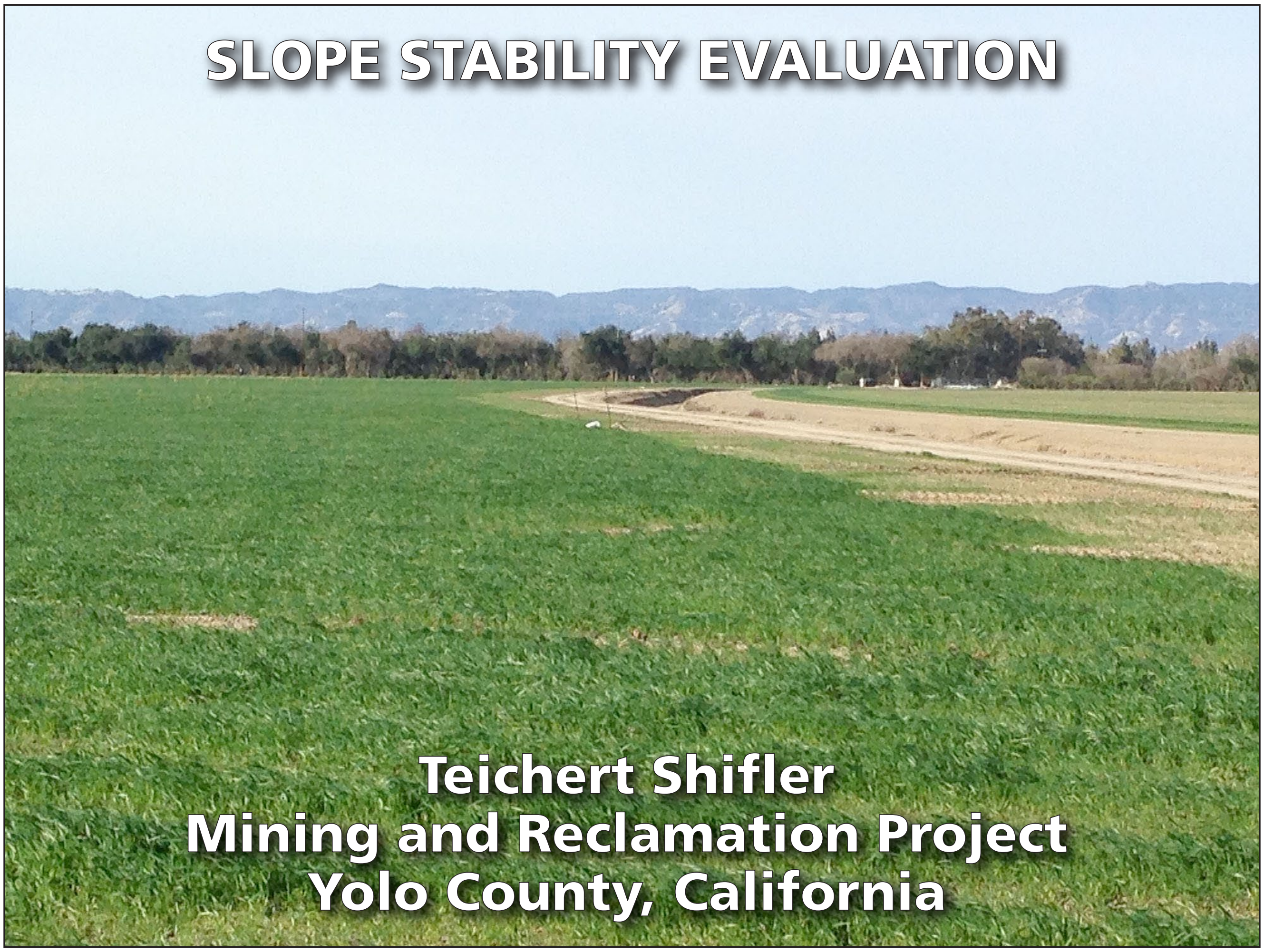
SLOPE STABILITY EVALUATION



Teichert Shifler
Mining and Reclamation Project
Yolo County, California

PREPARED FOR:

TEICHERT AGGREGATES
3500 AMERICAN RIVER DRIVE
SACRAMENTO, CALIFORNIA 95864

PREPARED BY:

GEOCON CONSULTANTS, INC.
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GEOCON PROJECT NO. S9534-05-04 **MAY 2016**

Project No. S9534-05-04
May 25, 2016

VIA ELECTRONIC MAIL

Jason Smith
A. Teichert & Son, Inc.
Aggregate Resource Development
3500 American River Drive
Sacramento, California 95864-5805

Subject: SLOPE STABILITY EVALUATION
TEICHERT SHIFLER MINING AND RECLAMATION PROJECT
YOLO COUNTY, CALIFORNIA

Dear Mr. Smith:

In accordance with your authorization, we have performed a geotechnical evaluation of the proposed perimeter slopes that will be constructed during the future Shifler Mining Project located northeast of the intersection of County Roads 22 and 94B in Yolo County, California.

The accompanying report presents our findings, conclusions, and recommendations regarding geotechnical aspects of slope construction as presently proposed and incorporates (as necessary) project revisions provided on March 17, 2016 for supplemental seepage analysis for the proposed relocation of the Moore Canal.

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 Surface Mining and Reclamation Ordinances* 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.

REGISTERED PROFESSIONAL ENGINEER RONALD ERIC LOUTZENHISER NO. 2865 GEOTECHNICAL STATE OF CALIFORNIA

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Senior Engineer

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1.0 INTRODUCTION

This report presents results of our geotechnical investigation for evaluation of proposed slopes that will be constructed as part of the Shifler Mining and Reclamation Project located northeast of the intersection of County Roads 22 and 94B in Yolo County, California. The approximate site location is shown on the Vicinity Map, Figure 1.

The purpose of our study was to evaluate subsurface conditions, evaluate pertinent geotechnical parameters, and to evaluate slope stability for proposed perimeter 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 and Reclamation Ordinances*, and the California *Surface Mining and Reclamation Act* (SMARA). The results of our evaluation will be used as part of the overall forward planning efforts for the project.

