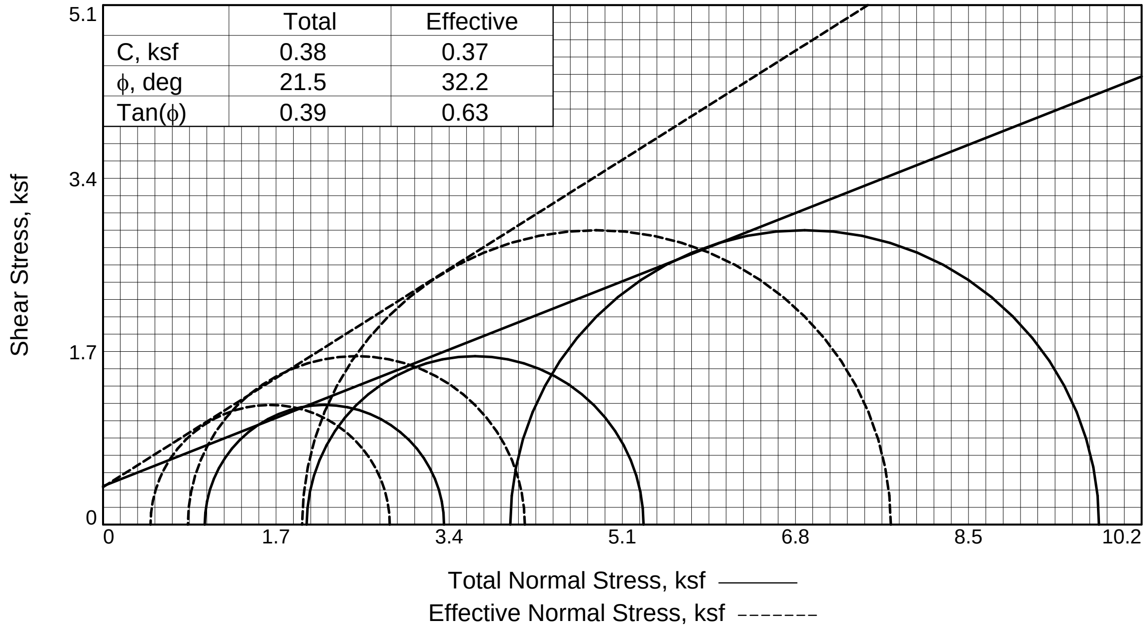
Peak Strength

	Total	Effective
a=	0.38 ksf	0.33 ksf
α=	20.0 deg	28.7 deg
tan α=	0.36	0.55

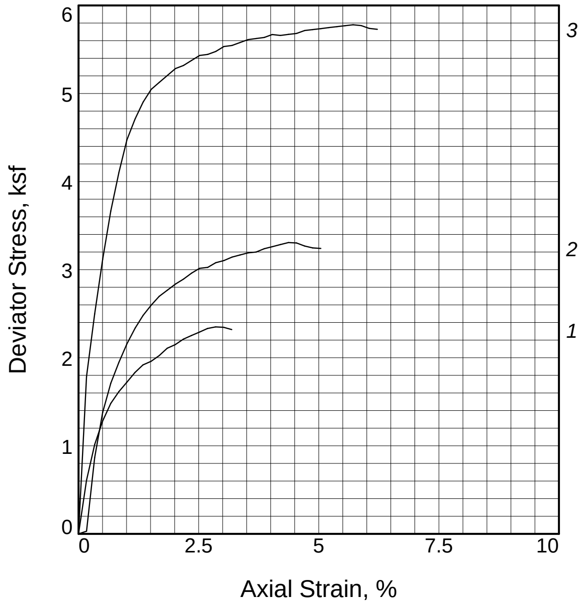
Client: Geocon, Inc.
Project: CEMEX - Cache Creek Plant
Location: A5-Bulk **Sample Number:** 27920
Project No.: 17-250 **Figure** B11

Gulf Shore Construction Services, LLC

Tested By: MPW **Checked By:** CMW



	Total	Effective
C, ksf	0.38	0.37
ϕ, deg	21.5	32.2
Tan(ϕ)	0.39	0.63



	Sample No.	1	2	3
Initial	Water Content, %	22.0	22.0	21.8
	Dry Density, pcf	95.7	95.7	96.2
	Saturation, %	77.9	78.1	78.3
	Void Ratio	0.7622	0.7620	0.7527
	Diameter, in.	2.86	2.86	2.86
	Height, in.	6.00	6.00	5.99
At Test	Water Content, %	27.2	27.6	27.5
	Dry Density, pcf	97.1	96.6	96.7
	Saturation, %	99.9	99.9	100.0
	Void Ratio	0.7358	0.7444	0.7440
	Diameter, in.	2.85	2.86	2.86
	Height, in.	5.96	5.95	5.95
	Strain rate, in./min.	0.012	0.013	0.011
	Back Pressure, psi	50.00	50.00	50.00
	Cell Pressure, psi	56.94	63.89	77.78
	Fail. Stress, ksf	2.35	3.31	5.78
	Total Pore Pr., ksf	7.73	8.37	9.24
	Ult. Stress, ksf			
	Total Pore Pr., ksf			
	$\bar{\sigma}_1$ Failure, ksf	2.82	4.14	7.74
	$\bar{\sigma}_3$ Failure, ksf	0.47	0.83	1.96

Type of Test:
CU with Pore Pressures

Sample Type: Liner

Description:

Specific Gravity= 2.7

Remarks:

Figure B12

Client: Geocon, Inc.

Project: CEMEX - Cache Creek Plant

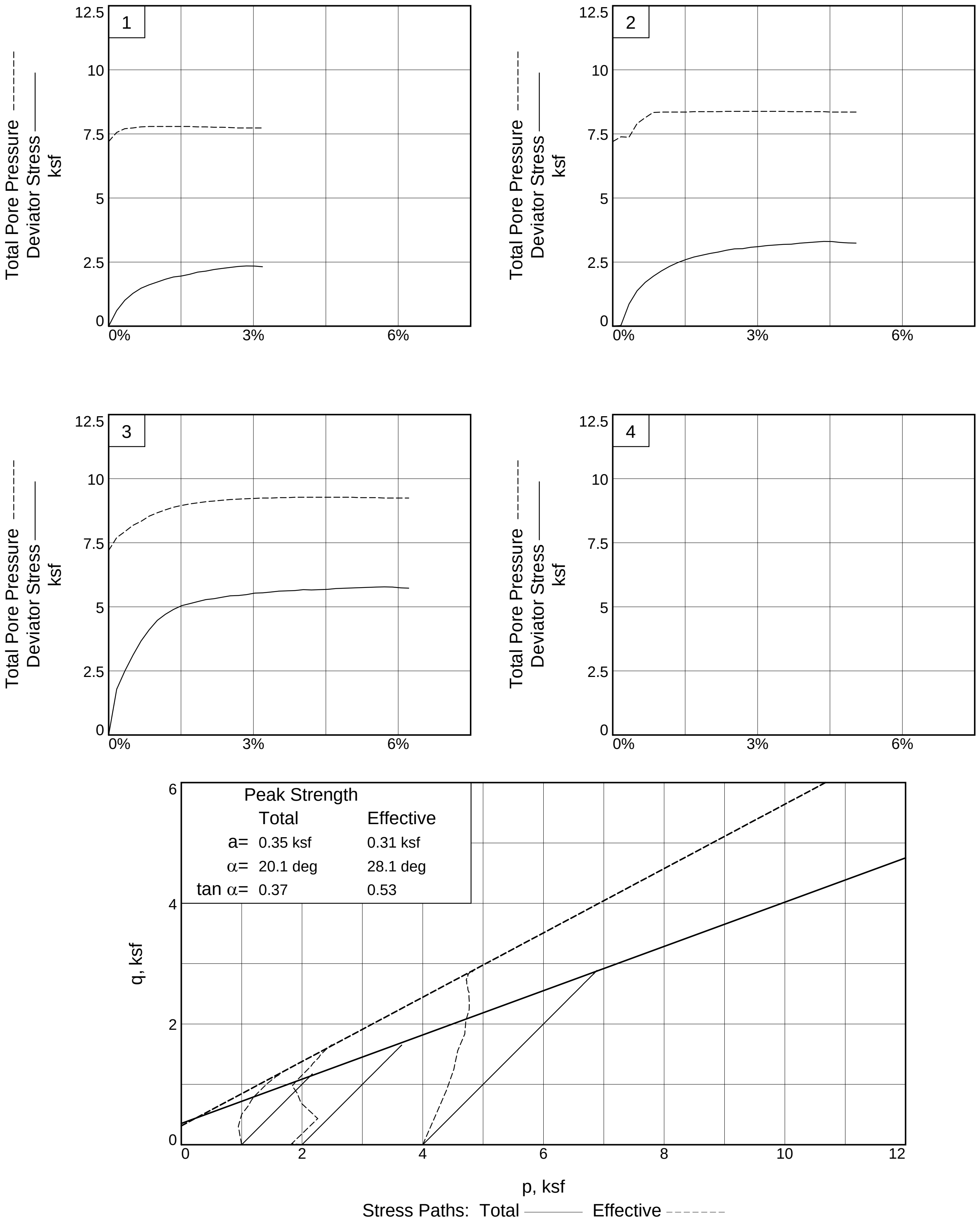
Location: B3b

Sample Number: 28032 **Depth:** 4.0'-5.5'

Proj. No.: 17-250 **Date Sampled:** Rec. 10/31/17

GS GULF SHORE
EXPLORATION AND TESTING

Tested By: MPW **Checked By:** CMW



Client: Geocon, Inc.

Project: CEMEX - Cache Creek Plant

Location: B3b **Depth:** 4.0'-5.5' **Sample Number:** 28032

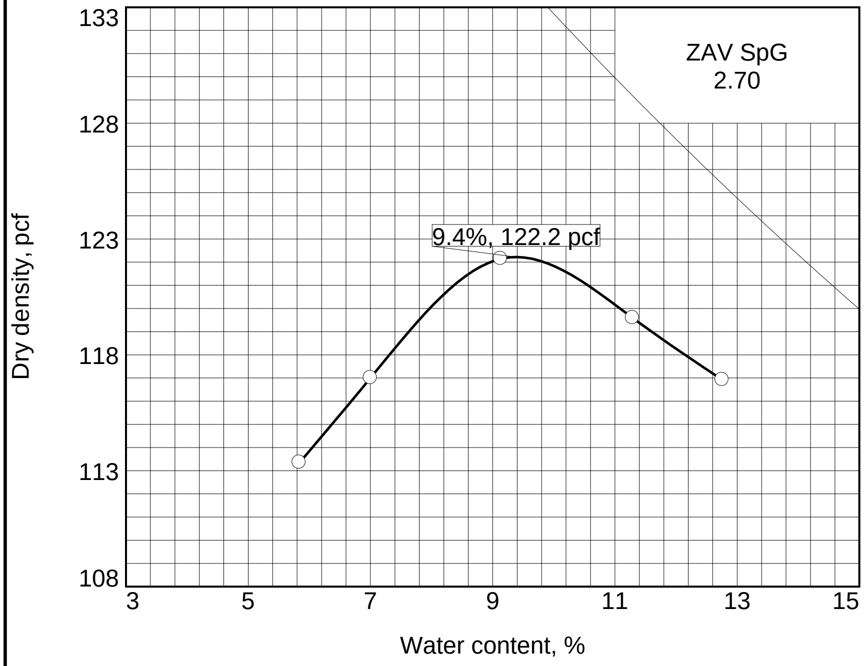
Project No.: 17-250 **Figure** B13

Gulf Shore Construction Services, LLC

Tested By: MPW **Checked By:** CMW

COMPACTION TEST REPORT

Curve No. 28093



Preparation Method Moist

Rammer: Wt. 10 lb. Drop 18 in.

Type Manual

Layers: No. five Blows per 25

Mold Size 0.03333 cu. ft.

Test Performed on Material

Passing 3/8 in. Sieve

%>3/8 in. %<No.200

Atterberg (D 4318): LL PI

NM (D 2216) Sp.G. (D 854) 2.70

USCS (D 2487)

AASHTO (M 145)

Date: Sampled Rec. 10/31/17

Received 10/31/17

Tested

Tested By

COMPACTION TESTING DATA
ASTM D 1557-12 Method B Modified

	1	2	3	4	5	6
WM + WS	6180.3	6199.4	6202.5	6080.0	6001.0	
WM	4187.2	4187.2	4187.2	4187.2	4187.2	
WW + T #1	491.4	450.7	439.0	430.1	421.7	
WD + T #1	443.1	409.6	406.2	405.3	401.3	
TARE #1	64.5	45.6	47.1	51.1	52.0	
WW + T #2						
WD + T #2						
TARE #2						
MOIST.	12.8	11.3	9.1	7.0	5.8	
DRY DENS.	116.9	119.6	122.1	117.0	113.4	

SIEVE TEST RESULTS

Opening Size	% Passing	Specs.

TEST RESULTS

Maximum dry density = 122.2 pcf

Optimum moisture = 9.4 %

Material Description

Remarks:

Project No. 17-250 **Client:** Geocon, Inc.

Project: CEMEX - Cache Creek Plant

○ **Location:** B2-Bulk **Sample Number:** 28093

GS GULF SHORE EXPLORATION AND TESTING

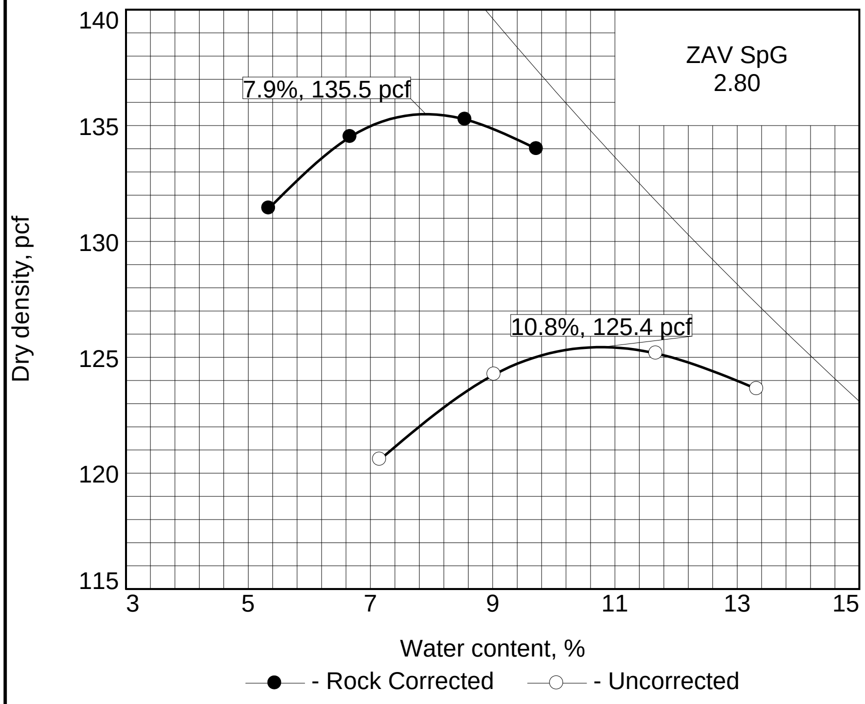
Checked by:

Title:

Figure B14

COMPACTION TEST REPORT

Curve No. 27920



Preparation Method Moist
Rammer: Wt. 10 lb. Drop 18 in.
Type Manual
Layers: No. five Blows per 56
Mold Size 0.075 cu. ft.

Test Performed on Material
Passing 3/4 in. Sieve

%>3/4 in. 29.0 %<No.200
Atterberg (D 4318): LL PI
NM (D 2216) Sp.G. (D 854)
USCS (D 2487)
AASHTO (M 145)
Date: Sampled Rec. 10/25/17
Received 10/25/17
Tested 11/2/17
Tested By BM

COMPACTION TESTING DATA
ASTM D 1557-12 Method C Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

	1	2	3	4	5	6
WM + WS	7137.0	7350.1	7496.4	7507.5		
WM	2741.3	2741.3	2741.2	2741.2		
WW + T #1	308.0	431.9	481.5	477.1		
WD + T #1	290.4	399.8	436.0	427.0		
TARE #1	44.4	44.2	46.3	51.0		
WW + T #2						
WD + T #2						
TARE #2						
MOIST.	5.3	6.7	8.6	9.7		
DRY DENS.	131.4	134.5	135.3	134.0		

SIEVE TEST RESULTS

Opening Size	% Passing	Specs.

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 135.5 pcf	125.4 pcf
Optimum moisture = 7.9 %	10.8 %

Material Description

Remarks:

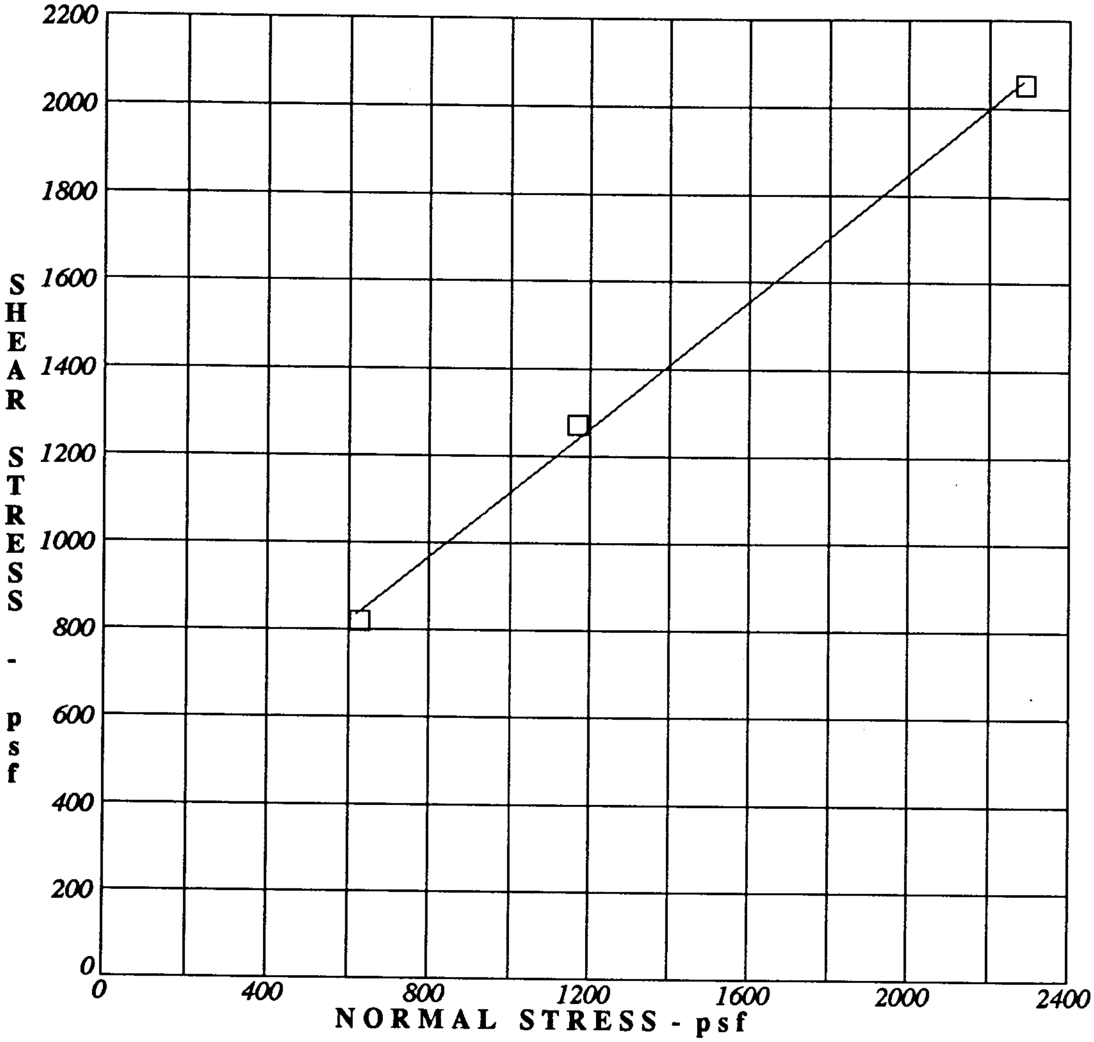
Project No. 17-250 **Client:** Geocon, Inc.
Project: CEMEX - Cache Creek Plant

○ **Location:** A5-Bulk **Sample Number:** 27920

GS GULF SHORE EXPLORATION AND TESTING

Checked by: CMW
Title: PM

Figure B15



TEST TYPE:	CD/WET/STAGED
BORING NO:	B-2
DEPTH:	45.0 ft.
SOIL DESCRIPTION:	Clean Gray Sand

FRICTION ANGLE = 37 deg.

COHESION = 380.0 psf

DRY DENSITY - pcf	106.4		
WATER CONTENT - %	18.3		
NORMAL STRESS - psf	630	1170	2290
MAXIMUM SHEAR - psf	820	1270	2050

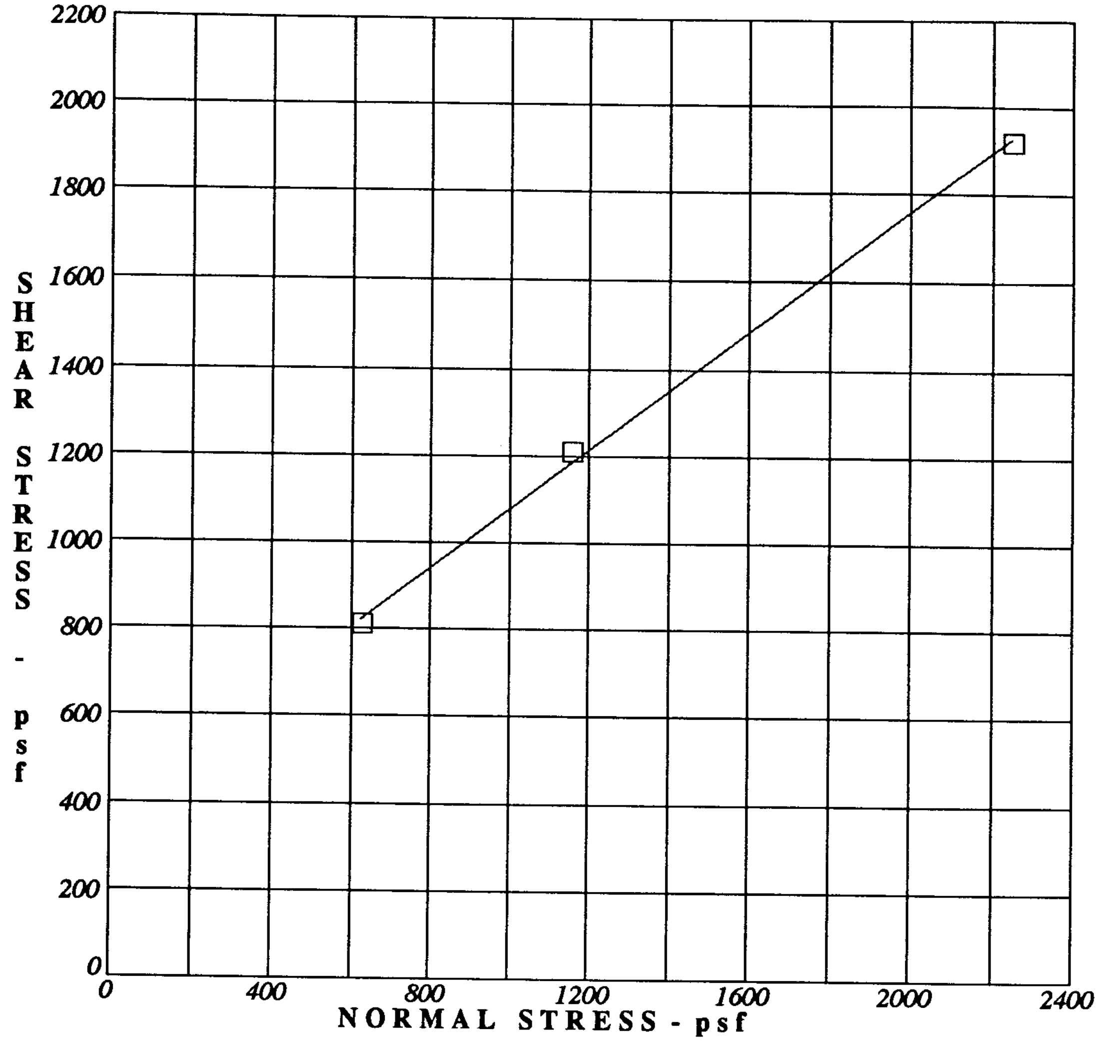
KLEINFELDER

PROJECT NO. 40-2695-01

DIRECT SHEAR TEST
Solano Concrete Madison Plant

Yolo County, California

PLATE



TEST TYPE: CD/WET/STAGED
BORING NO: B-2
DEPTH: 60.0 ft.
SOIL DESCRIPTION: Brown Silty Sand

FRICTION ANGLE = 34 deg.

COHESION = 400.0 psf

DRY DENSITY - pcf	98.7		
WATER CONTENT - %	22.3		
NORMAL STRESS - psf	630	1160	2250
MAXIMUM SHEAR - psf	810	1210	1920

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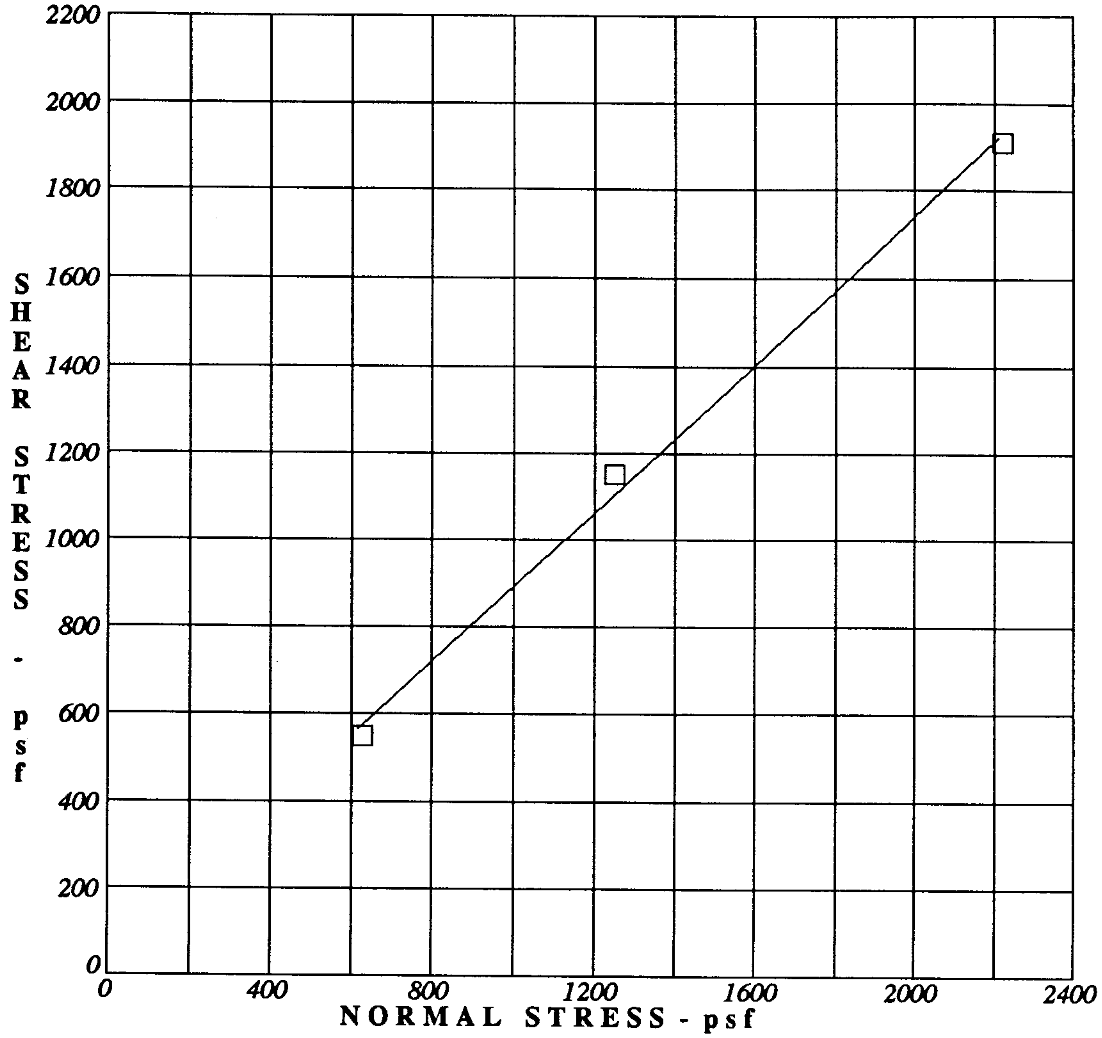
PROJECT NO. 40-2695-01

DIRECT SHEAR TEST
Solano Concrete Madison Plant

Yolo County, California

PLATE

18



TEST TYPE:	CD/WET/STAGED
BORING NO:	B-9
DEPTH:	30.0 ft.
SOIL DESCRIPTION:	Dark Brown Silty Sand

FRICTION ANGLE = 41 deg.

COHESION = 50.0 psf

DRY DENSITY - pcf	90.3	89.7	96.1
WATER CONTENT - %	19.4	19.2	19.7
NORMAL STRESS - psf	630	1250	2220
MAXIMUM SHEAR - psf	550	1150	1910

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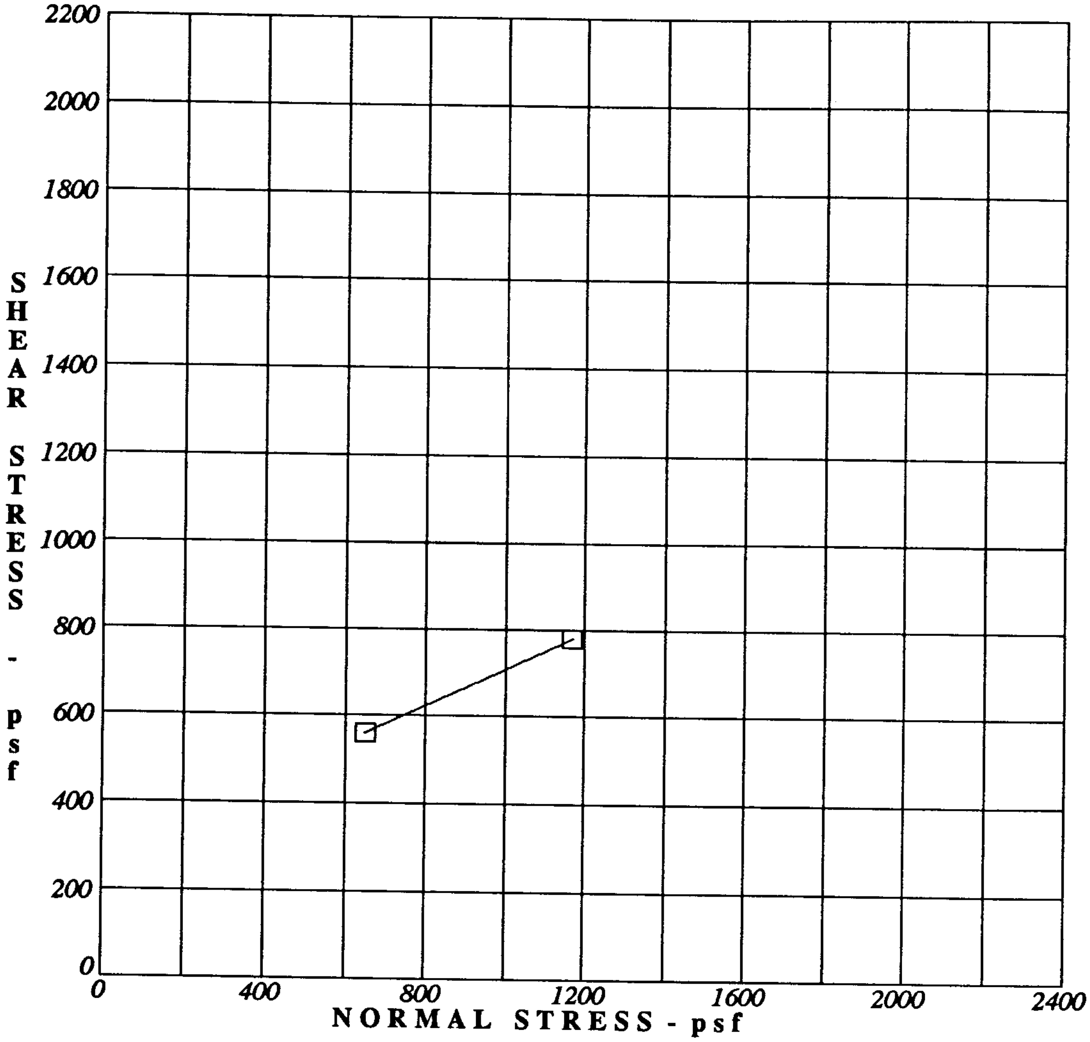
PROJECT NO. 40-2695-01

DIRECT SHEAR TEST
Solano Concrete Madison Plant

Yolo County, California

PLATE

19



TEST TYPE:	CD/WET/STAGED
BORING NO:	B-10
DEPTH:	60.0 ft.
SOIL DESCRIPTION:	Dark Brown Sand (slightly disturbed)

FRICTION ANGLE = 23 deg.

COHESION = 285.0 psf

DRY DENSITY - pcf	91.4	93.7	96.2
WATER CONTENT - %	22.9	22.0	23.3
NORMAL STRESS - psf	650	1170	2240
MAXIMUM SHEAR - psf	560	780	2000

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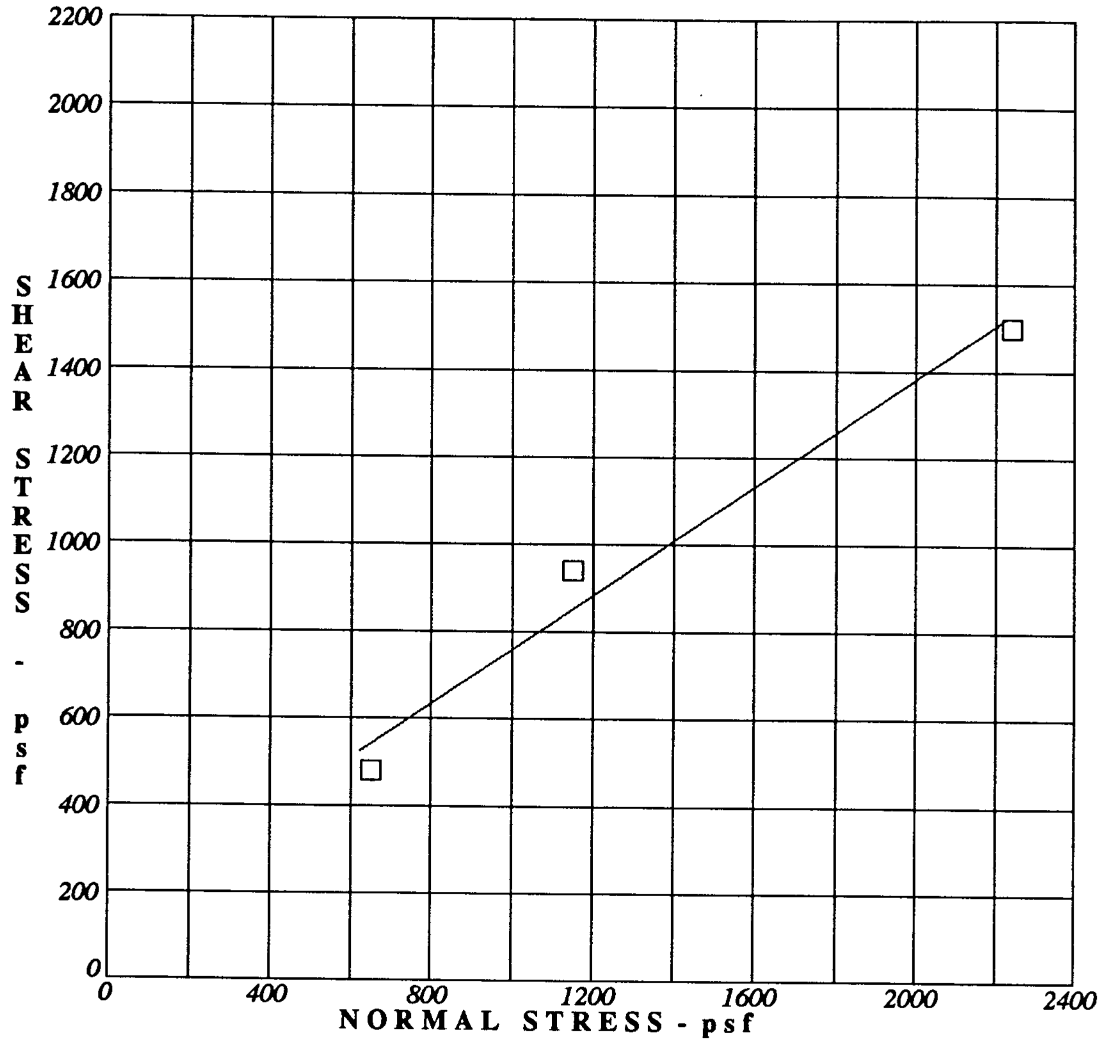
PROJECT NO. 40-2695-01

DIRECT SHEAR TEST
Solano Concrete Madison Plant

Yolo County, California

PLATE

20



TEST TYPE:	CD/WET/STAGED
BORING NO:	B-11
DEPTH:	65.0 ft.
SOIL DESCRIPTION:	Brown-Gray Silty Sand (Slightly Disturbed)

FRICTION ANGLE = 32 deg.

COHESION = 150.0 psf

DRY DENSITY - pcf	94	95.3	98.2
WATER CONTENT - %	17.3	17.1	17.3
NORMAL STRESS - psf	650	1150	2240
MAXIMUM SHEAR - psf	480	940	1500

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PROJECT NO. **40-2695-01**

DIRECT SHEAR TEST
Solano Concrete Madison Plant

Yolo County, California

PLATE

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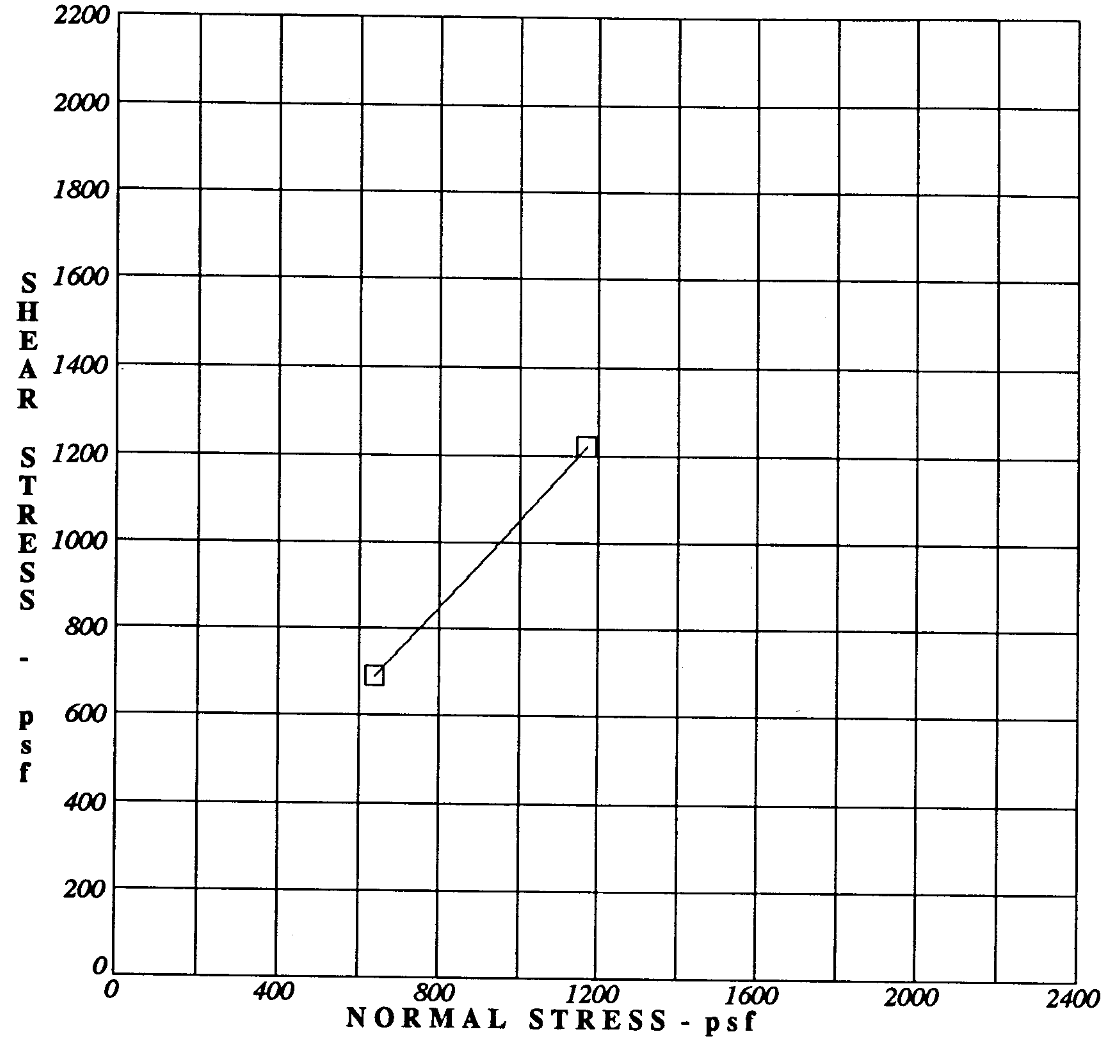

TEST TYPE:	CD/WET/STAGED
BORING NO:	B-12
DEPTH:	40.0 ft.
SOIL DESCRIPTION:	Brown Silty Sand (some pebbles)

FRICTION ANGLE = 46 deg.