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

- Performed a limited geologic/geotechnical literature and aerial photograph review to aid in evaluating the geologic and geotechnical conditions present at the site. A list of referenced material is included in Section 10.0 of this report.
- Reviewed available plans for the proposed project to select areas of exploration.
- Notified subscribing utility companies via Underground Service Alert at least 48 hours prior to performing exploratory excavations at the site.
- Paid required fees and obtained a soil boring permit from Yolo County Environmental Health Department.
- Performed six test pits (TPSHF1 through TPSHF6) using a CAT 385 excavator. Test pits were excavated to approximate depths ranging from 18 to 21 feet on October 28, 2010.
- Performed one exploratory boring (B1) using a truck-mounted drill rig equipped with hollow-stem augers to a depth of approximately 101 feet on February 20, 2014.
- Logged the test pits and boring in accordance with the Unified Soil Classification System (USCS).
- Obtained soil samples from the test pits and borings.
- Performed laboratory tests on selected soil samples to evaluate pertinent geotechnical parameters.
- Performed slope stability and seepage analyses for mining and reclamation slopes considering both static and seismic conditions.
- Performed supplemental seepage analysis for the proposed relocation of Moore Canal.
- Prepared this report summarizing our findings, conclusions and recommendations regarding the geotechnical aspects of the proposed project.

Details of our field exploration program including test pit, exploratory boring, and drill hole logs are presented in Appendix A. Approximate locations of subsurface explorations are shown on the Mining Site Plan and Reclamation Site Plan, Figures 2 and 3 respectively. 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.

2.0 SITE AND PROJECT INFORMATION

The Shifler property (the "site") occupies approximately 319.3 acres south of Cache Creek, and is identified by Yolo County Assessor's Parcel Numbers 025-430-01 (portion), 025-430-02, 025-120-32 (portion), and 025-120-33. The approximate location of the site is depicted on the Vicinity Map, Figure 1. The site is located north of County Road No. 22 and east of County Road No. 94B. The Moore Canal traverses the site from its northeast corner to its west boundary. The Moore Canal is an irrigation water conveyance canal operated by the Yolo County Flood Control and Water Conservation District. Land uses in the vicinity of the site consist of active and former aggregate mining operations, agriculture, and some rural and farm residences.

Based on mapping prepared by Cunningham Engineering and information provided by Teichert, site topography is relatively flat with surface elevations ranging from approximately 98.7 feet to 112 feet above mean sea level (MSL). The site is currently an agricultural property planted with row crops.

We understand that Teichert proposes to excavate the site for gravel mining operations. The proposed mining operations will require excavation of the site to a maximum pit bottom elevation of -5 feet MSL. The currently proposed mining boundary and base of excavation elevation contours are shown on the Mining Site Plan, Figure 2.

Prior to initiating mining operations, the Moore Canal will be relocated to flow in a newly constructed concrete-lined channel adjacent to the north and west boundaries of the proposed mining/reclamation area. The new canal will be set back approximately 50 feet from the mining area. The existing and proposed new Moore Canal locations are depicted on the Mining Site Plan, Figure 2.

Mining operations will consist of removing and stockpiling the existing overburden soil and retrieving the underlying gravel material down to a maximum pit bottom elevation of approximately -5 feet MSL. Based on the topography of the site, this will result in mining (excavation) depths up to approximately 110 feet, depending on location.

Planned mining and reclamation will create slopes of varying height and inclinations. Some of these mining and reclamation slopes will intercept the groundwater potentiometric surface. Typical slope configurations are shown on Figures 4 and 5 (from *Shifler Mining Plans* and *Shifler Reclamation Plans* by Cunningham Engineering, 2014). Review of the *Shifler Mining Plan* and *Shifler Reclamation Plan* sheets prepared by Cunningham Engineering, dated February 22, 2016, shows similar slope configurations and revised groundwater conditions. Proposed mining slopes shown in the 2016 plans will be excavated to an inclination of approximately ¾:1 (horizontal to vertical) above elevation 52 feet MSL; and 1:1 below elevation 47 feet MSL with a 5-foot-high 2:1 slope transition zone in between. As shown on the Mining Site Plan, Figure 2, a minimum 50-foot buffer will be maintained between the tops of the mining slopes and the property lines and the relocated Moore Canal.

Reclamation slopes will be constructed using stockpiled overburden soil that is placed and compacted to form new slopes ranging in inclination from 2:1 to 4:1 above elevation 43 MSL and 1:1 below this elevation. Reclamation slopes will be constructed in a sequential manner as mining progresses which should result in completed mining slopes only being exposed for a short period of time – on the order of one year or less. The proposed reclamation elevation contours are depicted on the Reclamation Site Plan, Figure 3.

3.0 SOIL AND GEOLOGIC CONDITIONS

We identified soil and geologic conditions by observing exploratory excavations (TPSHF1 through TPSHF6), an exploratory soil boring (B1), reviewing previous drill hole logs provided by Teichert (SHF05DH-1 through SHF06DH-27), and reviewing the referenced geologic literature (Section 9.0). 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 9- to 18-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 and will be the aggregate source for this mining project. The strata proposed for mining overlays a cemented sandstone to clay layer. Consistency of the clay layer varies from very stiff to hard as is typical of this type of sedimentary deposit.

Based on our review of the drill hole logs provided by Teichert, 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 the Typical Slope Sections exhibits, Figures 4 and 5.

Subsurface conditions described in the previous paragraphs are generalized. The test pit, exploratory boring, and drill hole 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 did not encounter groundwater in any of our test pits performed on October 28, 2010. We encountered groundwater in boring B1 performed on February 20, 2014, at a depth of 70 feet (elevation of approximately 38½ feet MSL).

We understand that groundwater analysis indicates a predicted high groundwater elevation during mining of 60 feet MSL and a predicted low of 52 feet MSL. The analysis also indicates a high groundwater elevation for the reclamation condition of 57 feet MSL and a low of 47 feet MSL. We understand that these groundwater conditions are based on a site-specific study performed by Luhdorff & Scalmanini (February 2016). Groundwater analysis performed in 2014 yielded different groundwater elevations which bracketed these values (slightly higher and slightly lower). As such, our slope stability and seepage analyses presented herein use the results of the 2014 groundwater analysis since those results are more adverse than the results of the 2016 groundwater analysis with respect to slope stability and seepage, resulting in a more conservative analysis.

It should be noted that fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and other factors. Depth to groundwater can also vary significantly due to localized pumping, irrigation practices, and seasonal fluctuations in Cache Creek.

5.0 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 8 miles to the west and northwest, respectively, are the closest known active faults to the site.

We used the USGS computer program *2008 Interactive Deaggregations* to estimate the PGA and modal (most probable) distance and magnitude associated with a 2% chance of exceedance in 50 years (2,475-year event). For an alluvial soil type, the USGS estimated PGA is 0.47g, the modal distance is 22.5 km and the modal magnitude is 6.6.

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 seismic slope stability analysis. The PGA_M for the site is 0.4g.