COHESION = 50.0 psf

DRY DENSITY - pcf	117.7	118.6	94.7
WATER CONTENT - %	13.5	13.8	27.2
NORMAL STRESS - psf	640	1170	2290
MAXIMUM SHEAR - psf	690	1220	4630

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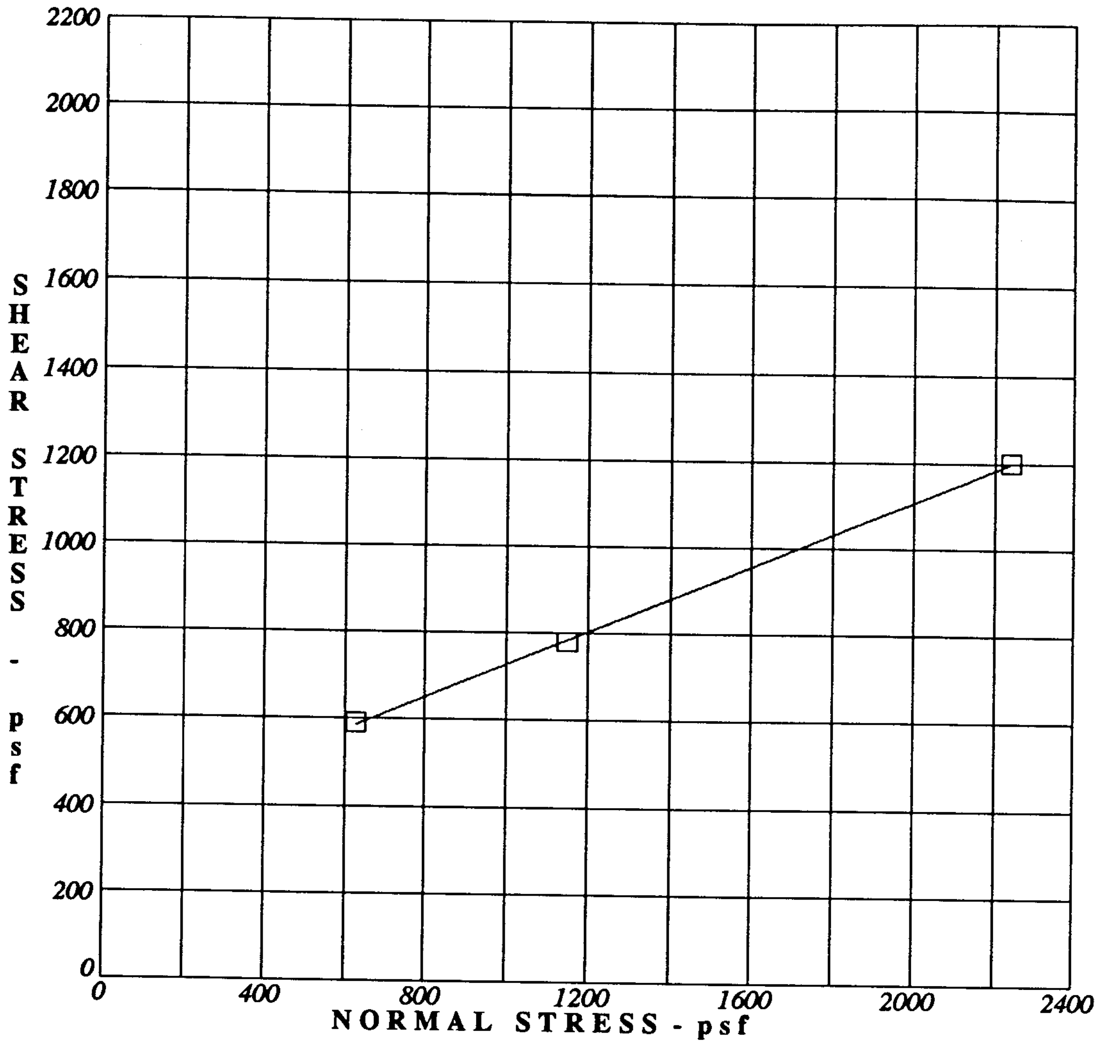
DIRECT SHEAR TEST
Solano Concrete Madison Plant

Yolo County, California



TEST TYPE: CD/WET/STAGED
BORING NO: B-13
DEPTH: 40.0 ft.
SOIL DESCRIPTION: Brown Sand (totally remolded)

FRICTION ANGLE = 21 deg.
COHESION = 340.0 psf

DRY DENSITY - pcf	94.3	100.9	97.8
WATER CONTENT - %	18.1	16.0	15.8
NORMAL STRESS - psf	630	1150	2240
MAXIMUM SHEAR - psf	590	780	1200

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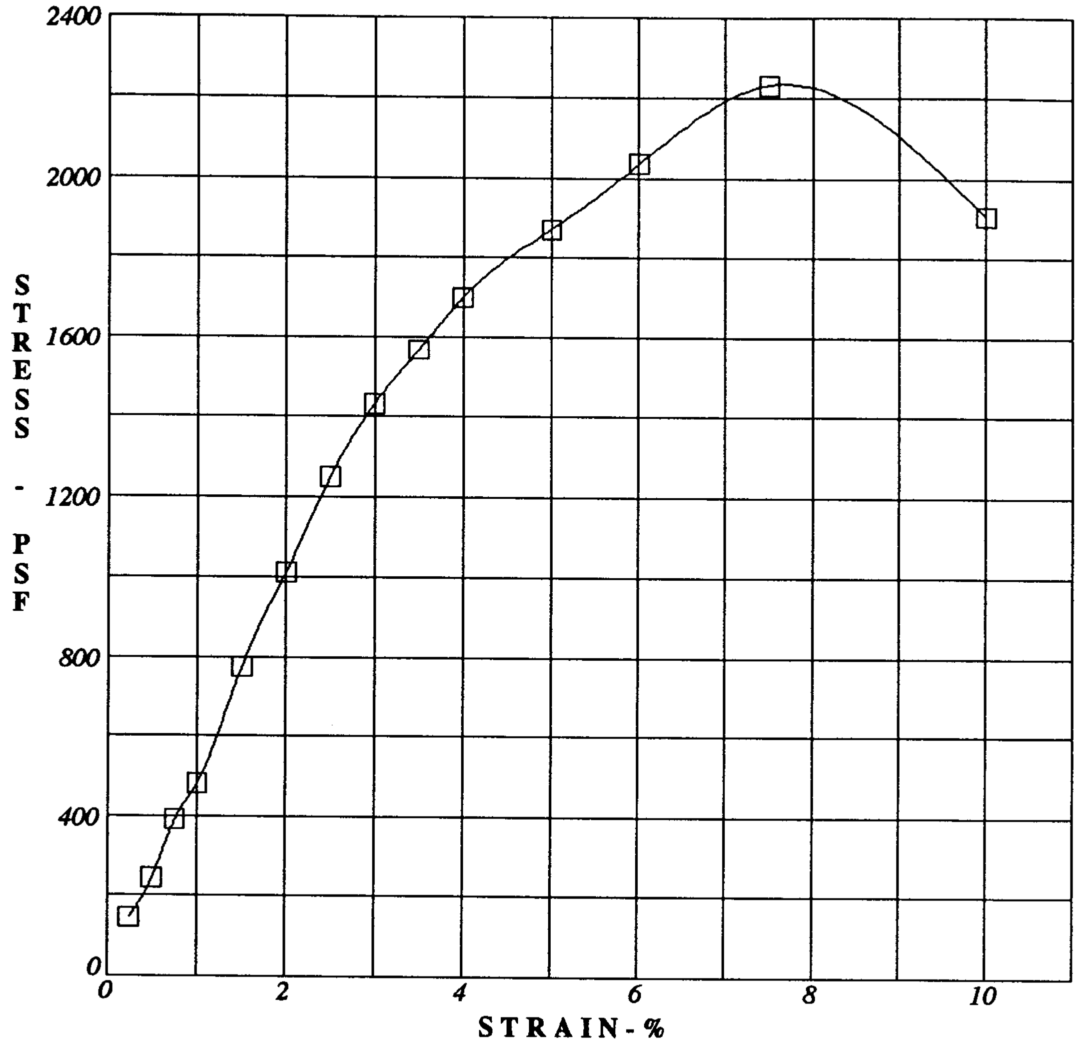
PROJECT NO. 40-2695-01

DIRECT SHEAR TEST
Solano Concrete Madison Plant

Yolo County, California

PLATE 23



BORING NO: B-1

DEPTH: 70.0 ft

SOIL DESCRIPTION: Yellow Brown Silty Clay

DRY DENSITY: 74.50 pcf

WATER CONTENT: 46.38 %

MAX. UC STRENGTH = 2232 psf AT 7.50% STRAIN

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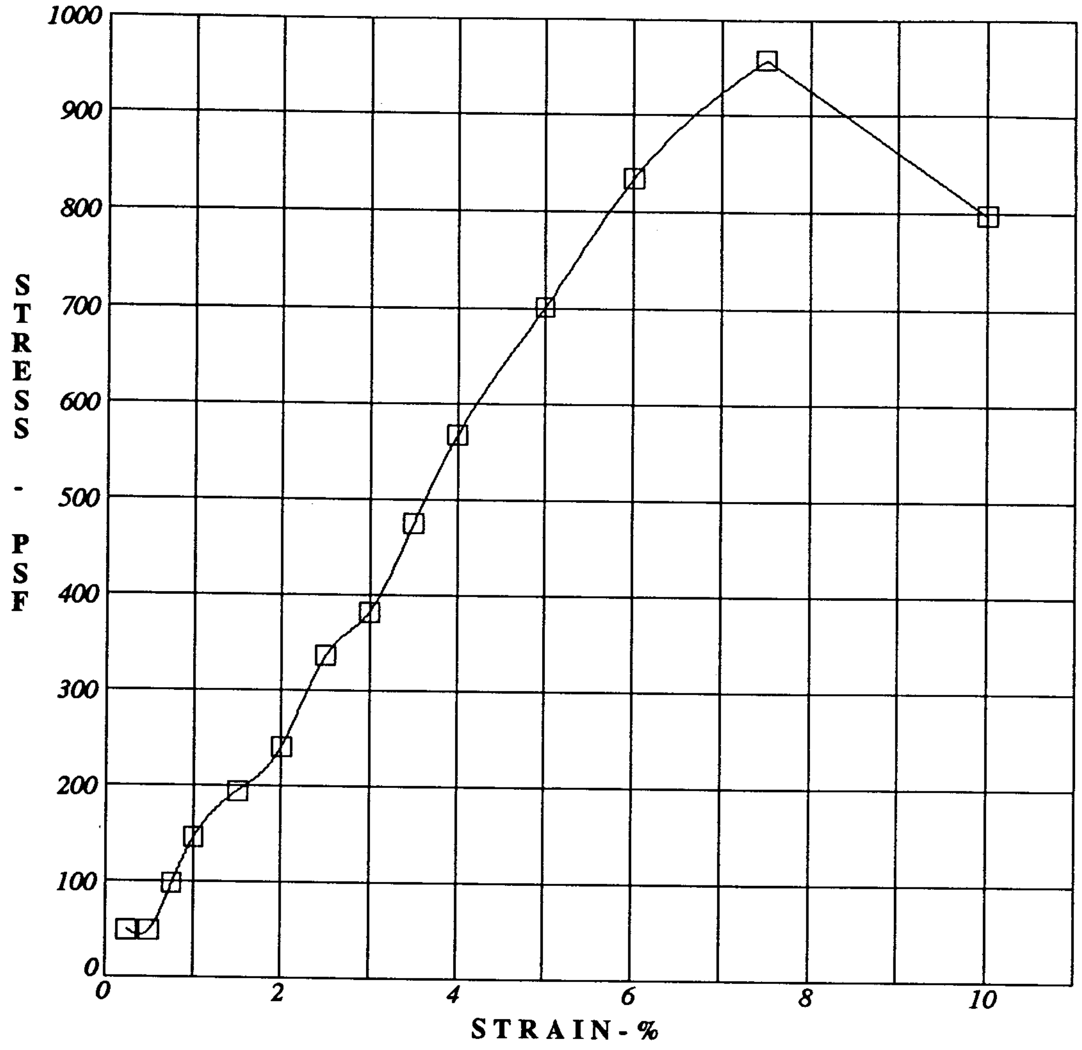
PROJECT NO. 40-2695-01

UNCONFINED COMPRESSION
Solano Concrete Madison Plant

Yolo County, California

PLATE
24



BORING NO: B-1

DEPTH: 85.0 ft

SOIL DESCRIPTION: Olive Brown Silty Clay

DRY DENSITY: 78.90 pcf

WATER CONTENT: 38.22 %

MAX. UC STRENGTH = 957 psf AT 7.50% STRAIN

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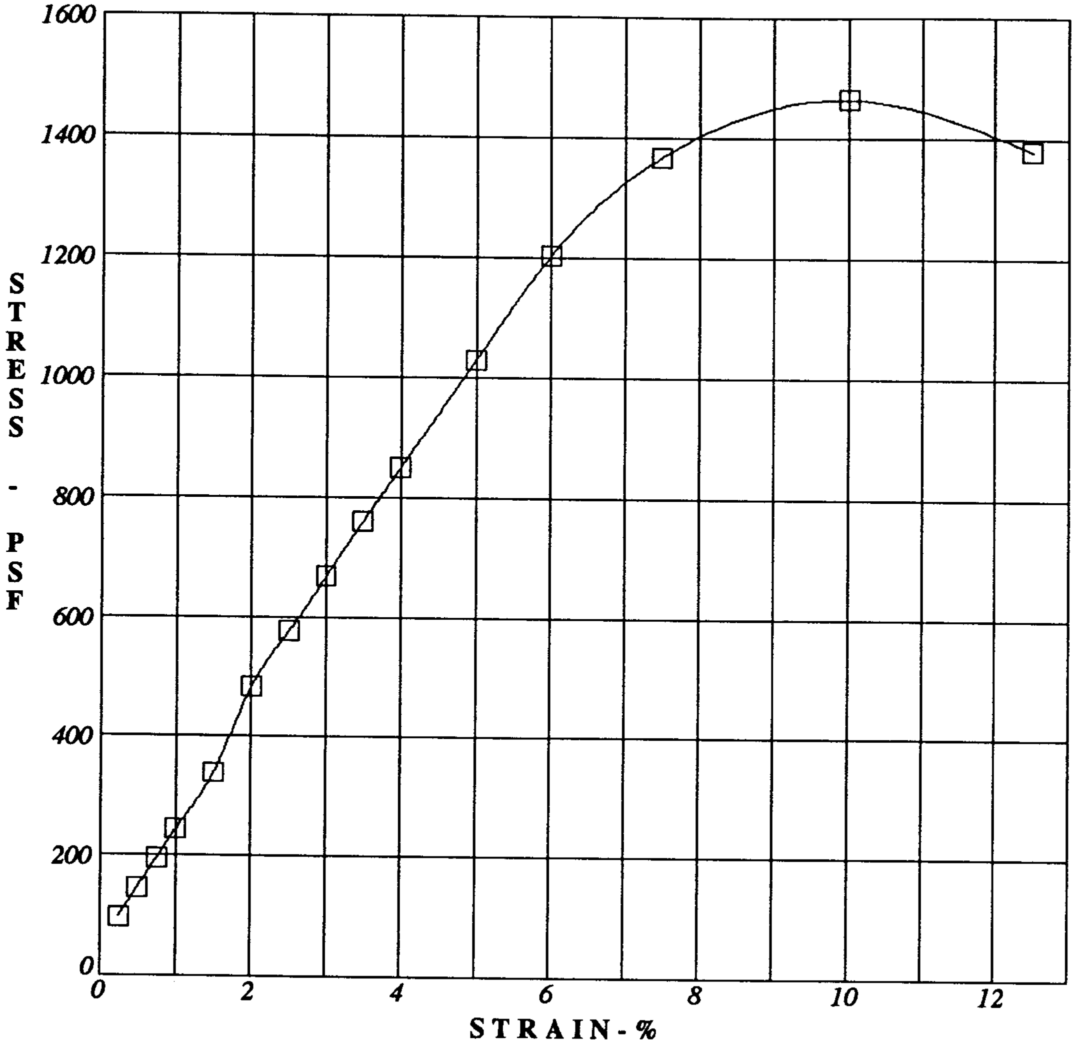
PROJECT NO. **40-2695-01**

UNCONFINED COMPRESSION
Solano Concrete Madison Plant

Yolo County, California

PLATE

25



BORING NO: B-2

DEPTH: 75.0 ft

SOIL DESCRIPTION: Gray Brown Silty Clay

DRY DENSITY: 75.90 pcf

WATER CONTENT: 43.68 %

MAX. UC STRENGTH = 1463 psf AT 10.00% STRAIN

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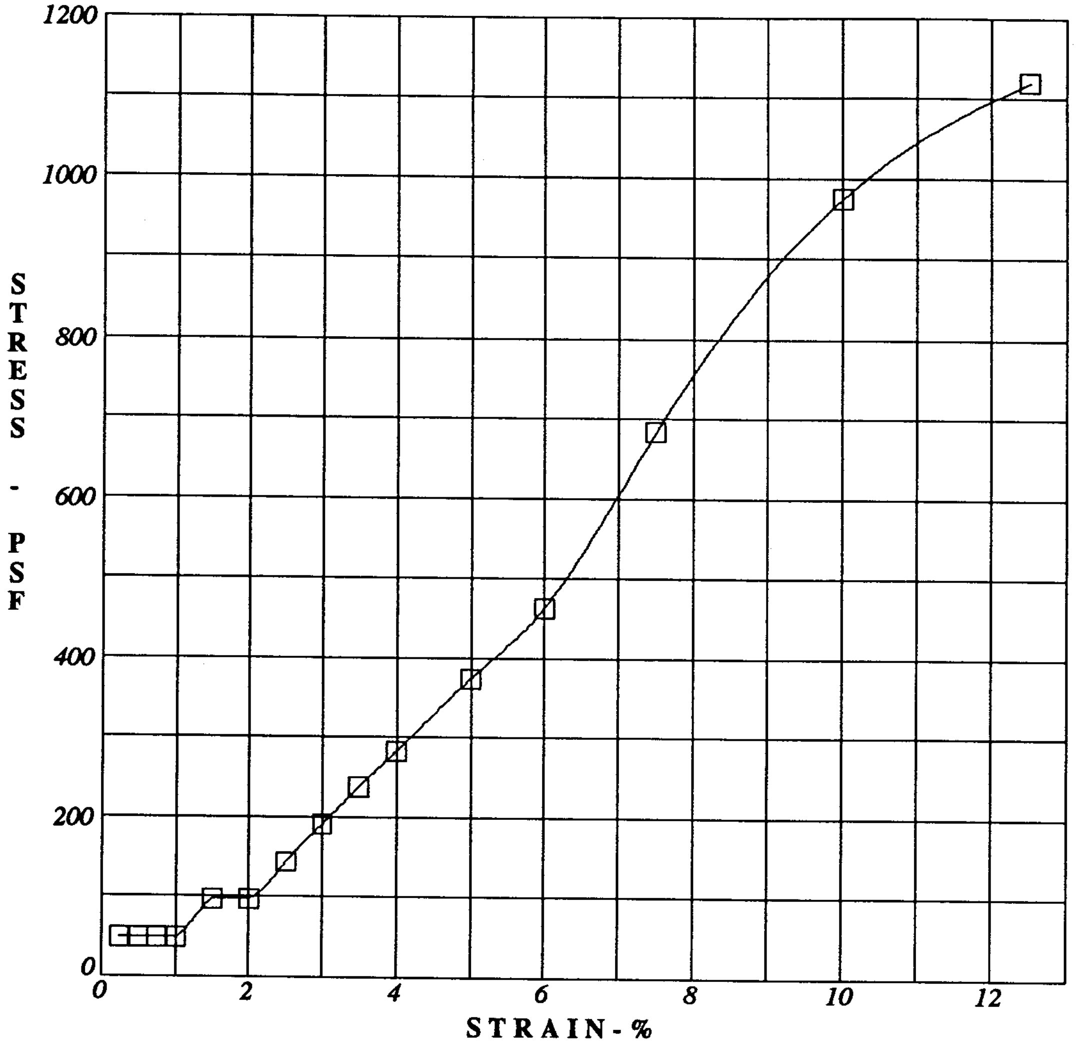
PROJECT NO. 40-2695-01

UNCONFINED COMPRESSION
Solano Concrete Madison Plant

Yolo County, California

PLATE



BORING NO: B-7

DEPTH: 75.0 ft

SOIL DESCRIPTION: Light Brown Silty Clay

DRY DENSITY: 78.40 pcf

WATER CONTENT: 39.10 %

MAX. UC STRENGTH = 1120 psf AT 12.50% STRAIN

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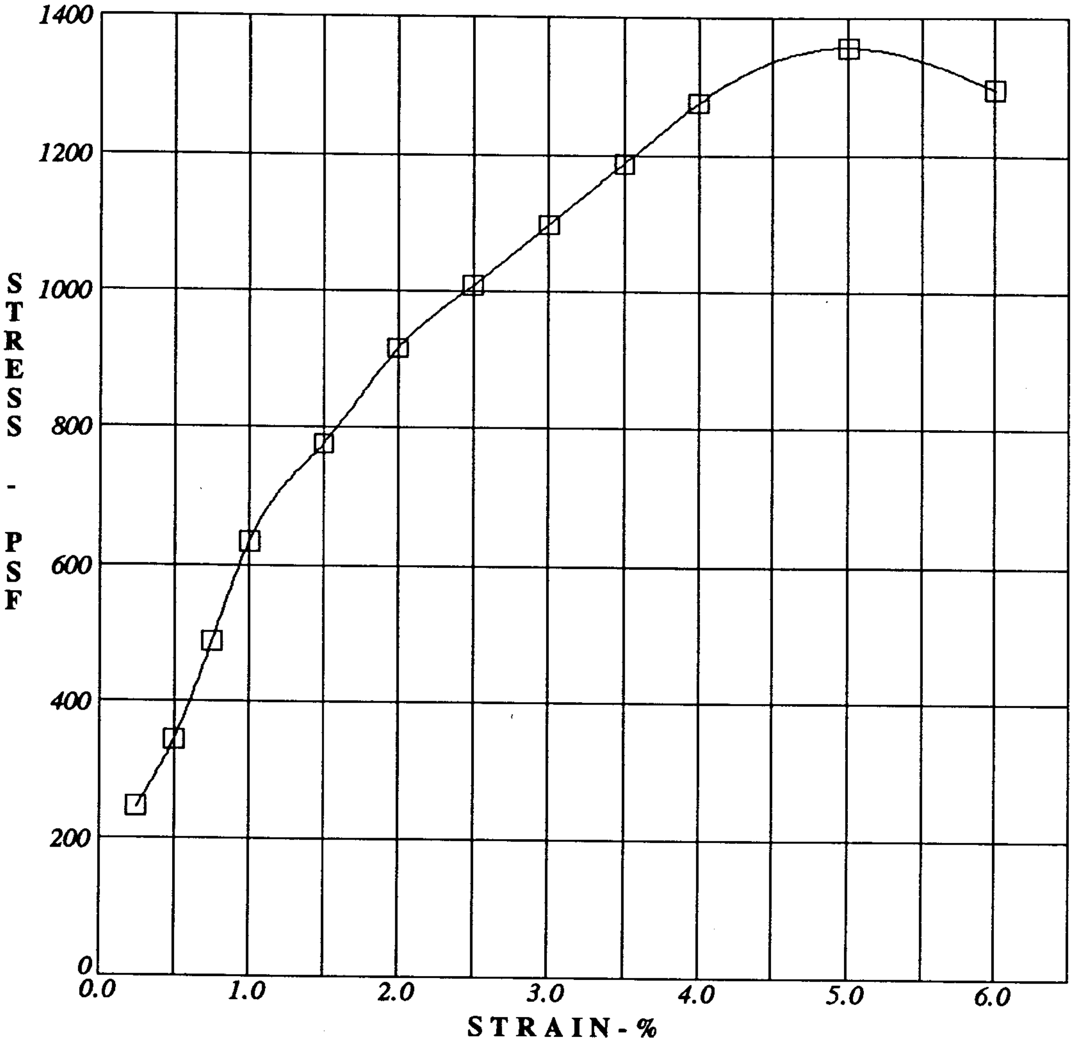
PROJECT NO. 40-2695-01

UNCONFINED COMPRESSION
Solano Concrete Madison Plant
Yolo County, California

PLATE

27



BORING NO: B-9

DEPTH: 35.0 ft

SOIL DESCRIPTION: Blue-Gray Silty Clay

DRY DENSITY: 89.30 pcf

WATER CONTENT: 31.29 %

MAX. UC STRENGTH = 1356 psf AT 5.00% STRAIN

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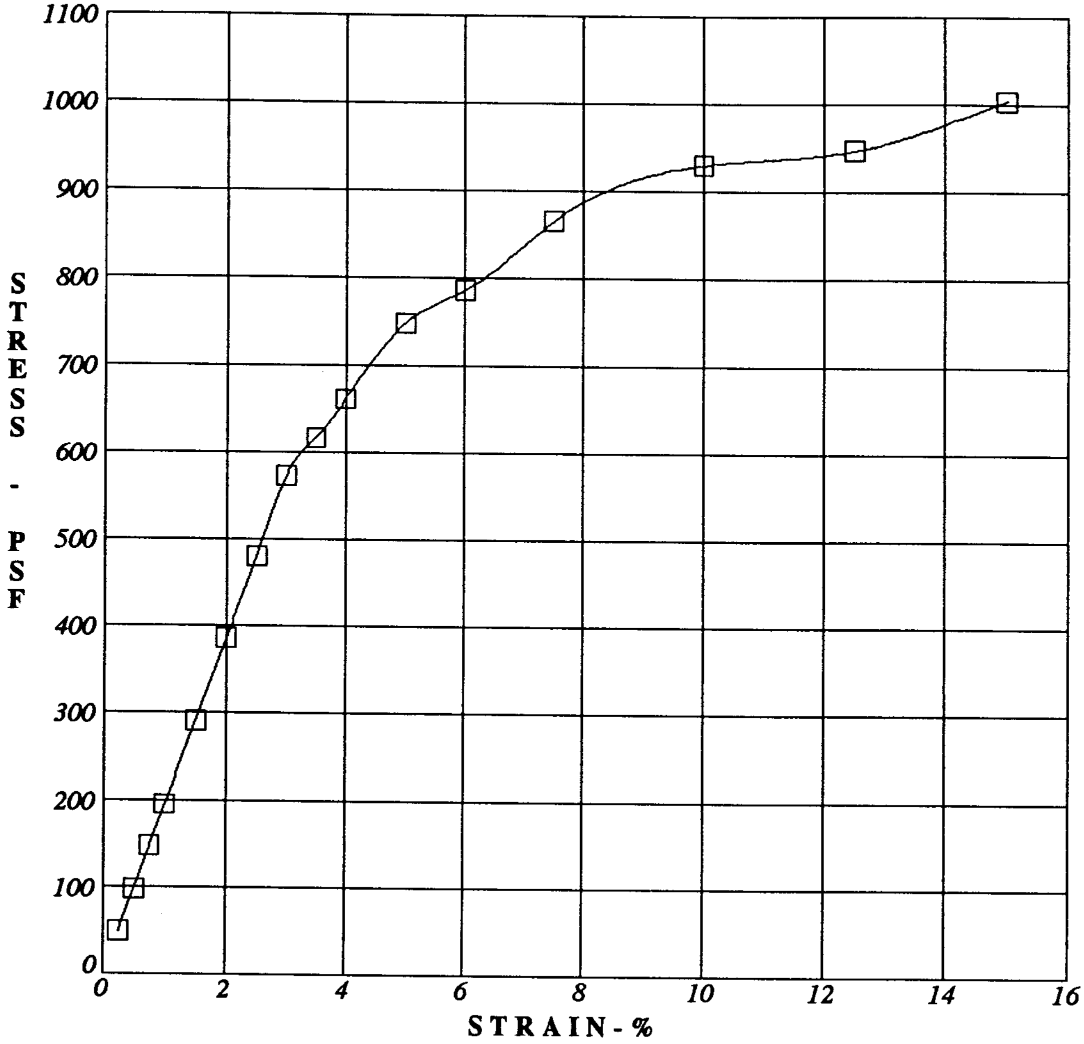
PROJECT NO. 40-2695-01

UNCONFINED COMPRESSION
Solano Concrete Madison Plant

Yolo County, California

PLATE

28



BORING NO: B-10

DEPTH: 45.0 ft

SOIL DESCRIPTION:

DRY DENSITY: 89.50 pcf

WATER CONTENT: 31.90 %

MAX. UC STRENGTH = 1004 psf AT 15.00% STRAIN

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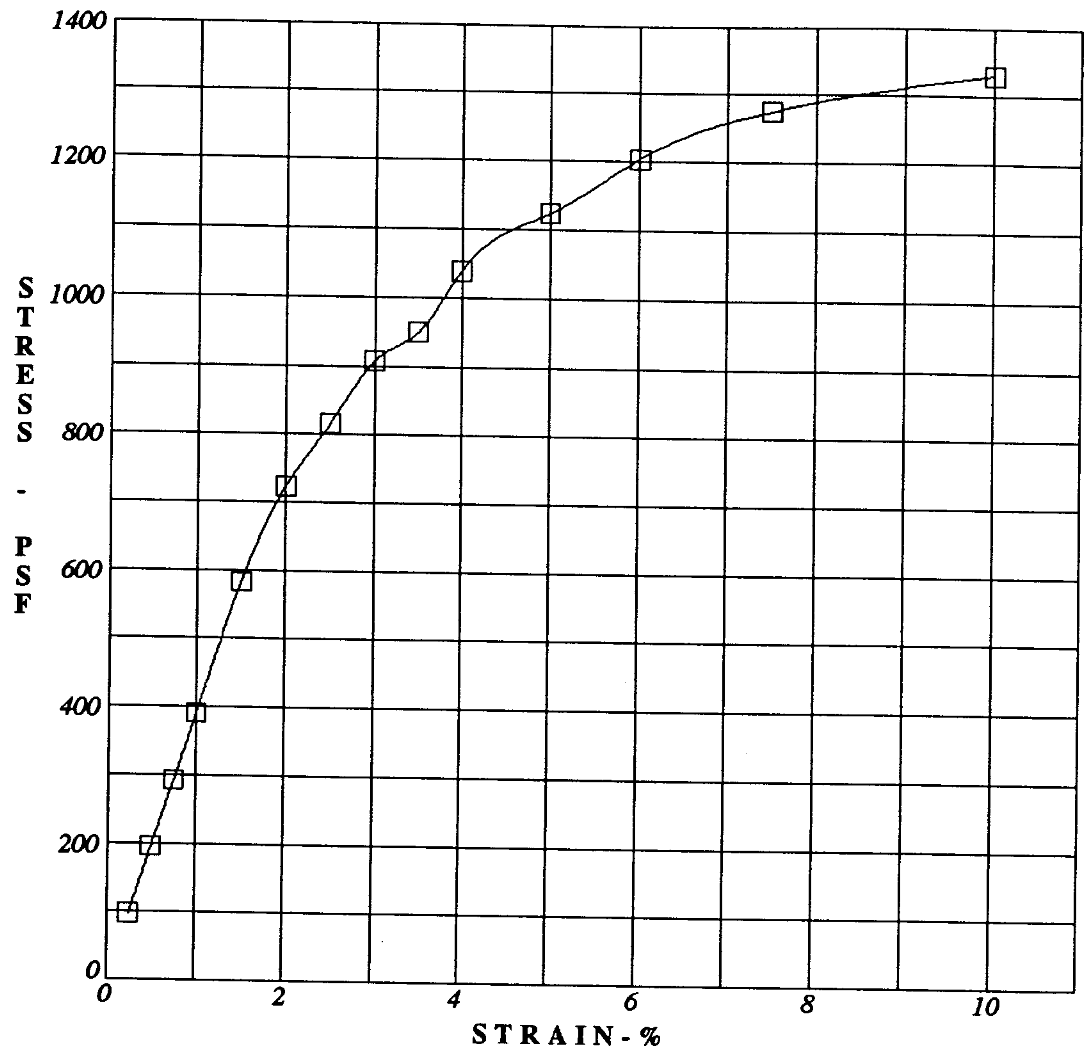
PROJECT NO. 40-2695-01

UNCONFINED COMPRESSION
Solano Concrete Madison Plant

Yolo County, California

PLATE

29



BORING NO: B-12

DEPTH: 50.0 ft

SOIL DESCRIPTION: Gray Clay

DRY DENSITY: 78.40 pcf

WATER CONTENT: 38.10 %

MAX. UC STRENGTH = 1330 psf AT 10.00% STRAIN

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PROJECT NO. 40-2695-01

UNCONFINED COMPRESSION

Solano Concrete Madison Plant

Yolo County, California

APPENDIX C

APPENDIX C
SLOPE STABILITY AND SEEPAGE ANALYSIS

The computer programs SLOPE/W and SEEP/W Version 7 distributed by Geo-Slope International were utilized to perform slope stability and seepage analyses. SEEP/W is a finite element analysis software product for analyzing groundwater seepage and excess-pore pressure dissipation problems within porous materials such as soil and rock. SLOPE/W uses conventional slope stability equations and a two-dimensional limit-equilibrium method to calculate the factor of safety against failure. For our analysis, the Morgenstern-Price Method with a circular failure mechanism was used. The Morgenstern-Price Method satisfies both moment and force equilibrium.

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. Tabulated results of the factor of safety (FS) against failure for each slope configuration under the conditions of analysis (e.g. high groundwater, low groundwater, static, seismic, surficial and global) are summarized in Table 6.6. Graphical representations of the seepage analyses, potential critical failure surfaces, and parameters used for each analysis are presented on Figures C1 through C17.

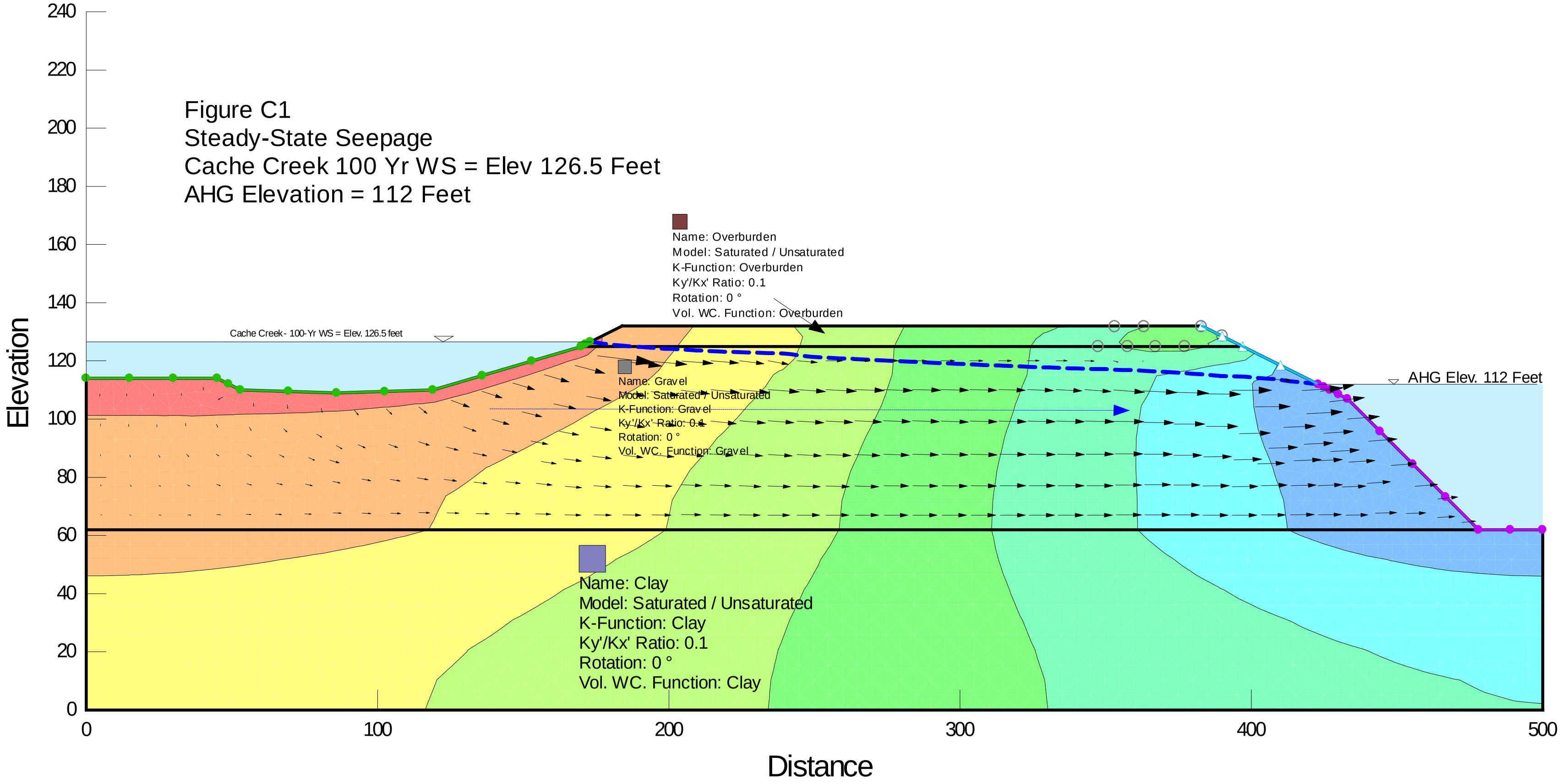

Figure C1
Steady-State Seepage
Cache Creek 100 Yr WS = Elev 126.5 Feet
AHG Elevation = 112 Feet

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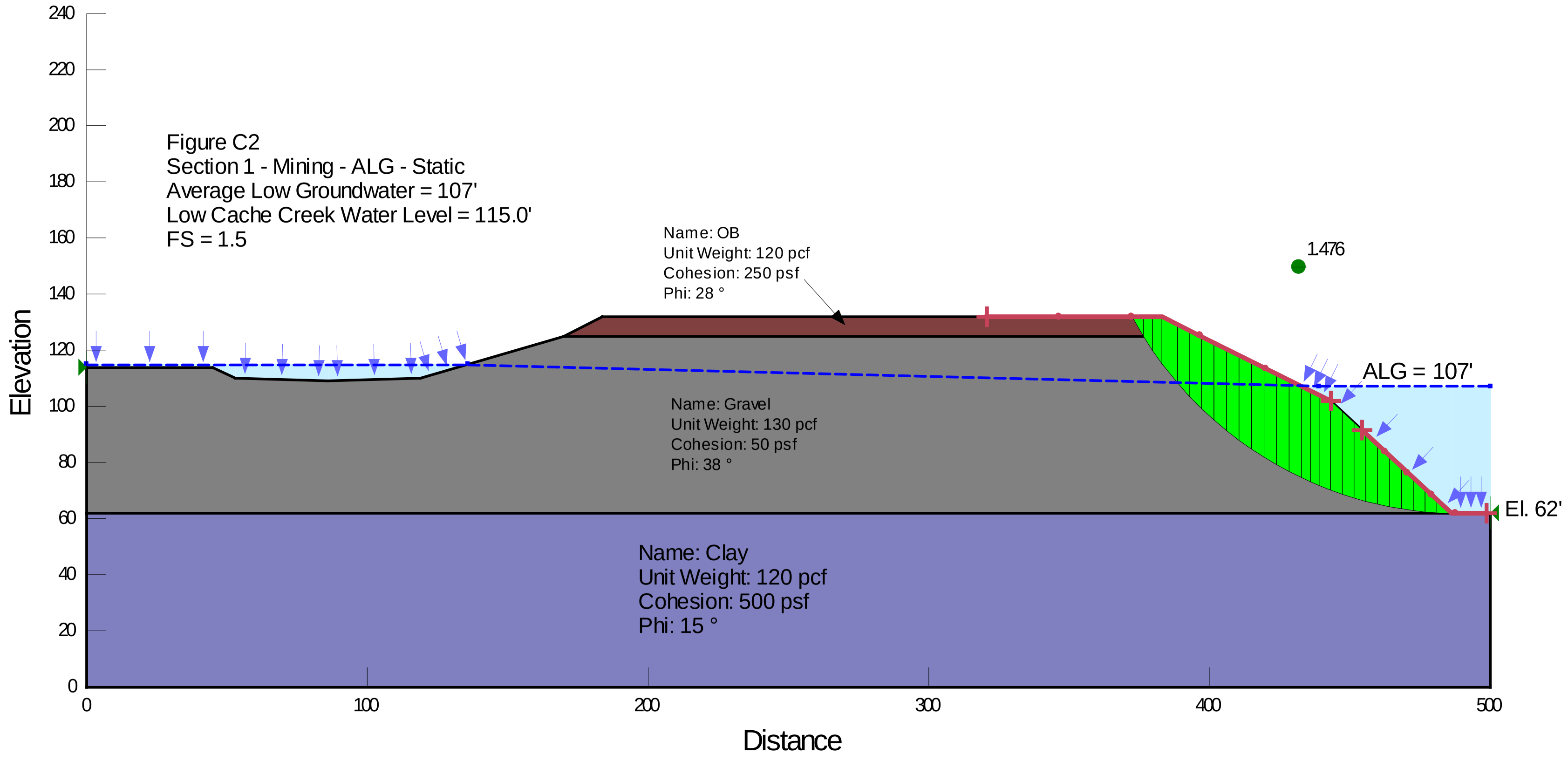
Yolo County,
California

Seepage Analysis: Section 1

S1294-05-01	February 2018	Figure C1



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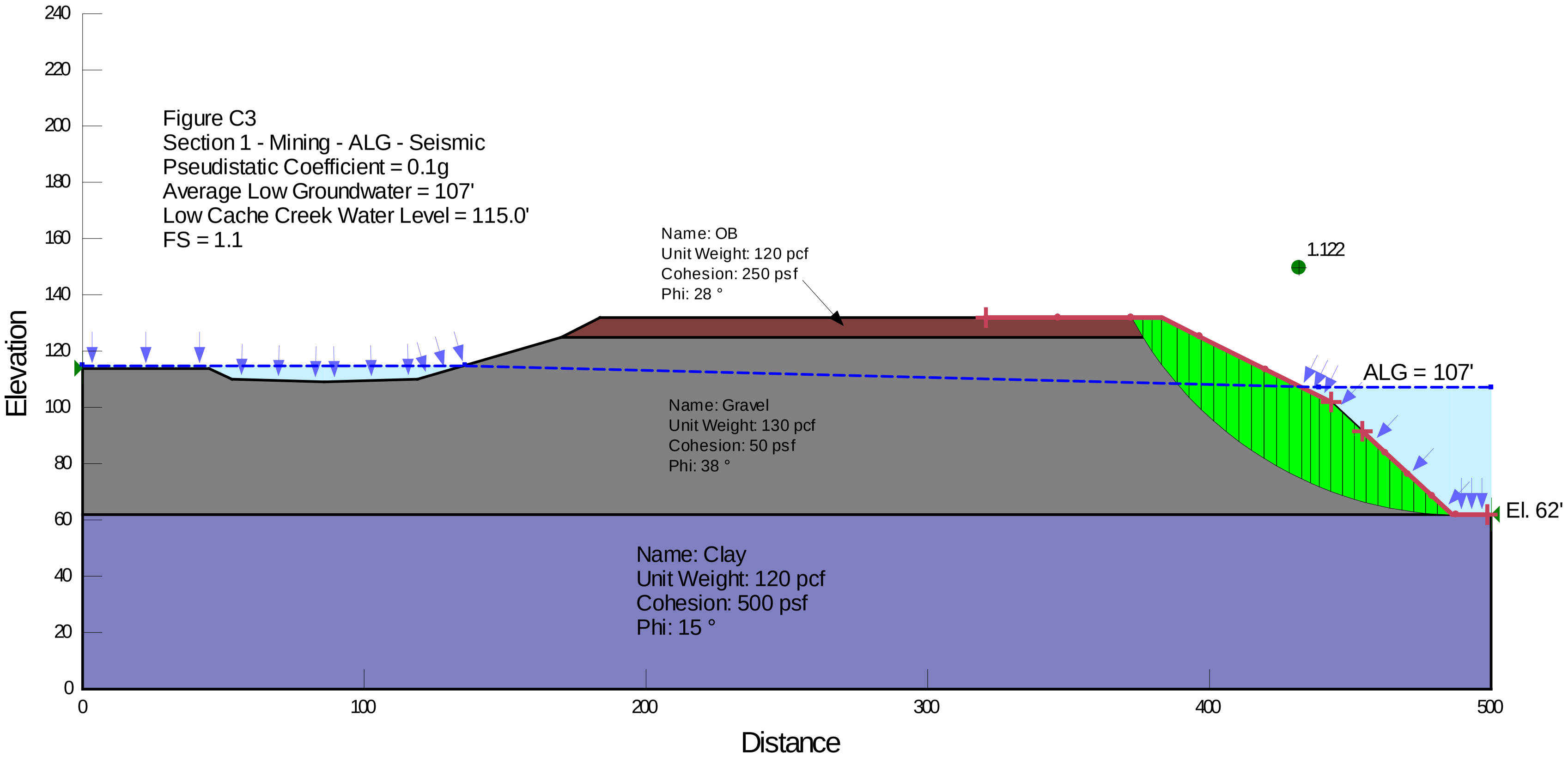
Slope Stability: Section 1