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.

6.0 SLOPE STABILITY AND SEEPAGE ANALYSIS

The stability of the proposed mining and reclamation slopes was evaluated based on soil strength parameters and the anticipated slope configurations and groundwater/seepage conditions from 2014 plans. Revised groundwater conditions provided in 2016 are bracketed by those used in the 2014 analysis. As such, we consider the results presented herein for analyses performed in 2014 as also appropriate given the revised groundwater conditions.

6.1 Stability Analysis Material Parameters

We evaluated slope stability at four locations considered representative of the anticipated mining and reclamation slope conditions along the perimeter of the proposed mining pit: A-A’ and D-D’ (north slope), B-B’ (west slope), and C-C’ (east slope). The analysis locations are shown on the Mining and Reclamation Site Plans, Figures 2 and 3, respectively. The configuration of slope stability analysis sections was based on topography and anticipated mining depths provided by Teichert. The typical slope sections are shown on Figures 4 and 5.

To select appropriate material parameters for our slope stability analysis, we used the results of our test pits, exploratory borings, drill hole information obtained from Teichert and our own borings, laboratory testing, published correlations, engineering judgment, and experience. The material parameters used in our analyses are summarized in Table 6.1.

TABLE 6.1
SOIL PARAMETERS FOR SLOPE STABILITY AND SEEPAGE ANALYSIS

Material Type	**Total Unit Weight (pcf)**	**Cohesion, C (psf)**		**Friction Angle, □ (degrees)**		**Permeability (ft/sec)**	
		Total	Effective	Total	Effective	Vertical	Horizontal
Overburden Soil	125	350	---	20	---	1.5×10^{-7}	1.5×10^{-6}
Gravel	125	---	150	---	42	1.5×10^{-4}	1.5×10^{-3}
Clay	120	450	375	18	30	1.5×10^{-7}	1.5×10^{-6}
Reclamation Fill	125	2,000	250	29	34	n/a	n/a

Discussion of the derivation of the parameters shown in Table 6.1 is presented hereinafter.

<u>Overburden Soil.</u> 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. Permeability is based on laboratory permeability testing. Based on sensitivity analysis, overburden soil parameters (total unit weight, C, ϕ) have a negligible effect on slope stability for this project.

<u>Gravel.</u> Since it is extremely difficult to obtain intact, undisturbed samples of gravel and cobble containing up to 4-inch particles, we derived shear strength parameters for the gravel using the following procedure. We excavated test pits and collected representative samples of the gravel from selected depths. Representative bulk samples of gravel were delivered to Ausenco Vector Laboratory in Grass Valley, California. The samples were sieved and recombined as close as practically possible to the average in-situ gradation and dry density based on average gradation of over 100 samples. Ausenco Vector then performed large box (12-inch square) direct shear testing on saturated, remolded specimens to determine effective shear strength parameters. Because this material contains very little fines and is relatively free-draining, drained (effective stress) parameters are used for both static and seismic stability analyses. Permeability of the gravel deposit was estimated using correlations developed by Alyamani and Sen, *Determination of Hydraulic Conductivity from Complete Grain-Size Distribution Curves*, Groundwater Journal, July-August 1993. Since the samples are remolded the shear strength results obtained do not account any for natural cementation which may be present in the material.

<u>Clay.</u> 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.

<u>Reclamation Fill.</u> We derived shear strength parameters for the future fill slopes constructed from the existing overburden material using the following procedure. We excavated test pits and collected representative samples of the overburden from selected depths. We then performed laboratory testing to determine a maximum dry density and optimum moisture content. Samples were remolded to approximately 90 percent relative compaction at least 2 percent above optimum moisture content. Staged triaxial shear testing was then performed on unconsolidated and consolidated samples to determine a range of total and effective shear strength parameters. Drained (effective stress) parameters are used for static stability analysis and undrained, total stress parameters are used for seismic stability analysis.

We assumed a generally flat soil layer stratigraphy consistent with the depositional and erosional geology of the site.

6.2 Groundwater Conditions

Based on the *Preliminary Mining and Reclamation Exhibits*, prepared by Cunningham Engineering dated January 30, 2014, we used the groundwater elevations in Table 6.2 in our analyses. These groundwater elevations bracket the revised groundwater elevations provided in 2016, resulting in a conservative analysis.

TABLE 6.2
GROUNDWATER ELEVATIONS FOR ANALYSIS

Condition	Average High Groundwater Elevation (Feet, MSL)	Average Low Groundwater Elevation (Feet, MSL)
Mining[1]	65	50
Reclamation[1]	62	40

Notes: 1. Groundwater conditions used for slope stability analysis from the *Preliminary Mining and Reclamation Exhibits* by Cunningham Engineering (dated January 30, 2014) are higher and lower and are therefore more conservative than the 2016 revised groundwater conditions.

6.3 Seismic Forces for Dynamic (Seismic) Slope Stability Analysis

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

We 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 for a soft rock site condition without the risk coefficient ($PGA_M/1.5$). Assuming a 5-cm displacement threshold, a $PGA_M/1.5$ of 0.27g, a modal distance of 22.5 km, and a modal magnitude of 6.6, the calculated seismic coefficient is 0.1.

6.4 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 slope conditions, we analyzed both shallow surface (surficial) and global stability. For the purposes of this report, “shallow surface” failures are those within close proximity to the top of the mining slope, generally within the outer 25-foot portion of the dedicated 50-foot buffer. “Global” failures for the mining slope condition are considered failure surfaces that would extend beyond the 50-foot buffer. For the reclamation slope conditions, we analyzed for global failure surfaces.

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. In our analyses, as a conservative measure for the mining condition, we assumed no ponded water against the slope, even though ponded water will be present during mining (no dewatering planned). For the reclamation condition, we assumed the ponded water elevation would be coincident with the potentiometric groundwater surface.

Tabulated results of our slope stability analysis (factor of safety 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 C1 in Appendix C. Graphical representations of the potential critical failure surfaces and parameters used for each stability analysis are presented on Figures C3 through C18 in Appendix C. Results are summarized in Table 6.5.