S1294-05-01 | February 2018 | Figure C2



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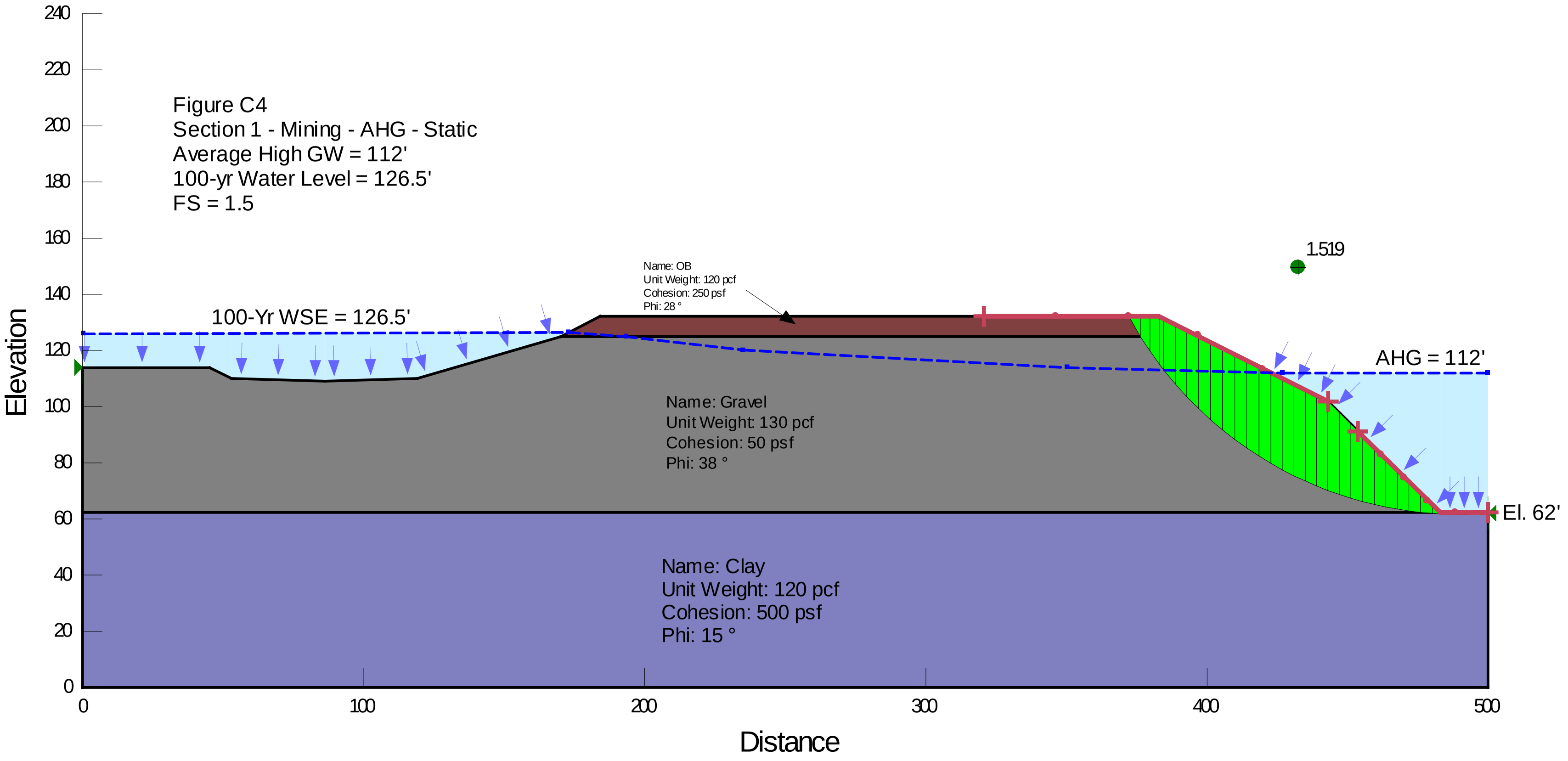
Slope Stability: Section 1

S1294-05-01	February 2018	Figure C3



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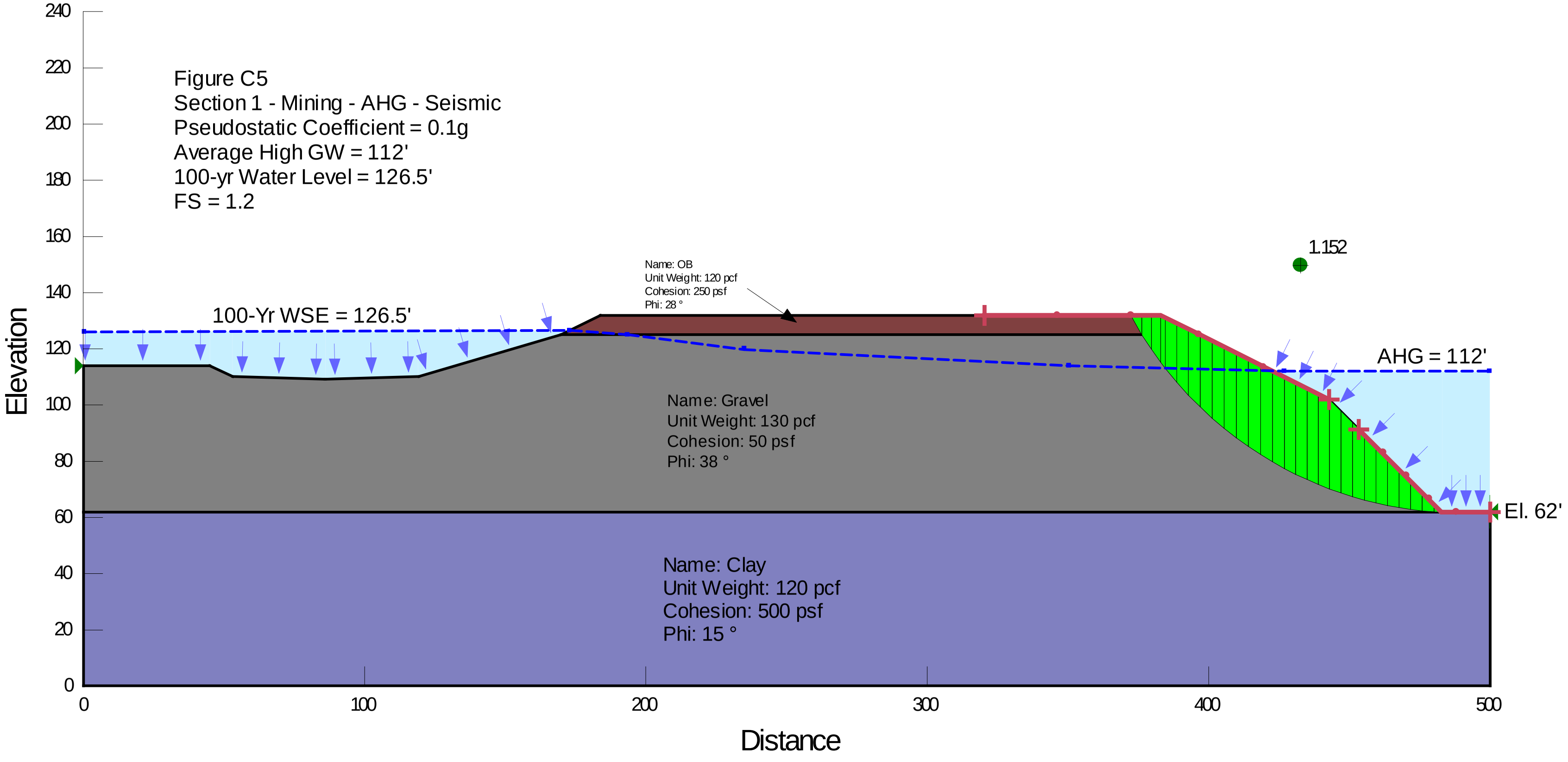
Slope Stability: Section 1

S1294-05-01	February 2018	Figure C4



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Cemex Cache Creek

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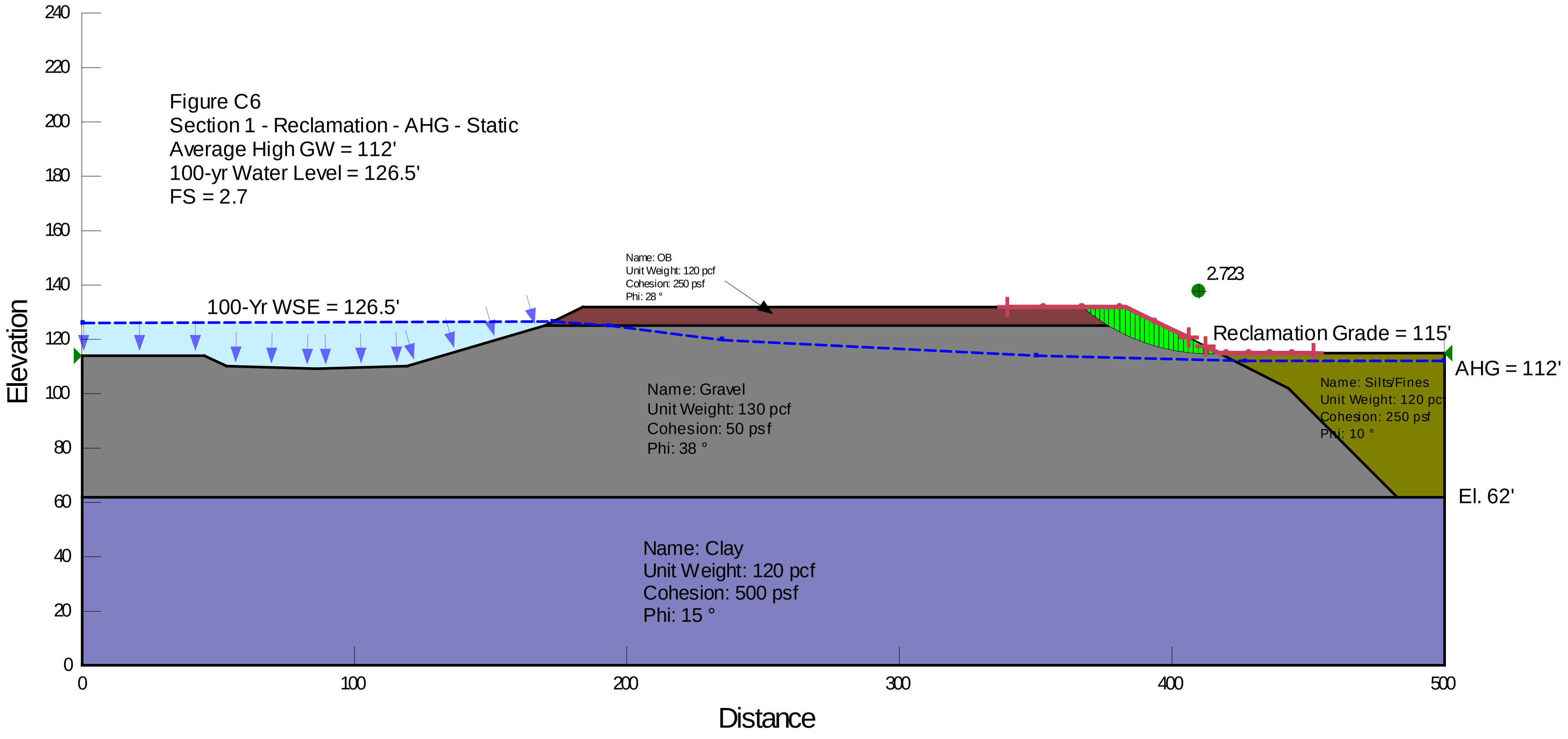
California

Slope Stability: Section 1

S1294-05-01	February 2018	Figure C5



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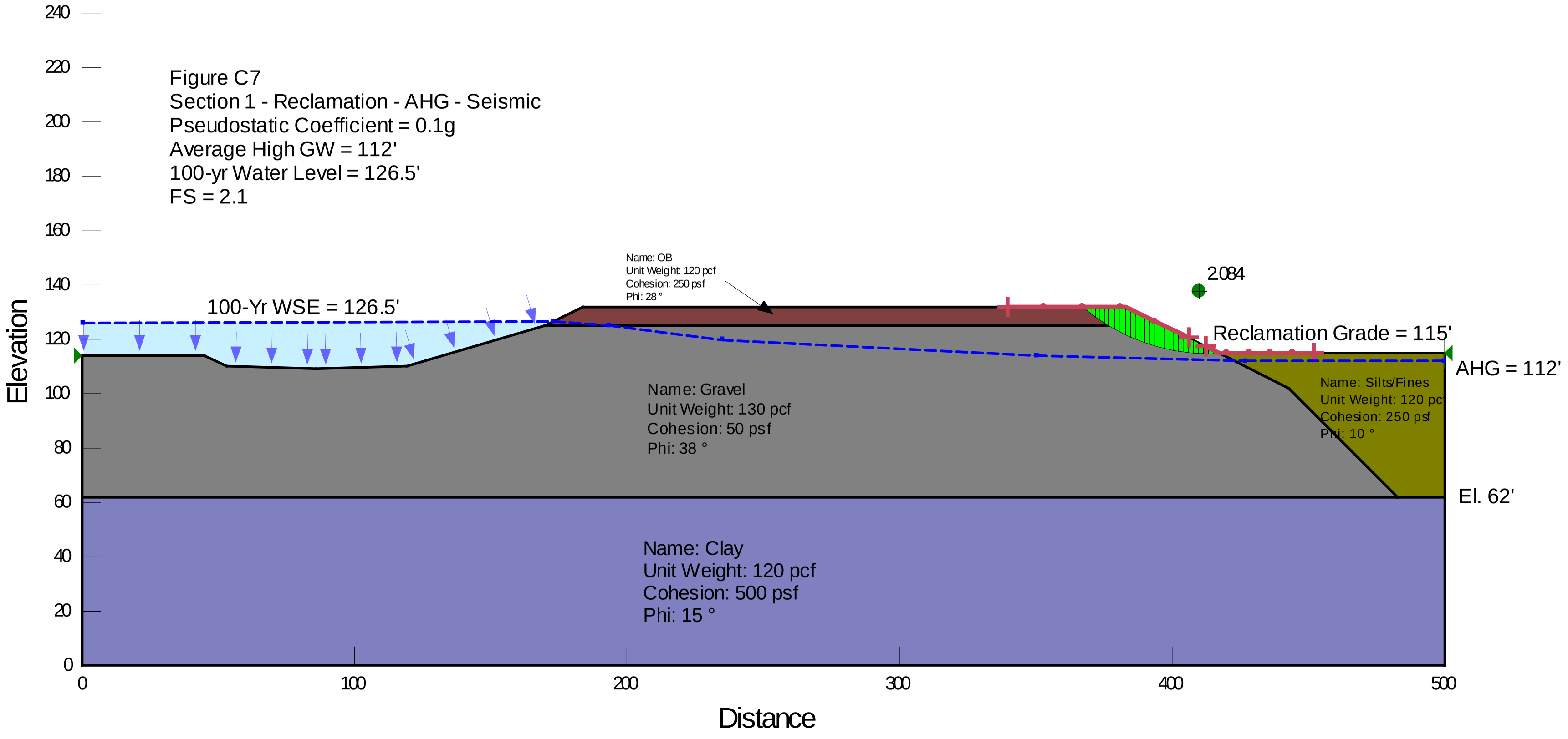
Slope Stability: Section 1

S1294-05-01 | February 2018 | Figure C6



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Cemex Cache Creek

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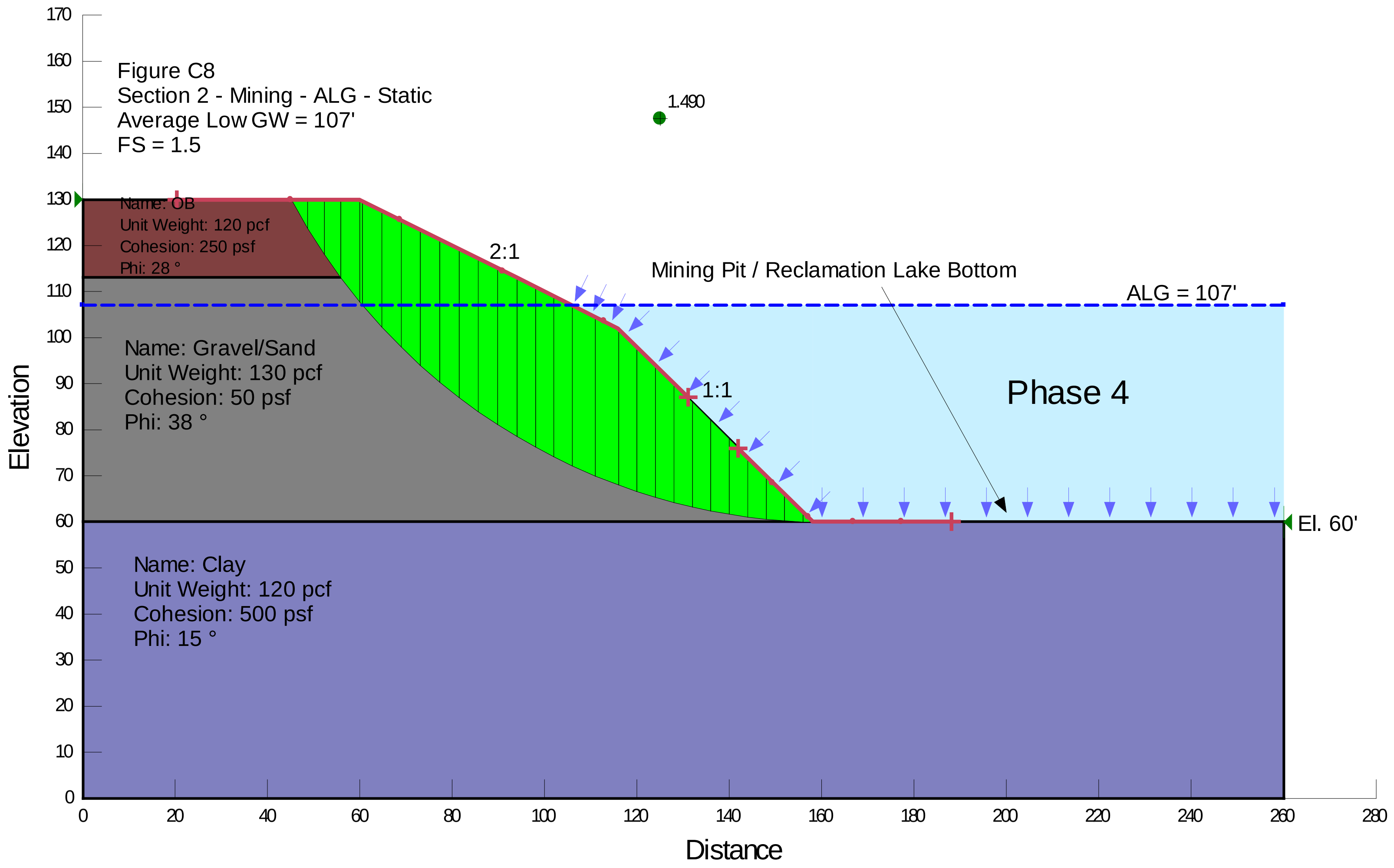
California

Slope Stability: Section 1

S1294-05-01	February 2018	Figure C7



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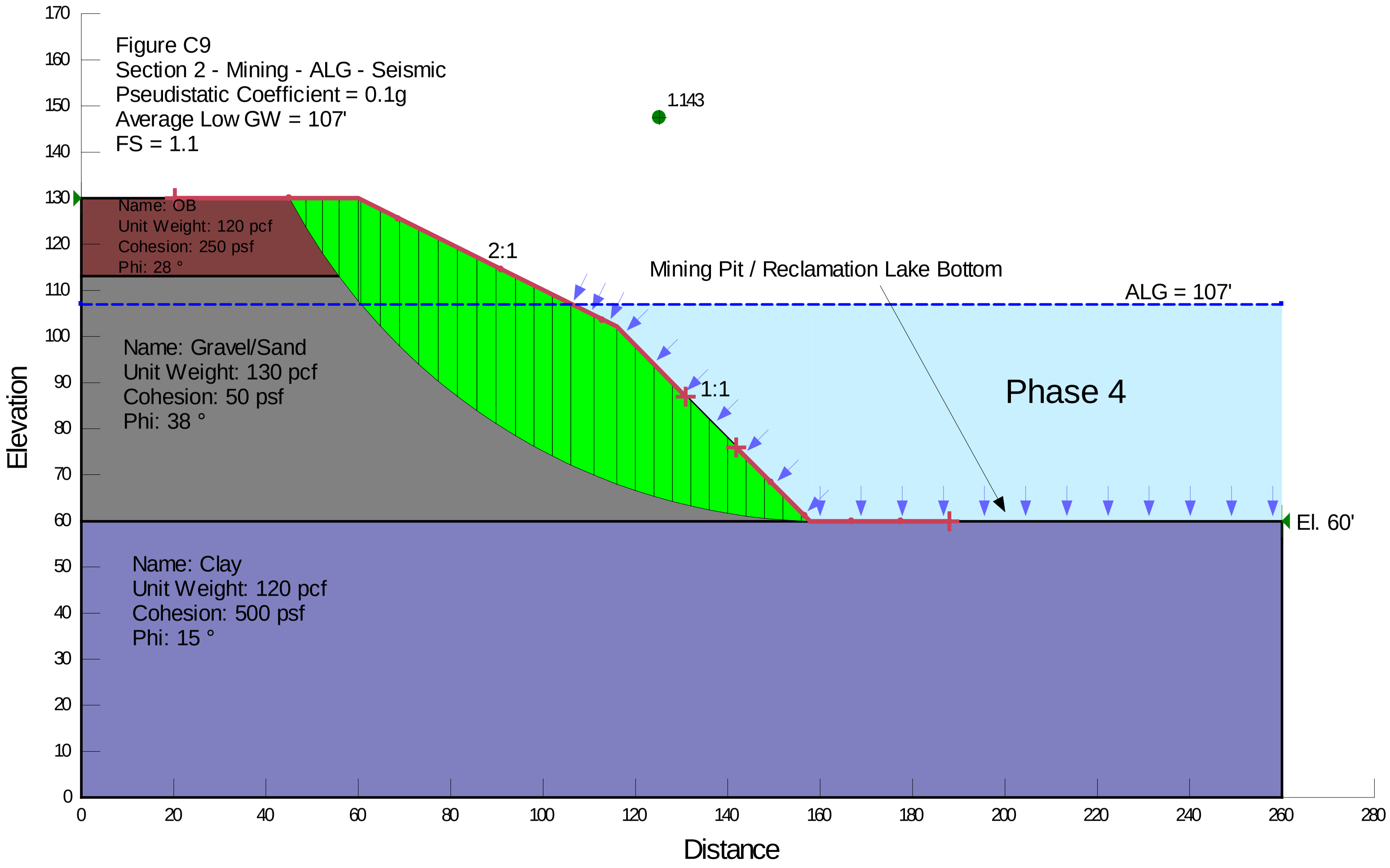
Cemex Cache Creek