TABLE 6.5
SLOPE STABILITY ANALYSIS RESULTS

Location	Condition	Calculated Minimum Factor of Safety	
		Static	Seismic
Northeast Slope (A-A’)	Mining – Low Groundwater/Shallow Surface	1.1 to 1.2	1.0 to 1.1
	Mining – Low Groundwater /Global	1.3	1.1
	Mining – High Groundwater/Shallow Surface	1.1	1.0
	Mining – High Groundwater /Global	1.2	1.0
	Reclamation – Low Groundwater	1.5	1.4
	Reclamation – High Groundwater	1.8	1.4
West Slope (B-B’)	Mining – Low Groundwater/Shallow Surface	1.2 to 1.3	1.0 to 1.1
	Mining – Low Groundwater /Global	1.7	1.1
	Mining – High Groundwater/Shallow Surface	1.1 to 1.2	1.0
	Mining – High Groundwater /Global	1.6	1.0
	Reclamation – Low Groundwater	3.7	2.3
	Reclamation – High Groundwater	3.7	2.0
East Slope (C-C’)	Mining – Low Groundwater/Shallow Surface	1.2 to 1.6	1.1 to 1.3
	Mining – Low Groundwater /Global	2.1	1.4
	Mining – High Groundwater/Shallow Surface	1.2 to 1.6	1.1 to 1.3
	Mining – High Groundwater /Global	2.1	1.3
	Reclamation – Low Groundwater	2.7	2.0
	Reclamation – High Groundwater	2.7	1.7
North-Central Slope (D-D’)	Mining – Low Groundwater/Shallow Surface	1.2	1.0 to 1.1
	Mining – Low Groundwater /Global	1.3	1.1
	Mining – High Groundwater/Shallow Surface	1.1	1.0
	Mining – High Groundwater /Global	1.3	1.0
	Reclamation – Low Groundwater	1.8	1.3
	Reclamation – High Groundwater	2.2	1.3

6.5 Seepage Analysis and Results

Cache Creek

The proposed north mining/reclamation slopes will be separated (set back) from Cache Creek by a minimum of 300 feet. To model seepage conditions in the north mining/reclamation slope under influence of a potential 200-year flood event in Cache Creek, we used the computer program SEEP/W, Version 7 (Geo-Slope International). In our analysis, we considered the initial condition for the site to be the average high groundwater elevation of 65 feet MSL for the mining condition (2014 groundwater conditions). We then modeled the transient 200-year water surface elevation (+98 feet MSL, per Cunningham Engineering, 2014) in Cache Creek for durations of one month, 100 days, and 100 years. Our seepage analysis results are presented graphically on Figures C1 and C2 in Appendix C.

The results of our analyses indicate 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 (100 years). Therefore, anticipated subsurface seepage conditions at the proposed north mining slope under the 200-year Cache Creek flood event are not expected to be more adverse than normal, average seasonal high groundwater conditions.

Relocated Moore Canal

As requested, we performed supplemental seepage analysis for the proposed Moore Canal relocation. The proposed north mining slope will be separated (set back) from the relocated canal by about 50 feet. We used the computer program SEEP/W, Version 7 (Geo-Slope International) for seepage modeling. In our analysis, we considered the initial condition for the site to be the average high groundwater elevation of 60 feet MSL for the mining condition (2016 groundwater conditions for this analysis). We then modeled the transient design water surface elevation (+105.5 feet MSL, per Cunningham Engineering) in the canal for durations of one month and 100 days (we understand that the canal is only used periodically and is frequently dry throughout the year) as well as steady state conditions. Our seepage analysis results are presented graphically on Figures C19 through C21 in Appendix C.

Two different near-surface soil conditions were evaluated for the relocated Moore Canal (overburden and clayey gravel). The canal is anticipated to be located primarily in overburden soils (see Section 6.1 for soil descriptions) but will likely be, at least locally, established in the underlying clayey gravels. Although a concrete lining is proposed for the relocated Moore Canal, our analysis conservatively does not include a concrete lining. The effectiveness of concrete linings as a water barrier can be variable depending on the condition of the liner, frequency of crack maintenance, and other factors. As such, our analysis assumes no concrete liner is present.

The results of our analyses for the two conditions modeled indicate 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 flow). Seepage is minimal from the canal during transient analysis and does not extend to the mining slope due to the generally clayey nature of the overburden and gravelly soils at the project location and the shallow depth of water in the canal. Therefore, anticipated subsurface seepage conditions at the proposed north mining slope under the design water conditions for the relocated canal are not expected to be more adverse than the normal, average seasonal high groundwater conditions.

6.6 Pit Capture Potential

In off-channel mining operations, "Pit capture" is a term to describe the process where the earthen material separating the mining pit from an adjacent watercourse is breached by overflowing floodwaters, streambank erosion, and/or channel migration. The northern portion of the site is bordered by Cache Creek. Based on current plans, mining will occur to within 300 feet of the south bank of the creek (North-Central Mining Slope). The 300-foot "setback" will include the relocated, concrete-lined Moore Canal and the existing aggregate conveyor facility owned by Teichert. A typical cross-section of the North-Central Mining Slope (Cross-Section D-D') showing the proximity of Cache Creek is presented on Figure 4.

To evaluate historic channel migration and floodwater conditions in Cache Creek, Teichert reviewed and compiled a series of historical aerial photographs covering the period of 1958 to 2012, copies of which are provided on Figure 6. The photograph from February 1958 shows Cache Creek under flood conditions. The remaining photographs (March 1973, June 1986, June 1993, April 2000, and February 2012) show the creek channel under various degrees of flow. The photographs suggest that floodwaters, when present, do not flow over the south bank of the creek adjacent to the site. This evidence agrees with the hydrologic models developed by Cunningham Engineering which indicate that floodwaters spread to the north of the creek. The aerial photographs also show increasing vegetation on the south bank over the 54-year photo period and a lack of channel migration to the south. These conditions, coupled with the absence of adverse seepage and slope stability conditions identified during our analyses suggest that the potential for pit capture is low.

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 mining condition, static factor of safety (FOS) against failure ranged from 1.1 to 2.1. The lower FOS values were for shallow surface failures within the outer portion of the 50-foot buffer. These values indicate that the mining slopes should be globally stable during the mining period provided unanticipated conditions are not encountered. Seismic FOS for the mining condition ranged from 1.0 to 1.4. Again, the lower FOS values are associated with shallow surface failures. Considering the relatively short amount of time that the mining slopes will be exposed (less than one year), the likelihood of a design-level earthquake event occurring during mining is low. Therefore, the risk of seismic-induced global failure is low.

For the long-term reclamation condition, static and seismic FOS for all slope configurations exceed FOS of 1.5 and 1.4, respectively, which is accepted by many jurisdictions for residential and commercial purposes, and is, in our opinion, consistent with the required FOS for the anticipated end use of the site, which is agriculture. Therefore, permanent slopes are anticipated to remain stable relative to global failure provided unanticipated conditions are not encountered during mining/reclamation.

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 (100 years / steady state conditions). Therefore, anticipated subsurface seepage conditions at the proposed north mining slope under a 200-year Cache Creek flood event or from design water elevation in the relocated Moore Canal are not expected to be more adverse than normal, average seasonal high groundwater conditions.

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 models developed by Cunningham Engineering indicate that floodwaters spread to the north of the creek. Aerial photographs show increasing vegetation on the south bank and an absence of southward channel migration over the 54-year photo period. These conditions, coupled with 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

Reclamation slopes should be constructed using stockpiled overburden materials. Reclamation fill should be compacted in horizontal lifts not exceeding 8 inches (loose thickness). Each lift should be moisture-conditioned to at least 2% above optimum and compacted to at least 90% relative compaction as determined by the latest American Society for Testing and Materials (ASTM) D1557 Test Procedure.

During mining, exposed gravel slopes are subject to erosion and deterioration and shallow surficial failures should be expected. Such surficial failures should be repaired immediately prior to additional mining. Consideration should be given to mining methods that minimize the amount of time that mining slopes are exposed and personnel and equipment are present on or below mining slopes. During mining, we recommend active, daily monitoring of slopes to identify potential instability.

In addition, the following measures should be considered:

- Reclamation should occur concurrently with or shortly after mining. We highly recommend not leaving mining slopes exposed throughout the winter months without a program of active monitoring and ongoing slope maintenance.
- Mining and reclamation activities adjacent to the Moore Canal should be coordinated with the Yolo County Flood Control and Water Conservation District.
- 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.
- Teichert should train onsite workers regarding seismic safety issues, including appropriate actions to be taken during a seismic event.
- During mining operations, Teichert 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 mining and reclamation plans prior to final submittal to assess whether our recommendations have been properly incorporated and evaluate if additional analysis and/or recommendations are required.

9.2 Future Services

If, during the course of mining and reclamation, sloughing or rills greater than 12 inches deep develop, Geocon should be requested to observe site conditions and develop 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 LIST OF REFERENCES

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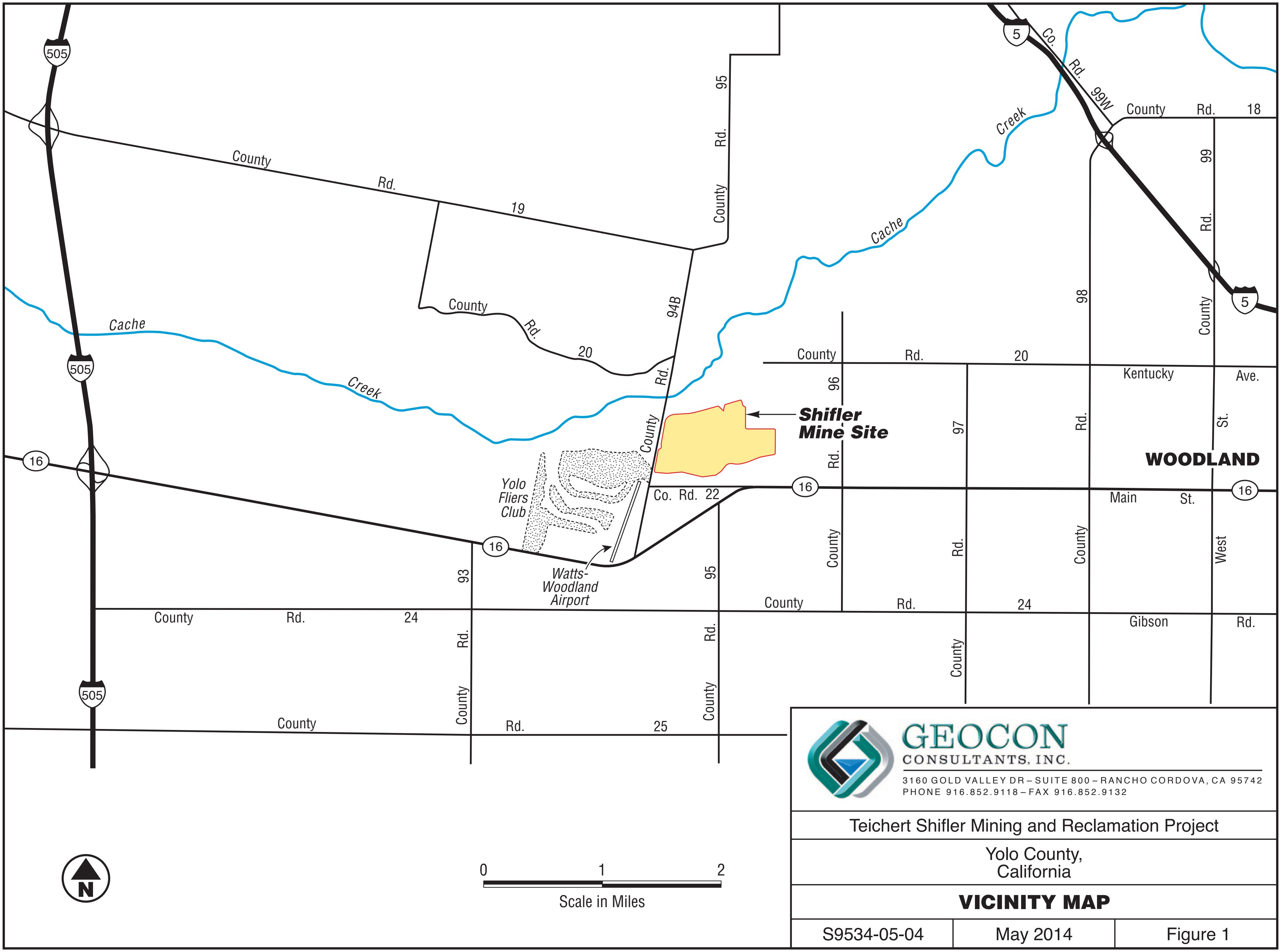