Yolo County,
California

Slope Stability: Section 2

S1294-05-01	February 2018	Figure C8



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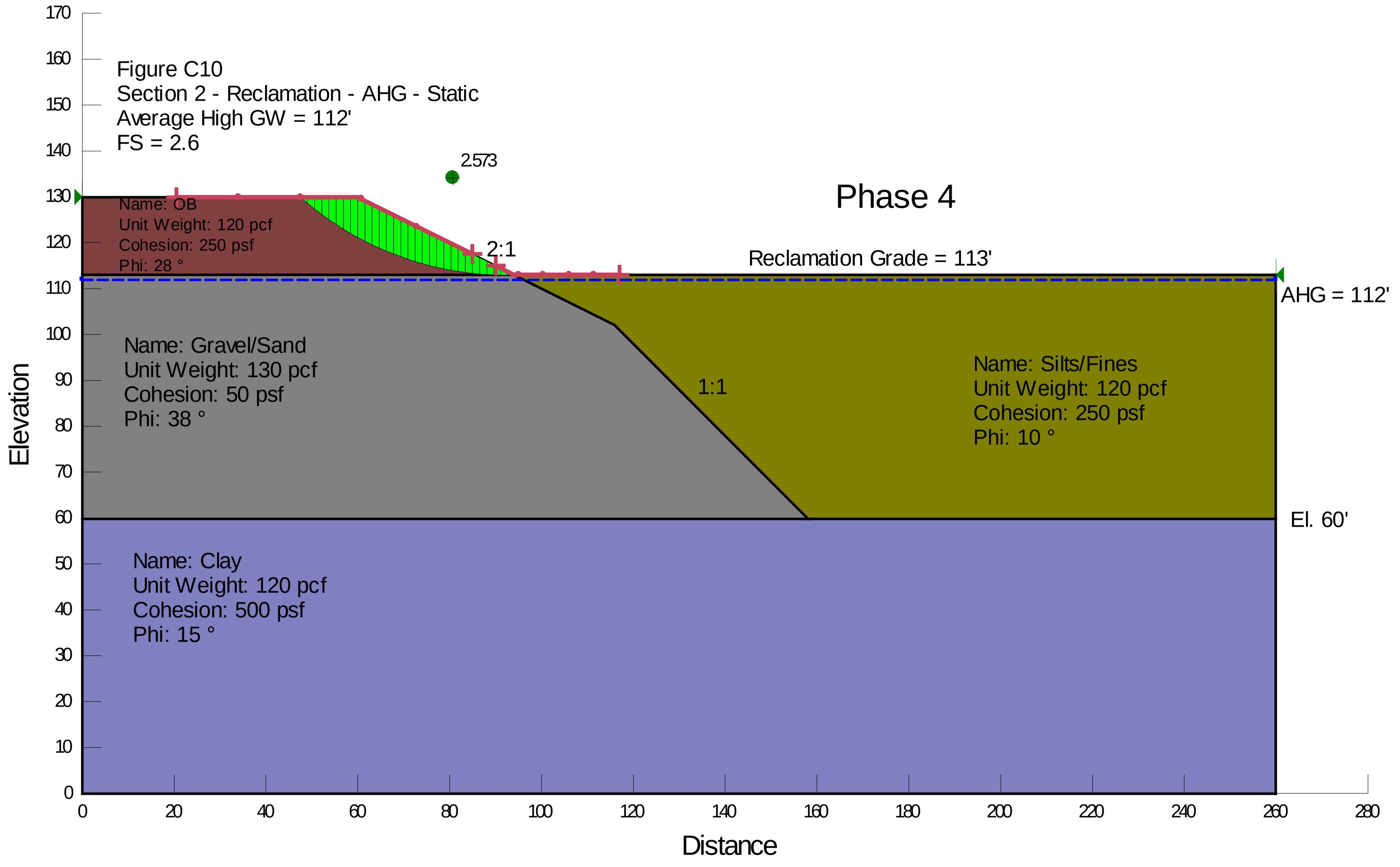
Slope Stability: Section 2

S1294-05-01	February 2018	Figure C9



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Cemex Cache Creek

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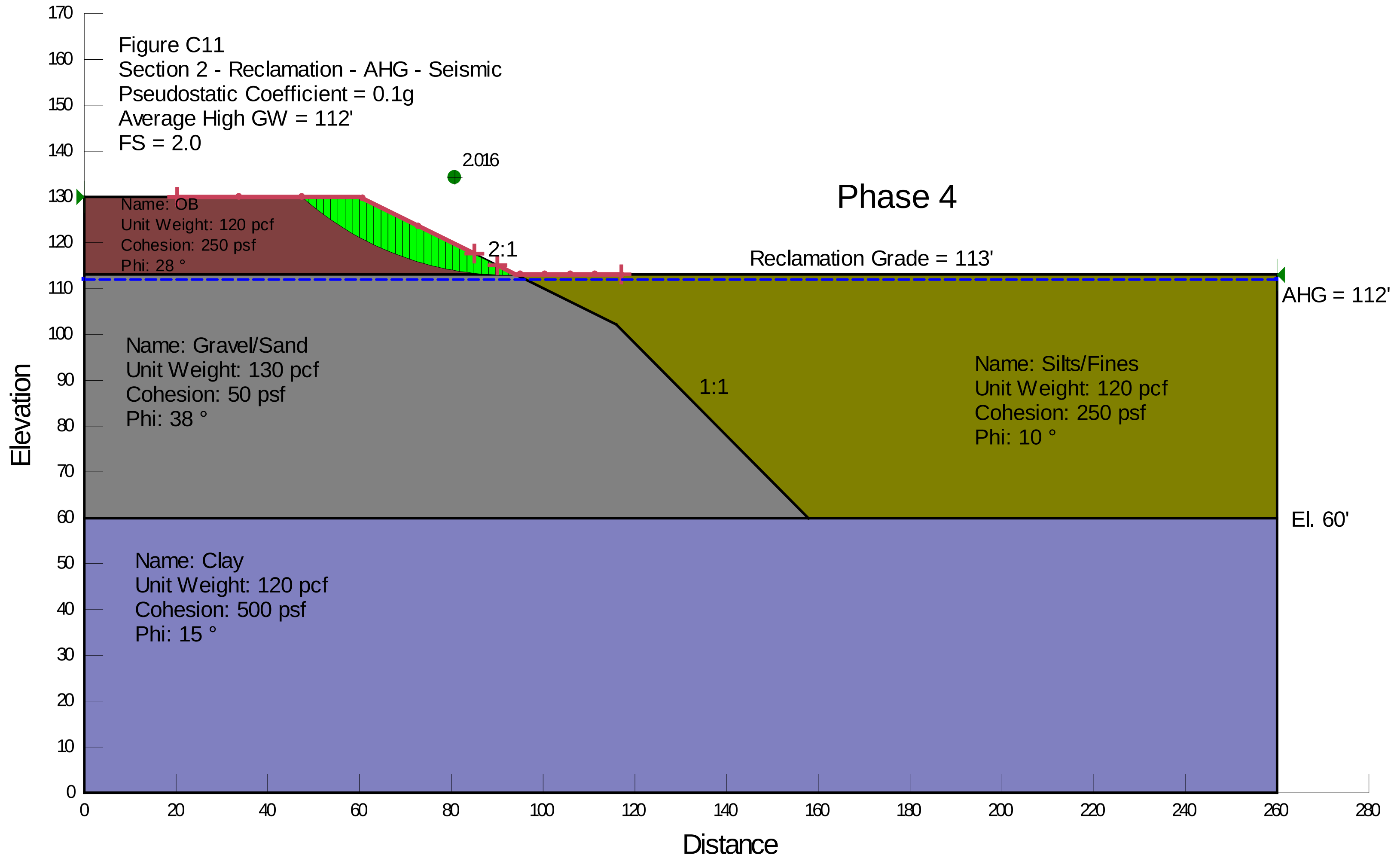
California

Slope Stability: Section 2

S1294-05-01	February 2018	Figure C10



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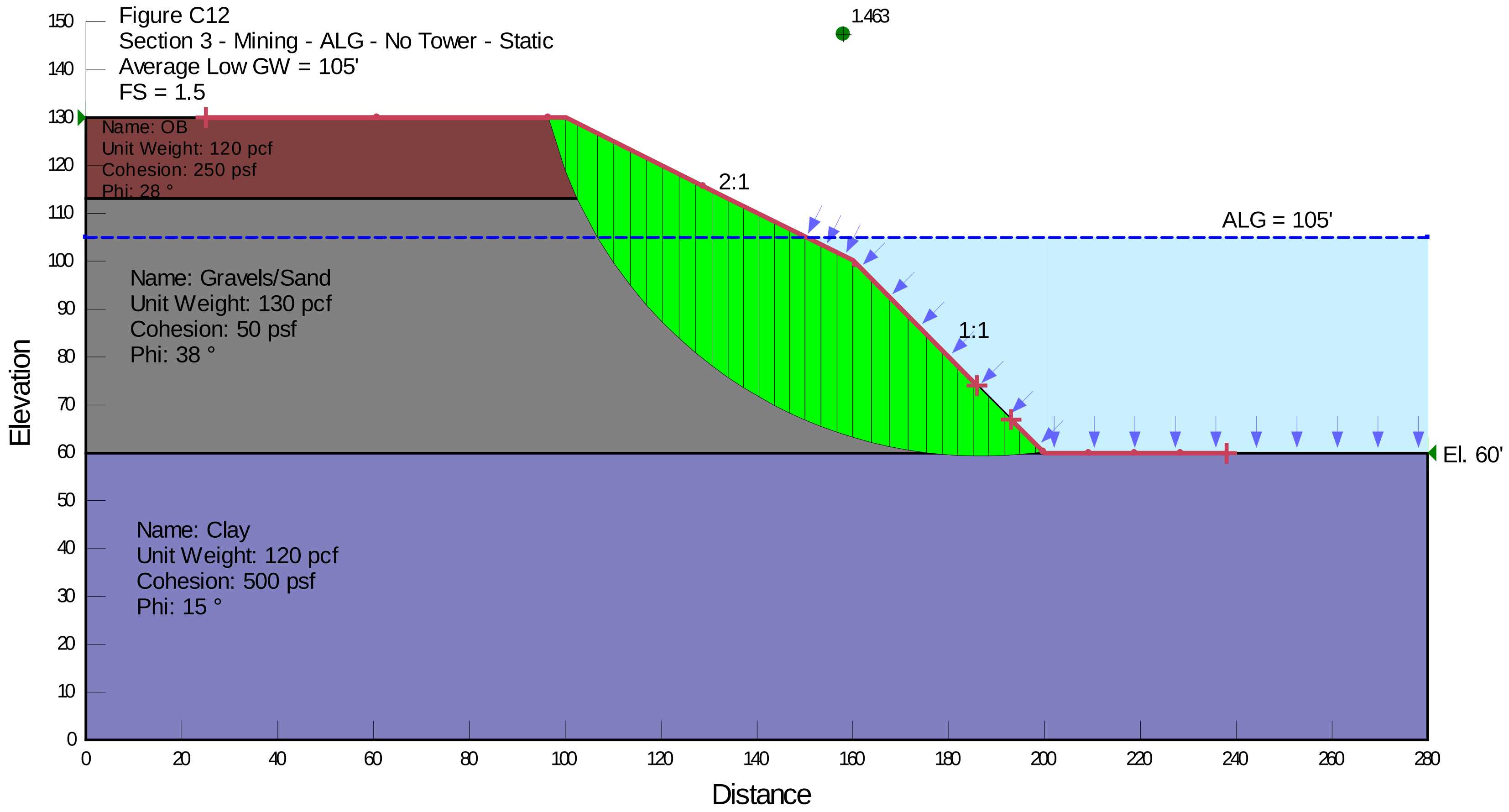
Cemex Cache Creek

Yolo County,
California

Slope Stability: Section 2

S1294-05-01 | February 2018 | Figure C11



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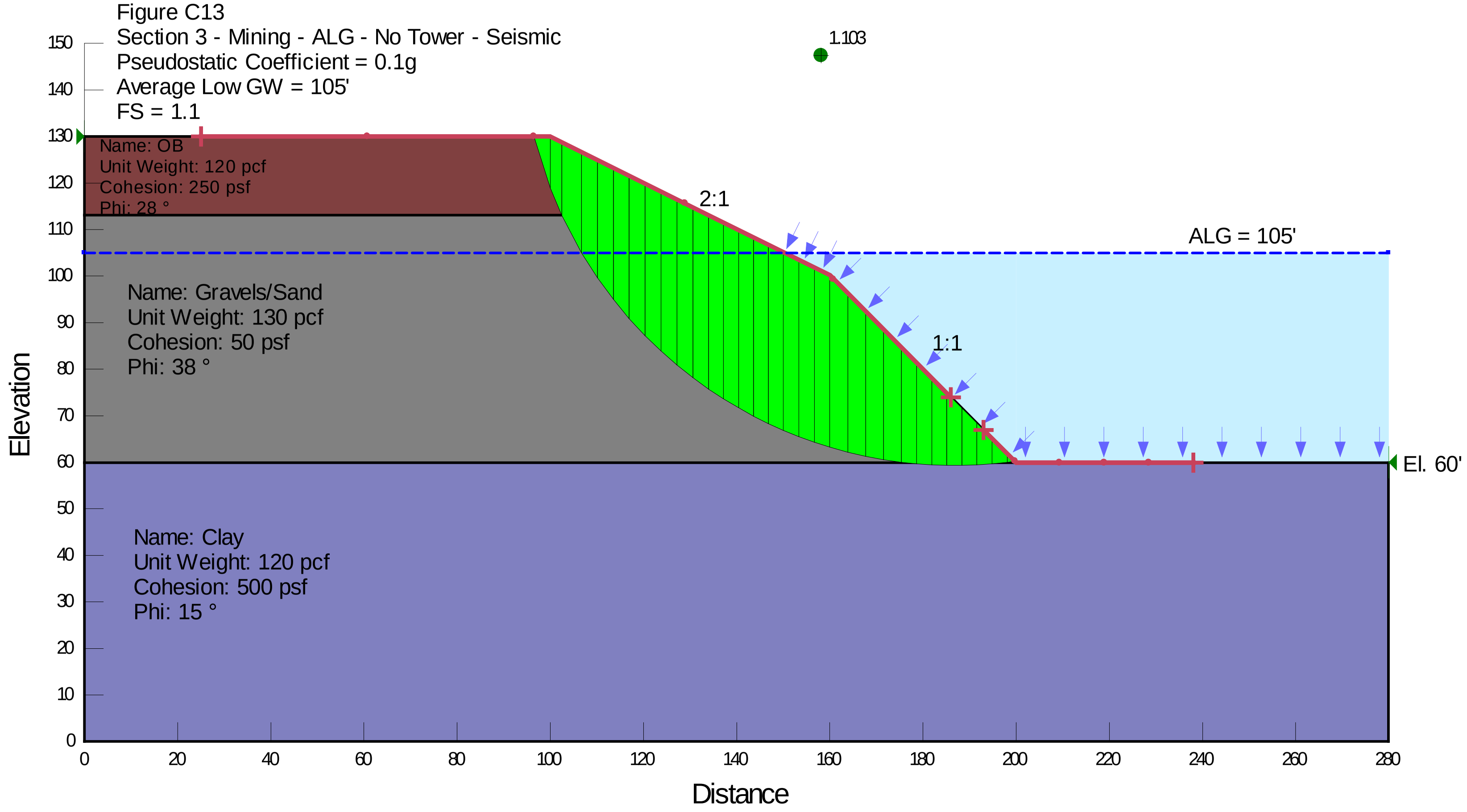
Cemex Cache Creek

Yolo County,
California

Slope Stability: Section 3

S1294-05-01	February 2018	Figure C12



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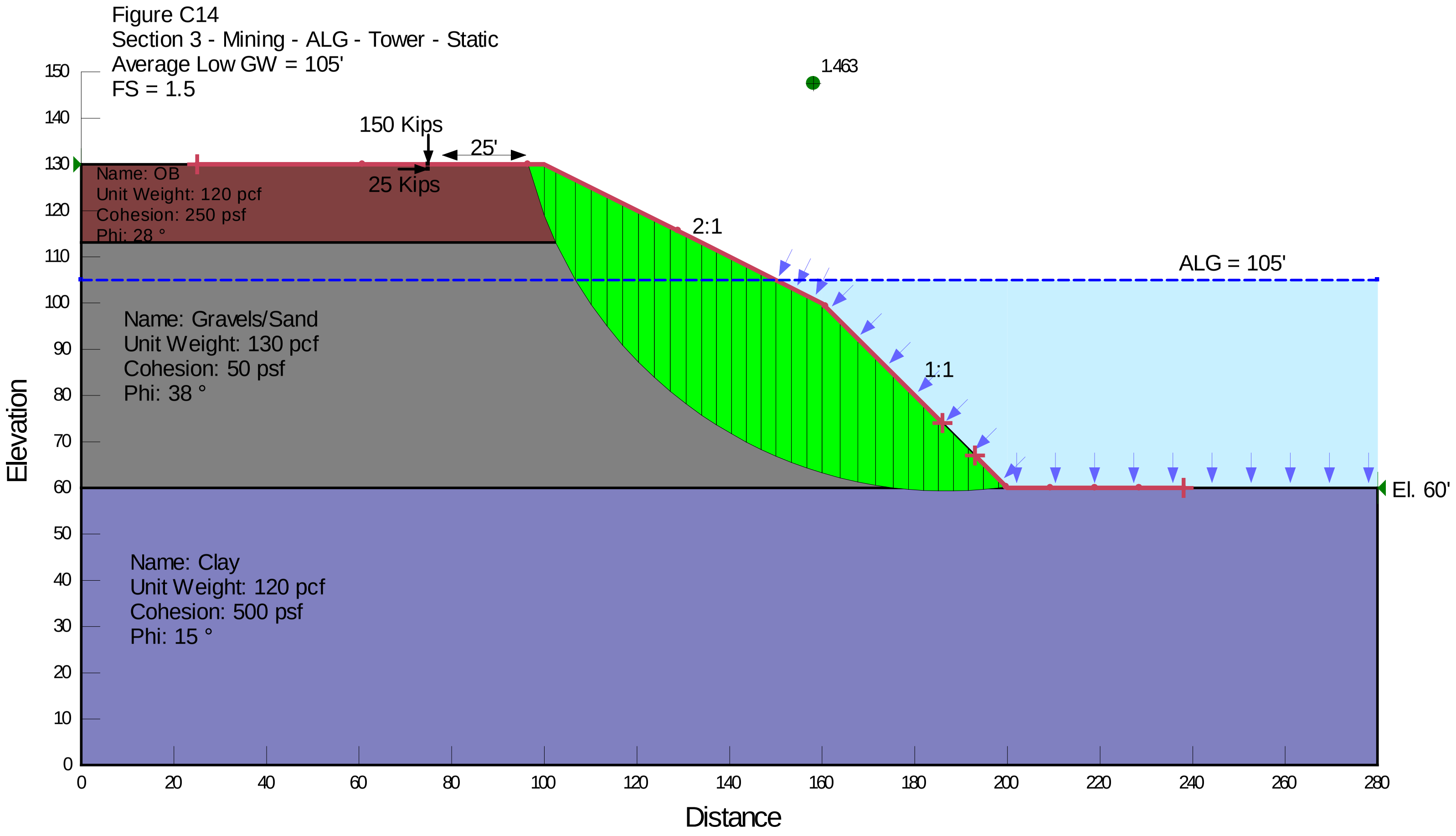
Cemex Cache Creek