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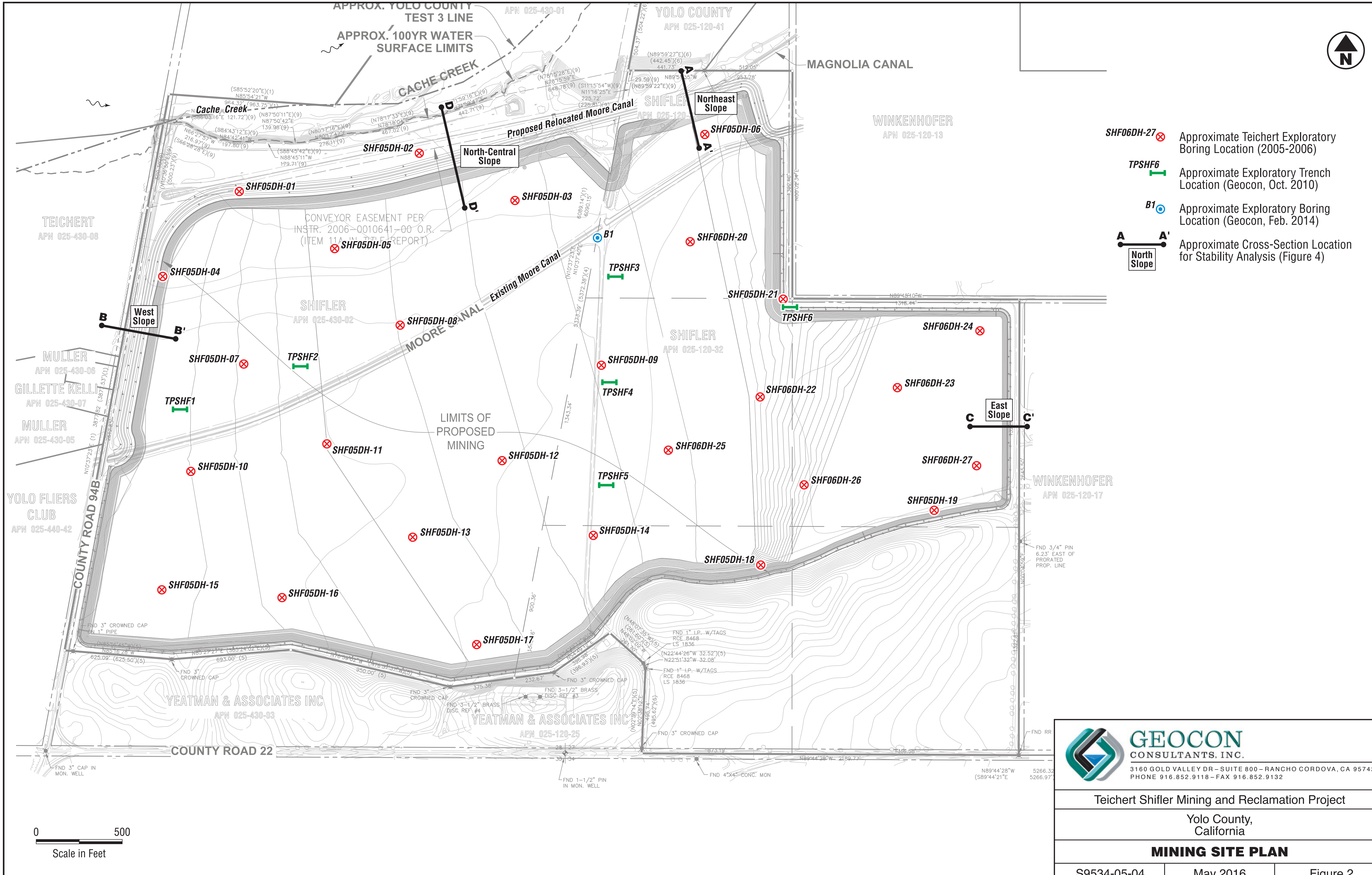
Teichert Shifler Mining and Reclamation Project

Yolo County, California

VICINITY MAP

S9534-05-04	May 2014	Figure 1



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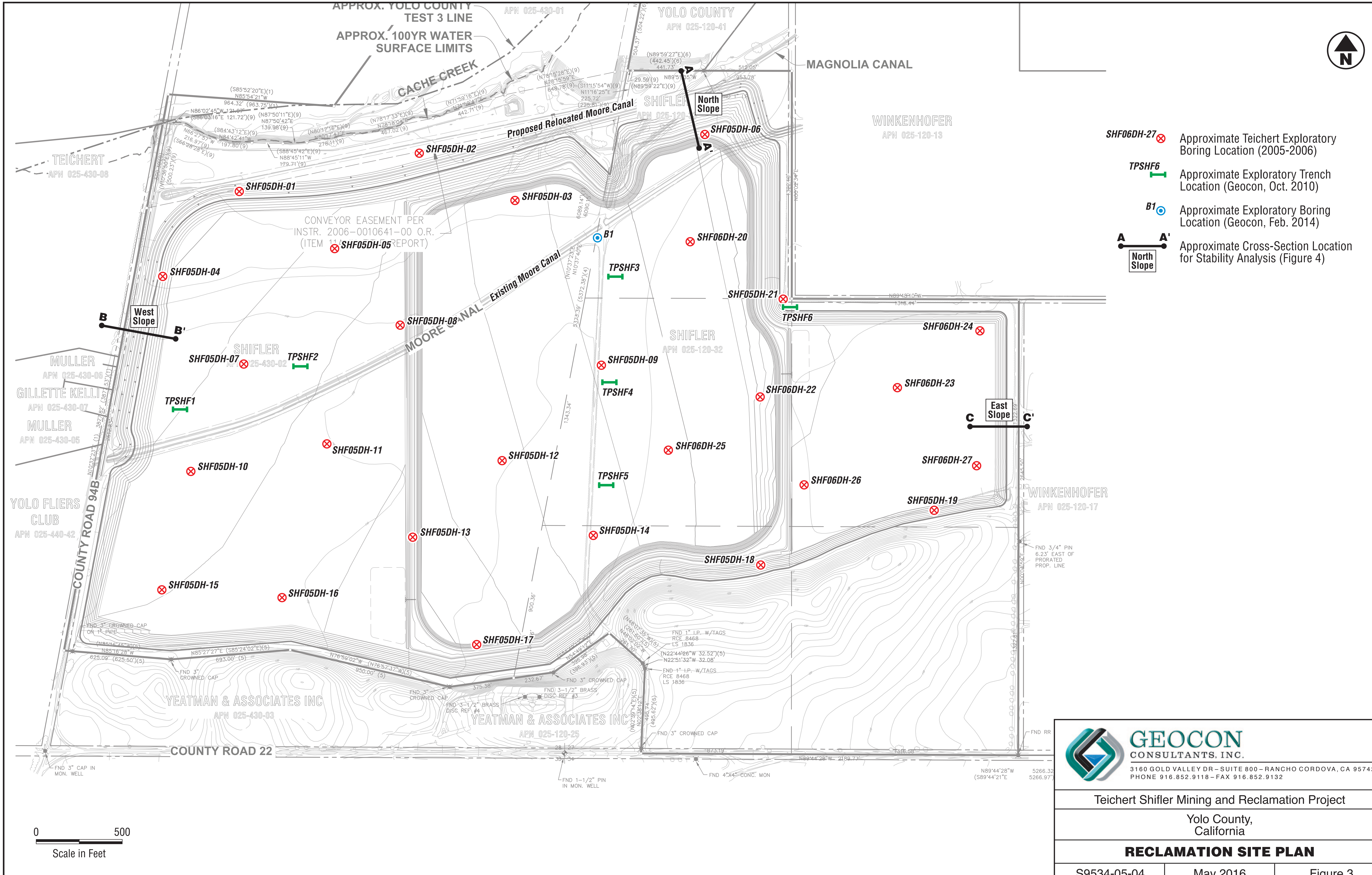
MINING SITE PLAN

S9534-05-04	May 2016	Figure 2



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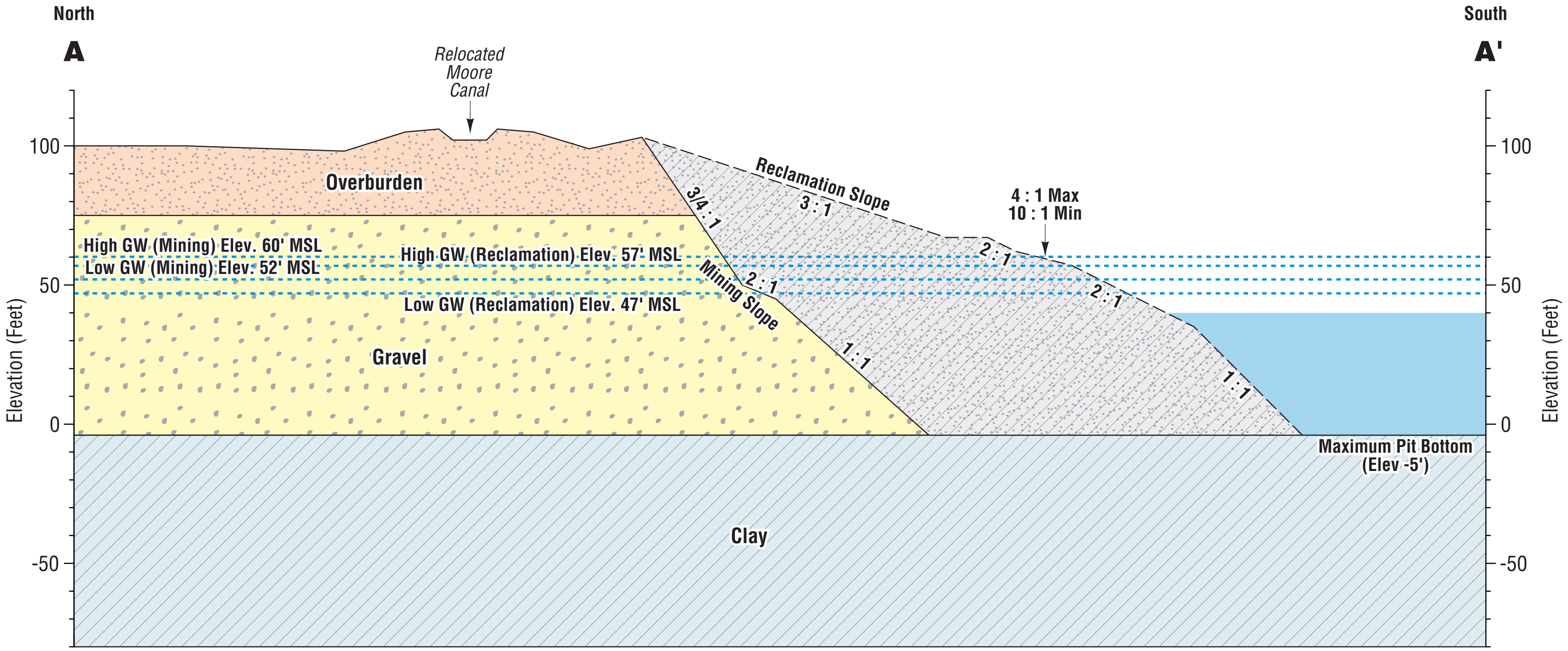
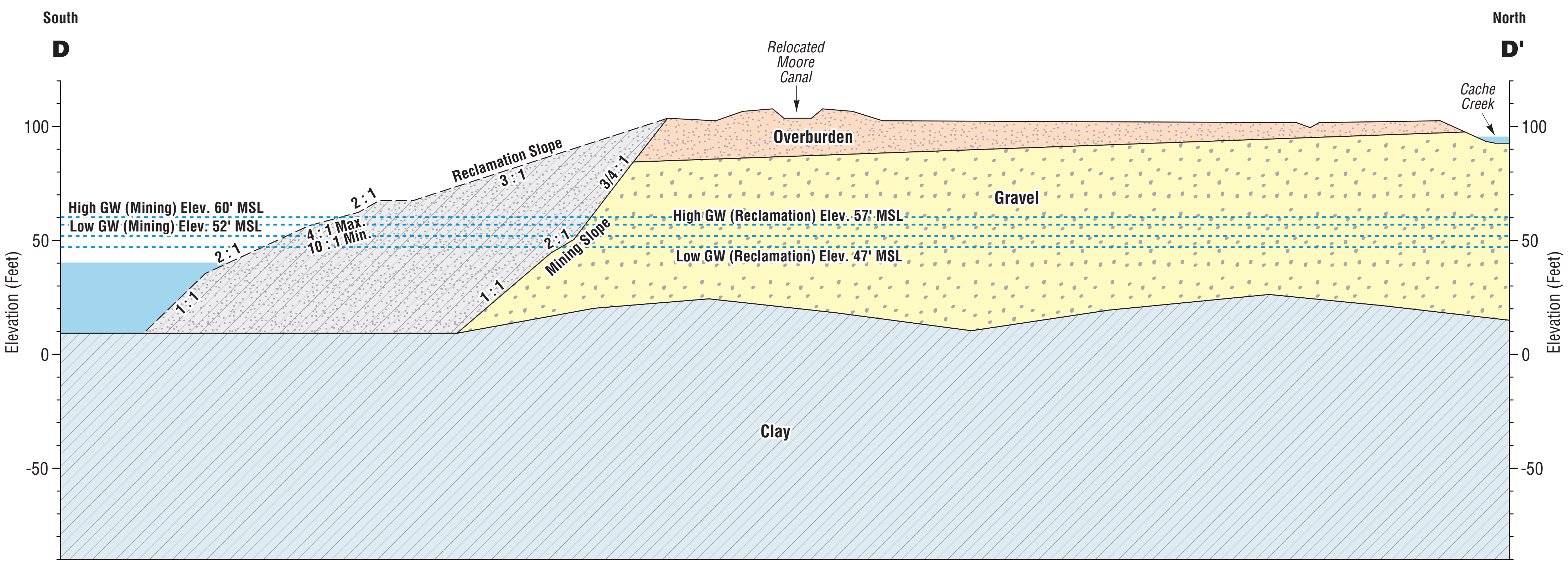
Yolo County, California