Yolo County,
California

Slope Stability: Section 3

S1294-05-01 | February 2018 | Figure C13



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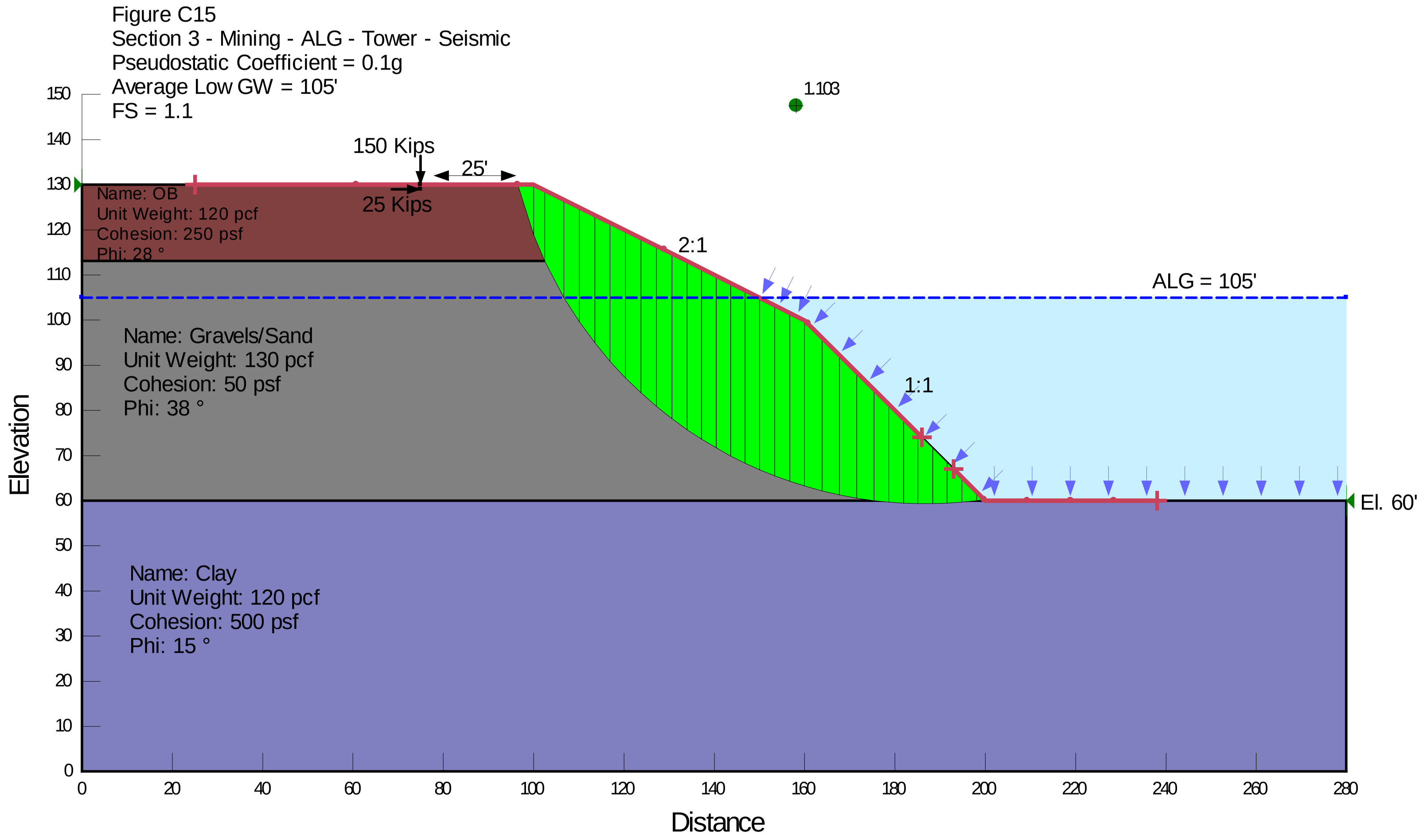
Cemex Cache Creek

Yolo County,
California

Slope Stability: Section 3

S1294-05-01	February 2018	Figure C14



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Slope Stability: Section 3

S1294-05-01 | February 2018 | Figure C15

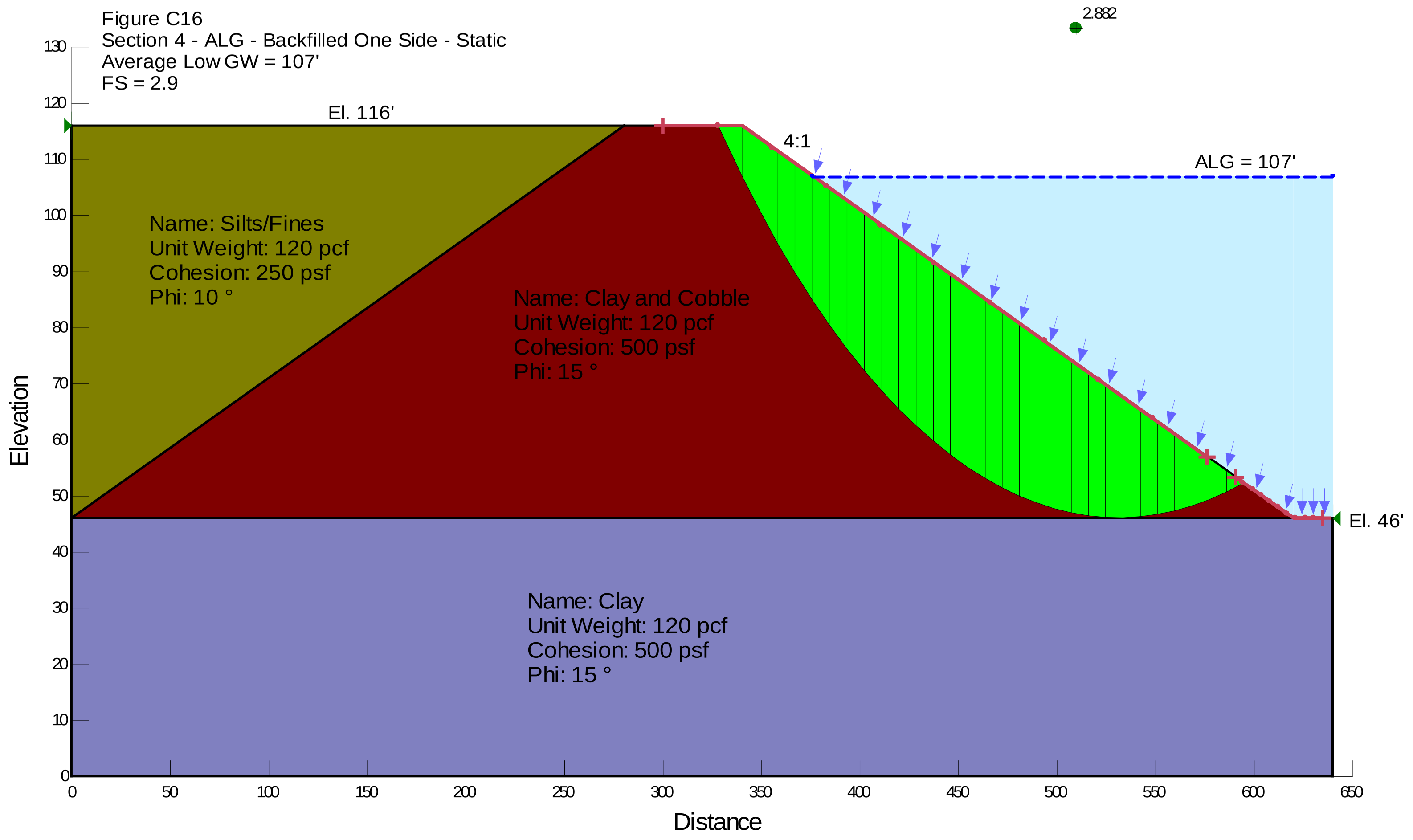
Figure C16
Section 4 - ALG - Backfilled One Side - Static
Average Low GW = 107'
FS = 2.9

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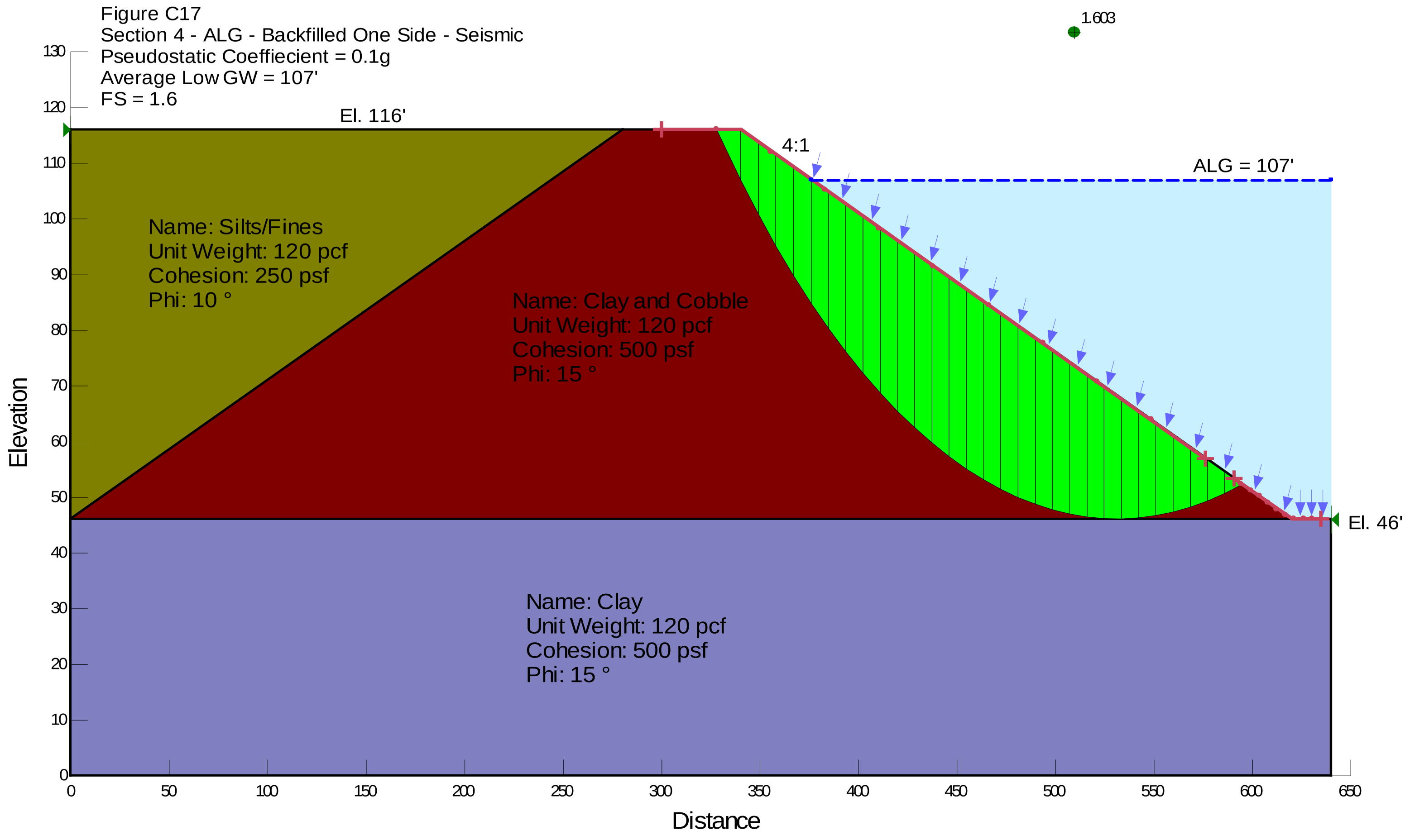
Cemex Cache Creek

Yolo County,
California

Slope Stability: Section 4

S1294-05-01 | February 2018 | Figure C16



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Cemex Cache Creek

Yolo County,
California

Slope Stability: Section 4

S1294-05-01	February 2018	Figure C17

APPENDIX D

APPENDIX D
LIQUEFACTION ANALYSIS

GEOCON

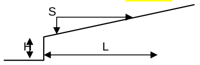
Liquefaction Hazard Analysis

Youd, T. L. et al - 2001
Project: Cemex Cache Creek
Proj No: S1294-05-01
Location: B1

Earthquake Variables
2% Probability of exceedence in
50 Years.
Return Period: 2474.92 Years
a_{max}: 0.490 g
Magnitude: 6.5 M_w
MSF 1.44192

Site variables
Water table depth: 30 ft
Global variables
γ_w 62.4 pcf
$P_{a\ (atmospheric\ pressure)}$ 1.058 tsf
$FS_{min,\ allowable}$: 1.3
ε_v method: Tokimatsu

Slope and Free Face Variables
Slope, S 0.0 %
Face Height, H 0 (ft)
Dist. to Face, L 0 (ft)



Results
Liquified Layers: 0
Thickness: 0.0 ft
Dry Settlement: 0.2 in
Liq. Settlement 0.0 in
Lateral Spread: 0 ft

Layer	Top	Bottom	Soil Type	γ	σ_{vo}	σ'_{vo}	r_d	CSR	N_{spt}	$(N_1)_{60}$	%Fines	$(N_1)_{60cs}$	Calc?	$CRR_{7.5}$	CRR	FS	ε_v	ΔH	ΔH_{Dry}	$\Sigma\Delta H$	LD	S_r
	(ft)	(ft)		(pcf)	(tsf)	(tsf)					(%)						(%)	(in)	(in)	(in)	(ft)	(tsf)
1	0.00	0.94	CL	120	0.03	0.03	1.00	0.32	17.7	22.57	90.00	32.1	n						0.00	0.00	0.00	
2	0.94	1.89	CL	120	0.09	0.09	1.00	0.32	17.7	22.57	90.00	32.1	n						0.00	0.00	0.00	
3	1.89	2.83	CL	120	0.14	0.14	1.00	0.32	17.7	22.57	90.00	32.1	n						0.00	0.00	0.00	
4	2.83	3.78	CL	120	0.20	0.20	0.99	0.32	14.0	17.91	90.00	26.5	n						0.00	0.00	0.00	
5	3.78	4.72	CL	120	0.26	0.26	0.99	0.32	11.5	14.65	90.00	22.6	n						0.01	0.01	0.00	
6	4.72	5.67	CL	120	0.31	0.31	0.99	0.32	9.5	12.07	90.00	19.5	n						0.01	0.01	0.00	
7	5.67	6.61	CL	120	0.37	0.37	0.99	0.31	10.1	12.81	90.00	20.4	n						0.01	0.01	0.00	
8	6.61	7.56	CL	120	0.43	0.43	0.99	0.31	10.8	12.80	90.00	20.4	n						0.01	0.01	0.00	
9	7.56	8.50	CL	120	0.48	0.48	0.98	0.31	10.8	12.02	90.00	19.4	n						0.01	0.01	0.00	
10	8.50	9.00	CL	120	0.53	0.53	0.98	0.31	10.8	11.52	90.00	18.8	n						0.01	0.01	0.00	
11	9.00	9.44	CL-ML	120	0.55	0.55	0.98	0.31	12.2	12.62	90.00	20.1	n						0.00	0.00	0.00	
12	9.44	10.39	CL-ML	120	0.60	0.60	0.98	0.31	12.2	12.17	90.00	19.6	n						0.01	0.01	0.00	
13	10.39	11.33	CL-ML	120	0.65	0.65	0.98	0.31	12.2	15.50	90.00	23.6	n						0.01	0.01	0.00	
14	11.33	12.28	CL-ML	120	0.71	0.71	0.98	0.31	12.2	14.87	90.00	22.8	n						0.01	0.01	0.00	
15	12.28	13.00	CL-ML	120	0.76	0.76	0.97	0.31	12.2	14.37	90.00	22.2	n						0.01	0.01	0.00	
16	13.00	13.22	SP	115	0.79	0.79	0.97	0.31	35.2	40.77	5.10	40.8	y						0.00	0.00	0.00	
17	13.22	14.17	SP	115	0.82	0.82	0.97	0.31	35.2	39.93	5.10	40.0	y						0.00	0.00	0.00	
18	14.17	15.11	SP	115	0.87	0.87	0.97	0.31	35.2	38.67	5.10	38.7	y						0.00	0.00	0.00	
19	15.11	16.06	SP	115	0.93	0.93	0.97	0.31	35.2	37.52	5.10	37.6	y						0.00	0.00	0.00	
20	16.06	17.00	SP	115	0.98	0.98	0.96	0.31	35.2	36.47	5.10	36.5	y						0.00	0.00	0.00	
21	17.00	17.94	SP	115	1.04	1.04	0.96	0.31	35.2	35.50	5.10	35.6	y						0.00	0.00	0.00	
22	17.94	18.89	SP	115	1.09	1.09	0.96	0.31	35.2	34.61	5.10	34.7	y						0.00	0.00	0.00	
23	18.89	19.50	SP	115	1.14	1.14	0.96	0.31	35.2	33.92	5.10	34.0	y						0.00	0.00	0.00	
24	19.50	19.83	SW-SM	115	1.16	1.16	0.96	0.30	46.0	43.84	5.10	43.9	y						0.00	0.00	0.00	
25	19.83	20.78	SW-SM	115	1.20	1.20	0.96	0.30	46.0	43.16	5.10	43.2	y						0.00	0.00	0.00	
26	20.78	21.72	SW-SM	115	1.25	1.25	0.95	0.30	45.0	41.36	5.10	41.4	y						0.00	0.00	0.00	
27	21.72	22.67	SW-SM	115	1.31	1.31	0.95	0.30	44.3	39.86	5.10	39.9	y						0.00	0.00	0.00	
28	22.67	23.61	SW-SM	115	1.36	1.36	0.95	0.30	43.6	38.44	5.10	38.5	y						0.00	0.00	0.00	
29	23.61	24.56	SW-SM	115	1.42	1.42	0.94	0.30	42.9	37.09	5.10	37.2	y						0.00	0.00	0.00	
30	24.56	25.50	SW-SM	115	1.47	1.47	0.94	0.30	42.3	35.82	5.10	35.9	y						0.00	0.00	0.00	
31	25.50	26.44	SW-SM	115	1.53	1.53	0.94	0.30	42.3	35.18	5.10	35.2	y						0.00	0.00	0.00	
32	26.44	27.39	SW-SM	115	1.58	1.58	0.93	0.30	42.3	34.57	5.10	34.6	y						0.00	0.00	0.00	
33	27.39	28.33	SW-SM	115	1.63	1.63	0.93	0.30	42.3	33.99	5.10	34.0	y						0.01	0.01	0.00	
34	28.33	29.28	SW-SM	115	1.69	1.69	0.93	0.29	42.3	33.44	5.10	33.5	y						0.01	0.01	0.00	
35	29.28	30.00	SW-SM	115	1.74	1.74	0.92	0.29	42.3	32.98	5.10	33.0	y						0.00	0.00	0.00	
36	30.00	30.22	SW-SM	115	1.76	1.76	0.92	0.29	42.3	32.75	5.10	32.8	y							0.00	0.00	
37	30.22	31.17	SW-SM	115	1.80	1.78	0.92	0.30	42.3	32.61	5.10	32.7	y							0.00	0.00	
38	31.17	32.11	SW-SM	115	1.85	1.80	0.91	0.30	42.3	32.39	5.10	32.4	y							0.00	0.00	
39	32.11	33.06	SW-SM	115	1.91	1.83	0.91	0.30	42.3	32.17	5.10	32.2	y							0.00	0.00	
40	33.06	34.00	SW-SM	115	1.96	1.85	0.90	0.30	42.3	31.95	5.10	32.0	y							0.00	0.00	
41	34.00	34.00	ML	120	1.99	1.86	0.90	0.30	16.9	12.74	100.00	20.3	n							0.00	0.00	
42	34.00	34.94	ML	120	2.02	1.88	0.89	0.31	16.9	12.69	100.00	20.2	n							0.00	0.00	
43	34.94	35.89	ML	120	2.07	1.90	0.89	0.31	16.9	12.60	100.00	20.1	n							0.00	0.00	
44	35.89	36.83	ML	120	2.13	1.93	0.88	0.31	16.9	12.51	100.00	20.0	n							0.00	0.00	
45	36.83	37.78	ML	120	2.19	1.96	0.87	0.31	16.9	12.42	100.00	19.9	n							0.00	0.00	
46	37.78	38.72	ML	120	2.24	1.99	0.86	0.31	16.9	12.34	100.00	19.8	n							0.00	0.00	
47	38.72	39.00	ML	120	2.28	2.00	0.86	0.31	16.9	12.28	100.00	19.7	n							0.00	0.00	
48	39.00	39.67	GP	125	2.31	2.02	0.86	0.31	101.4	73.44	6.20	73.9	y							0.00	0.00	
49	39.67	40.61	GP	125	2.36	2.04	0.85	0.31	101.4	72.98	6.20	73.4	y							0.00	0.00	
50	40.61	41.56	GP	125	2.42	2.07	0.84	0.31	101.4	72.46	6.20	72.9	y							0.00	0.00	
51	41.56	42.50	GP	125	2.48	2.10	0.83	0.31	101.4	71.95	6.20	72.4	y							0.00	0.00	
52	42.50	43.44	GP	125	2.54	2.13	0.82	0.31	101.4	71.45	6.20	71.9	y							0.00	0.00	
53	43.44	44.39	GP	125	2.59	2.16	0.81	0.31	101.4	70.96	6.20	71.4	y							0.00	0.00	
54	44.39	45.33	GP	125	2.65	2.19	0.80	0.31	101.4	70.48	6.20	70.9	y							0.00	0.00	
55	45.33	46.28	GP	125	2.71	2.22	0.79	0.31	101.4	70.01	6.20	70.4	y							0.00	0.00	
56	46.28	47.22	GP	125	2.77	2.25	0.78	0.31	101.4	69.54	6.20	70.0	y							0.00	0.00	
57	47.22	48.17	GP	125	2.83	2.28	0.78	0.31	101.4	69.09	6.20	69.5	y							0.00	0.00	
58	48.17	49.11	GP	125	2.89	2.31	0.77	0.31	63.4	42.95	6.20	43.2	y							0.00	0.00	
59	49.11	50.06	GP	125	2.95	2.34	0.76	0.30	57.5	38.65	6.20	38.9	y							0.00	0.00	
60	50.06	51.00	GP	125	3.01	2.37	0.75	0.30	57.5	38.41	6.20	38.7	y							0.00	0.00	
61	51.00	51.94	GP	125	3.07	2.40	0.74	0.30	57.5	38.17	6.20	38.4	y							0.00	0.00	
62	51.94	52.89	GP	125	3.13	2.43	0.73	0.30	57.5	37.94	6.20	38.2	y							0.00	0.00	
63	52.89	53.50	GP	125	3.17	2.45	0.72	0.30	57.5	37.75	6.20	38.0	y							0.00	0.00	
64	53.50	53.83	SC-SM	120	3.20	2.47	0.71	0.30	82.8	54.25	22.00	63.2	y							0.00	0.00	
65	53.83	54.78	SC-SM	120	3.24	2.48	0.71	0.29	82.8	54.05	22.00	63.0	y							0.00	0.00	
66	54.78	55.72	SC-SM	120	3.30	2.51	0.70	0.29	82.8	53.75	22.00	62.7	y							0.00	0.00	
67	55.72	56.67	SC-SM	120	3.36	2.54	0.69	0.29	79.2	51.12	22.00	59.8	y							0.00	0.00	
68	56.67	57.61	SC-SM	120	3.41	2.57	0.68	0.29	76.3	49.00	22.00	57.5	y							0.00	0.00	
69	57.61	58.56	SC-SM	120	3.47	2.59	0.67	0.29	73.4	46.91	22.00	55.2	y							0.00	0.00	
70	58.56	59.50	SC-SM	120	3.53	2.62	0.67	0.29	70.6	44.84	22.00	52.9	y							0.00	0.00	
71	59.50	60.00	SC-SM	120	3.57	2.64	0.66	0.28	67.6	42.79	22.00	50.7	y							0.00	0.00	
72	60.00	60.44	GP	125	3.60	2.65	0.66	0.28	67.6	42.68	6.20	42.9	y							0.00	0.00	
73	60.44	61.39	GP	125	3.64	2.68	0.65	0.28	67.6	42.50	6.20	42.8	y							0.00	0.00	
74	61.39	62.33	GP	125	3.70	2.71	0.64	0.28	67.6	42.27	6.20	42.5	y							0.00	0.00	
75	62.33	63.28	GP	125	3.76	2.74	0.64	0.28	67.6	42.04	6.20	42.3	y							0.00	0.00	
76	63.28	64.22	GP	125	3.82	2.77	0.63	0.28	67.6	41.82	6.20	42.1	y							0.00	0.00	
77	64.22	65.17	GP	125	3.88	2.79	0.62	0.28	67.6	41.59	6.20	41.9	y							0.00	0.00	
78	65.17	66.11	GP	125	3.94	2.82	0.62	0.27	67.6	41.38	6.20	41.6	y							0.00	0.00	
79	66.11	67.06	GP	125	4.00	2.85	0.61	0.27	67.6	41.16	6.20	41.4	y							0.00	0.00	
80	67.06	68.00	GP	125	4.05	2.88	0.61	0.27	67.6	40.95	6.20	41.2	y							0.00	0.00	
81	68.00	68.94	GP	125	4.11	2.91	0.60	0.27	67.6	40.74	6.20	41.0	y							0.00	0.00	
82	68.94	69.00	GP	125	4.14	2.93	0.60	0.27	67.6	40.63	6.20	40.9	y							0.00	0.00	
83	69.00	69.89	SP	115	4.17	2.94	0.59	0.27	54.1	32.44	5.10	32.5	y							0.00	0.00	
84	69.89	70.83	SP	115	4.22	2.97	0.59	0.27	54.1	32.30	5.10	32.4	y							0.00	0.00	
85	70.83	71.78	SP	115	4.28	2.99	0.58	0.27	55.0	32.69	5.10	32.7	y							0.00	0.00	
86	71.78	72.72	SP	115	4.33	3.01	0.58	0.27	55.6	32.94	5.10	33.0	y							0.00	0.00	
87	72.72	73.67	SP	115	4.39	3.04	0.57	0.26	56.2	33.18	5.10	33.2	y							0.00	0.00	
88	73.67	74.61	SP	115	4.44	3.06	0.57	0.26	56.9	33.42	5.10	33.5	y							0.00	0.00	
89	74.61	75.56	SP	115	4.50	3.09	0.57	0.26	57.5	33.66	5.10	33.7	y							0.00	0.00	
90	75.56	76.50	SP	115	4.55	3.11	0.56	0.26	58.2	33.90	5.10	34.0	y							0.00	0.00	
91	76.50	77.44	SP	115	4.60	3.14	0.56	0.26	58.8	34.13	5.10	34.2	y							0.00	0.00	
92	77.44	78.39	SP	115	4.66	3.16	0.56	0.26	59.4	34.37	5.10	34.4	y							0.00	0.00	
93	78.39	79.33	SP	115	4.71	3.19	0.55	0.26	60.1	34.60	5.10	34.7	y							0.00	0.00	
94	79.33	80.28	SP	115	4.77	3.21	0.55	0.26	60.8	34.91	5.10	35.0	y							0.00	0.00	
95	80.28	81.22	SP	115	4.82	3.24	0.54	0.26	60.8	34.77	5.10	34.8	y							0.00	0.00	
96	81.22	82.17	SP	115	4.88	3.26	0.54	0.26	60.8	34.64	5.10	34.7	y							0.00	0.00	
97	82.17	83.00	SP	115	4.93	3.29	0.54	0.26	60.8	34.52	5.10	34.6	y							0.00	0.00	
98	83.00	83.11	CL	120	4.95	3.30	0.54	0.26	82.2	46.55	90.00	60.9	n							0.00	0.00	
99	83.11	84.06	CL	120	4.99	3.31	0.54	0.26	82.5	46.61	90.00	60.9	n							0.00	0.00	
100	84.06	85.00	CL	120	5.04	3.34	0.53	0.26	82.2	46.25	90.00	60.5	n							0.00	0.00	

Liquefaction Hazard Analysis

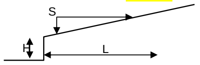
Youd, T. L. et al - 2001
Project: Cemex Cache Creek
Proj No: S1294-05-01
Location: B2

Earthquake Variables
2% Probability of exceedence in
50 Years.
Return Period: 2474.92 Years
a_{max}: 0.490 g
Magnitude: 6.5 M_w
MSF 1.44192

Site variables
Water table depth: 25 ft

Global variables
γ_w 62.4 pcf
$P_{a\ (atmospheric\ pressure)}$ 1.058 tsf
$FS_{min,\ allowable}$: 1.3
ε_v method: Tokimatsu

Slope and Free Face Variables
Slope, S 0.0 %
Face Height, H 0 (ft)
Dist. to Face, L 0 (ft)



Results
Liquified Layers: 0
Thickness: 0.0 ft
Dry Settlement: 0.2 in
Liq. Settlement 0.0 in
Lateral Spread: 0 ft

Layer	Top (ft)	Bottom (ft)	Soil Type	γ (pcf)	σ_{vo} (tsf)	σ'_{vo} (tsf)	r_d	CSR	N_{spt}	$(N_1)_{60}$	%Fines (%)	$(N_1)_{60cs}$	Calc?	$CRR_{7.5}$	CRR	FS	ε_v (%)	ΔH (in)	ΔH_{Dry} (in)	ΣΔH (in)	LD (ft)	S_r (tsf)
1	0.00	0.82	CL	115	0.02	0.02	1.00	0.32	17.7	22.57	90.00	32.1	n						0.00	0.00	0.00	
2	0.82	1.65	CL	115	0.07	0.07	1.00	0.32	17.7	22.57	90.00	32.1	n						0.00	0.00	0.00	
3	1.65	2.47	CL	115	0.12	0.12	1.00	0.32	17.7	22.57	90.00	32.1	n						0.00	0.00	0.00	
4	2.47	3.29	CL	115	0.17	0.17	1.00	0.32	14.9	18.96	90.00	27.8	n						0.00	0.00	0.00	
5	3.29	4.11	CL	115	0.21	0.21	0.99	0.32	13.6	17.30	90.00	25.8	n						0.00	0.00	0.00	
6	4.11	4.94	CL	115	0.26	0.26	0.99	0.32	12.7	16.17	90.00	24.4	n						0.00	0.00	0.00	
7	4.94	5.76	CL	115	0.31	0.31	0.99	0.32	12.2	15.51	90.00	23.6	n						0.01	0.01	0.00	
8	5.76	6.58	CL	115	0.35	0.35	0.99	0.31	11.9	15.11	90.00	23.1	n						0.01	0.01	0.00	
9	6.58	7.40	CL	115	0.40	0.40	0.99	0.31	11.6	14.15	90.00	22.0	n						0.01	0.01	0.00	
10	7.40	8.23	CL	115	0.45	0.45	0.98	0.31	11.4	13.13	90.00	20.8	n						0.01	0.01	0.00	
11	8.23	9.05	CL	115	0.50	0.50	0.98	0.31	11.2	12.24	90.00	19.7	n						0.01	0.01	0.00	
12	9.05	9.87	CL	115	0.54	0.54	0.98	0.31	11.0	11.47	90.00	18.8	n						0.01	0.01	0.00	
13	9.87	10.69	CL	115	0.59	0.59	0.98	0.31	10.8	14.47	90.00	22.4	n						0.01	0.01	0.00	
14	10.69	11.52	CL	115	0.64	0.64	0.98	0.31	10.8	13.92	90.00	21.7	n						0.01	0.01	0.00	
15	11.52	12.34	CL	115	0.69	0.69	0.97	0.31	10.8	13.43	90.00	21.1	n						0.01	0.01	0.00	
16	12.34	13.16	CL	115	0.73	0.73	0.97	0.31	10.8	12.99	90.00	20.6	n						0.01	0.01	0.00	
17	13.16	13.98	CL	115	0.78	0.78	0.97	0.31	10.8	12.59	90.00	20.1	n						0.01	0.01	0.00	
18	13.98	14.81	CL	115	0.83	0.83	0.97	0.31	10.8	12.23	90.00	19.7	n						0.01	0.01	0.00	
19	14.81	15.63	CL	115	0.88	0.88	0.97	0.31	10.8	11.89	90.00	19.3	n						0.01	0.01	0.00	
20	15.63	16.45	CL	115	0.92	0.92	0.97	0.31	10.8	11.58	90.00	18.9	n						0.01	0.01	0.00	
21	16.45	17.00	CL	115	0.96	0.96	0.96	0.31	10.8	11.34	90.00	18.6	n						0.01	0.01	0.00	
22	17.00	17.27	GW	125	0.99	0.99	0.96	0.31	36.5	37.81	1.50	37.8	y						0.00	0.00	0.00	
23	17.27	18.10	GW	125	1.02	1.02	0.96	0.31	36.5	37.17	1.50	37.2	y						0.00	0.00	0.00	
24	18.10	18.92	GW	125	1.07	1.07	0.96	0.31	36.5	36.27	1.50	36.3	y						0.00	0.00	0.00	
25	18.92	19.74	GW	125	1.12	1.12	0.96	0.31	36.5	35.43	1.50	35.4	y						0.00	0.00	0.00	
26	19.74	20.56	GW	125	1.17	1.17	0.96	0.30	36.5	34.65	1.50	34.6	y						0.00	0.00	0.00	
27	20.56	21.00	GW	125	1.21	1.21	0.95	0.30	36.5	34.08	1.50	34.1	y						0.00	0.00	0.00	
28	21.00	21.39	SP	125	1.24	1.24	0.95	0.30	41.9	38.72	10.00	40.4	y						0.00	0.00	0.00	
29	21.39	22.21	SP	125	1.28	1.28	0.95	0.30	41.9	38.14	10.00	39.8	y						0.00	0.00	0.00	
30	22.21	23.03	SP	125	1.33	1.33	0.95	0.30	41.9	37.40	10.00	39.1	y						0.00	0.00	0.00	
31	23.03	23.85	SP	125	1.38	1.38	0.95	0.30	41.9	36.69	10.00	38.4	y						0.00	0.00	0.00	
32	23.85	24.68	SP	125	1.43	1.43	0.94	0.30	41.9	36.03	10.00	37.7	y						0.00	0.00	0.00	
33	24.68	25.00	SP	125	1.47	1.47	0.94	0.30	41.9	35.59	10.00	37.2	y						0.00	0.00	0.00	
34	25.00	25.50	SP	125	1.49	1.49	0.94	0.30	41.9	35.37	10.00	37.0	y							0.00	0.00	
35	25.50	26.32	SP	125	1.53	1.51	0.94	0.30	41.9	35.12	10.00	36.7	y							0.00	0.00	
36	26.32	27.15	SP	125	1.59	1.53	0.93	0.31	41.9	34.82	10.00	36.4	y							0.00	0.00	
37	27.15	27.97	SP	125	1.64	1.56	0.93	0.31	41.9	34.53	10.00	36.1	y							0.00	0.00	
38	27.97	28.79	SP	125	1.69	1.58	0.93	0.32	41.9	34.25	10.00	35.9	y							0.00	0.00	
39	28.79	29.61	SP	125	1.74	1.61	0.92	0.32	41.9	33.98	10.00	35.6	y							0.00	0.00	
40	29.61	30.00	SP	125	1.78	1.63	0.92	0.32	41.9	33.78	10.00	35.4	y							0.00	0.00	
41	30.00	30.44	CL	120	1.80	1.64	0.92	0.32	10.1	8.14	90.00	14.8	n							0.00	0.00	
42	30.44	31.26	CL	120	1.84	1.66	0.92	0.32	11.4	9.10	90.00	15.9	n							0.00	0.00	
43	31.26	32.08	CL	120	1.89	1.68	0.91	0.33	12.6	10.01	90.00	17.0	n							0.00	0.00	
44	32.08	32.90	CL	120	1.94	1.71	0.91	0.33	13.8	10.90	90.00	18.1	n							0.00	0.00	
45	32.90	33.73	CL	120	1.99	1.73	0.90	0.33	15.1	11.79	90.00	19.1	n							0.00	0.00	
46	33.73	34.55	CL	120	2.04	1.75	0.90	0.33	16.3	12.66	90.00	20.2	n							0.00	0.00	
47	34.55	35.37	CL	120	2.09	1.78	0.89	0.33	17.6	13.56	90.00	21.3	n							0.00	0.00	
48	35.37	35.50	CL	120	2.12	1.79	0.89	0.33	17.6	13.51	90.00	21.2	n							0.00	0.00	
49	35.50	36.19	ML	120	2.14	1.80	0.88	0.33	17.6	13.48	90.00	21.2	n							0.00	0.00	
50	36.19	37.02	ML	120	2.19	1.82	0.88	0.34	17.6	13.40	90.00	21.1	n							0.00	0.00	
51	37.02	37.84	ML	120	2.24	1.85	0.87	0.34	17.6	13.32	90.00	21.0	n							0.00	0.00	
52	37.84	38.66	ML	120	2.29	1.87	0.86	0.34	17.6	13.23	90.00	20.9	n							0.00	0.00	
53	38.66	39.48	ML	120	2.33	1.90	0.86	0.34	17.6	13.15	90.00	20.8	n							0.00	0.00	
54	39.48	40.31	ML	120	2.38	1.92	0.85	0.34	17.6	13.07	90.00	20.7	n							0.00	0.00	
55	40.31	41.13	ML	120	2.43	1.94	0.84	0.34	17.6	12.99	90.00	20.6	n							0.00	0.00	
56	41.13	41.95	ML	120	2.48	1.97	0.84	0.34	17.6	12.91	90.00	20.5	n							0.00	0.00	
57	41.95	42.00	ML	120	2.51	1.98	0.83	0.34	17.6	12.87	90.00	20.4	n							0.00	0.00	
58	42.00	42.77	GP-GC	125	2.53	1.99	0.83	0.34	62.5	45.57	6.20	45.9	y							0.00	0.00	
59	42.77	43.60	GP-GC	125	2.58	2.02	0.82	0.33	62.5	45.29	6.20	45.6	y							0.00	0.00	
60	43.60	44.42	GP-GC	125	2.64	2.04	0.81	0.33	62.5	45.00	6.20	45.3	y							0.00	0.00	
61	44.42	45.24	GP-GC	125	2.69	2.07	0.80	0.33	62.5	44.72	6.20	45.0	y							0.00	0.00	
62	45.24	46.06	GP-GC	125	2.74	2.09	0.80	0.33	64.0	45.47	6.20	45.8	y							0.00	0.00	
63	46.06	46.89	GP-GC	125	2.79	2.12	0.79	0.33	65.8	46.47	6.20	46.8	y							0.00	0.00	
64	46.89	47.71	GP-GC	125	2.84	2.15	0.78	0.33	67.6	47.46	6.20	47.8	y							0.00	0.00	
65	47.71	48.53	GP-GC	125	2.89	2.17	0.77	0.33	69.4	48.44	6.20	48.7	y							0.00	0.00	
66	48.53	49.35	GP-GC	125	2.94	2.20	0.76	0.33	71.2	49.41	6.20	49.7	y							0.00	0.00	
67	49.35	50.18	GP-GC	125	3.00	2.22	0.75	0.32	73.0	50.37	6.20	50.7	y							0.00	0.00	
68	50.18	51.00	GP-GC	125	3.05	2.25	0.75	0.32	74.8	51.32	6.20	51.6	y							0.00	0.00	
69	51.00	51.82	GP-GC	125	3.10	2.27	0.74	0.32	76.6	52.26	6.20	52.6	y							0.00	0.00	
70	51.82	52.65	GP-GC	125	3.15	2.30	0.73	0.32	78.4	53.19	6.20	53.5	y							0.00	0.00	
71	52.65	53.47	GP-GC	125	3.20	2.33	0.72	0.32	80.2	54.11	6.20	54.4	y							0.00	0.00	
72	53.47	54.29	GP-GC	125	3.25	2.35	0.71	0.31	82.0	55.03	6.20	55.4	y							0.00	0.00	
73	54.29	55.11	GP-GC	125	3.30	2.38	0.70	0.31	84.5	56.37	6.20	56.7	y							0.00	0.00	
74	55.11	55.94	GP-GC	125	3.36	2.40	0.70	0.31	85.0	56.42	6.20	56.8	y							0.00	0.00	
75	55.94	56.76	GP-GC	125	3.41	2.43	0.69	0.31	85.9	56.67	6.20	57.0	y							0.00	0.00	
76	56.76	57.58	GP-GC	125	3.46	2.45	0.68	0.31	86.7	56.92	6.20	57.3	y							0.00	0.00	
77	57.58	58.40	GP-GC	125	3.51	2.48	0.67	0.30	87.5	57.17	6.20	57.5	y							0.00	0.00	
78	58.40	59.23	GP-GC	125	3.56	2.51	0.67	0.30	88.4	57.42	6.20	57.8	y							0.00	0.00	
79	59.23	60.05	GP-GC	125	3.61	2.53	0.66	0.30	89.6	57.90	6.20	58.3	y							0.00	0.00	
80	60.05	60.87	GP-GC	125	3.66	2.56	0.65	0.30	89.6	57.61	6.20	58.0	y							0.00	0.00	
81	60.87	61.69	GP-GC	125	3.72	2.58	0.65	0.30	89.6	57.32	6.20	57.7	y							0.00	0.00	
82	61.69	62.52	GP-GC	125	3.77	2.61	0.64	0.30	89.6	57.04	6.20	57.4	y							0.00	0.00	
83	62.52	63.34	GP-GC	125	3.82	2.63	0.64	0.29	89.6	56.76	6.20	57.1	y							0.00	0.00	
84	63.34	64.16	GP-GC	125	3.87	2.66	0.63	0.29	89.6	56.49	6.20	56.8	y							0.00	0.00	
85	64.16	64.98	GP-GC	125	3.92	2.69	0.62	0.29	89.6	56.21	6.20	56.6	y							0.00	0.00	
86	64.98	65.81	GP-GC	125	3.97	2.71	0.62	0.29	89.6	55.95	6.20	56.3	y							0.00	0.00	
87	65.81	66.63	GP-GC	125	4.02	2.74	0.61	0.29	89.6	55.68	6.20	56.0	y							0.00	0.00	
88	66.63	67.00	GP-GC	125	4.06	2.76	0.61	0.29	89.6	55.49	6.20	55.8	y							0.00	0.00	
89	67.00	67.45	CH	122	4.09	2.77	0.61	0.29	55.4	34.27	99.00	46.1	n							0.00	0.00	
90	67.45	68.27	CH	122	4.13	2.79	0.60	0.28	55.4	34.15	99.00	46.0	n							0.00	0.00	
91	68.27	69.10	CH	122	4.18	2.81	0.60	0.28	55.4	34.00	99.00	45.8	n							0.00	0.00	
92	69.10	69.92	CH	122	4.23	2.84	0.59	0.28	55.4	33.85	99.00	45.6	n							0.00	0.00	
93	69.92	70.74	CH	122	4.28	2.86	0.59	0.28	55.4	33.71	99.00	45.4	n							0.00	0.00	
94	70.74	71.56	CH	122	4.33	2.89	0.58	0.28	54.5	33.00	99.00	44.6	n							0.00	0.00	
95	71.56	72.39	CH	122	4.38	2.91	0.58	0.28	53.8	32.46	99.00	43.9	n							0.00	0.00	
96	72.39	73.21	CH	122	4.43	2.93	0.58	0.28	53.2	31.92	99.00	43.3	n							0.00	0.00	
97	73.21	74.03	CH	122	4.48	2.96	0.57	0.28	52.5	31.39	99.00	42.7	n							0.00	0.00	
98	74.03	74.85	CH	122	4.53	2.98	0.57	0.28	82.2	48.95	99.00	63.7	n							0.00	0.00	
99	74.85	75.68	CH	122	4.58	3.01	0.57	0.27	82.5	48.92	99.00	63.7	n							0.00	0.00	
100	75.68	76.50	CH	122	4.63	3.03	0.56	0.27	82.2	48.55	99.00	63.3	n							0.00	0.00	