RECLAMATION SITE PLAN

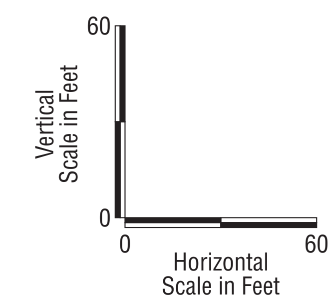
S9534-05-04	May 2016	Figure 3



NORTHEAST SLOPE
(100' Maximum Height)



NORTH-CENTRAL SLOPE
(100' Maximum Height)



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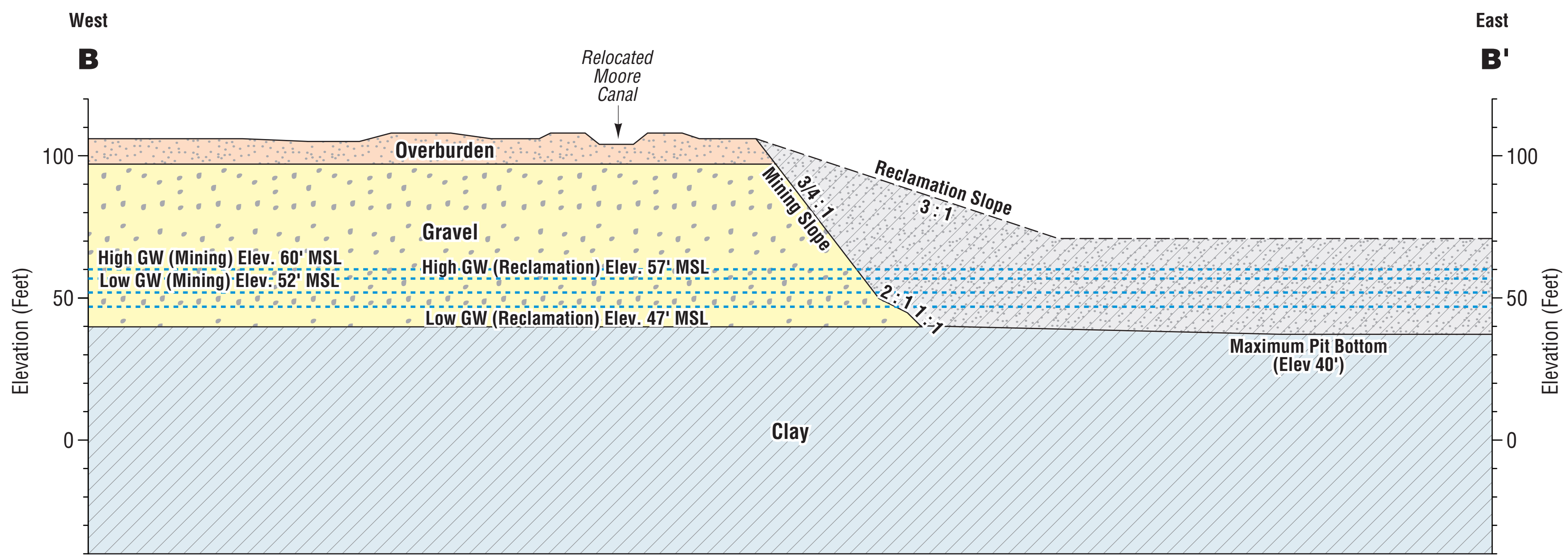
Teichert Shifler Mining and Reclamation Project

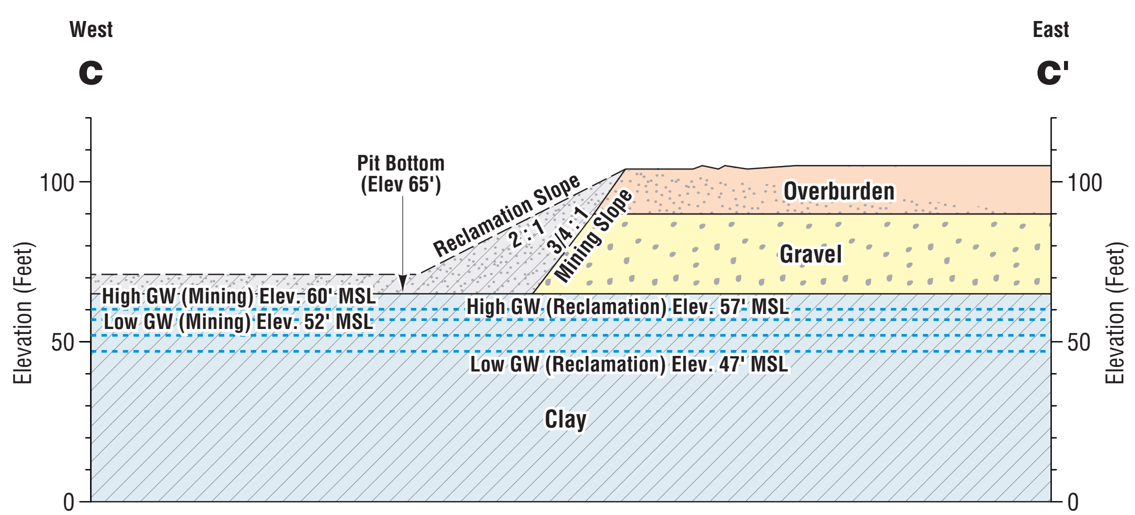
Yolo County, California

TYPICAL SLOPE SECTIONS

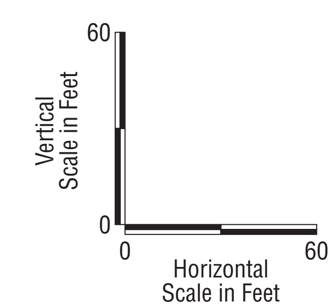
S9534-05-04	May 2016	Figure 4



WEST SLOPE
(65' Maximum Height)



EAST SLOPE
(40' Maximum Height)



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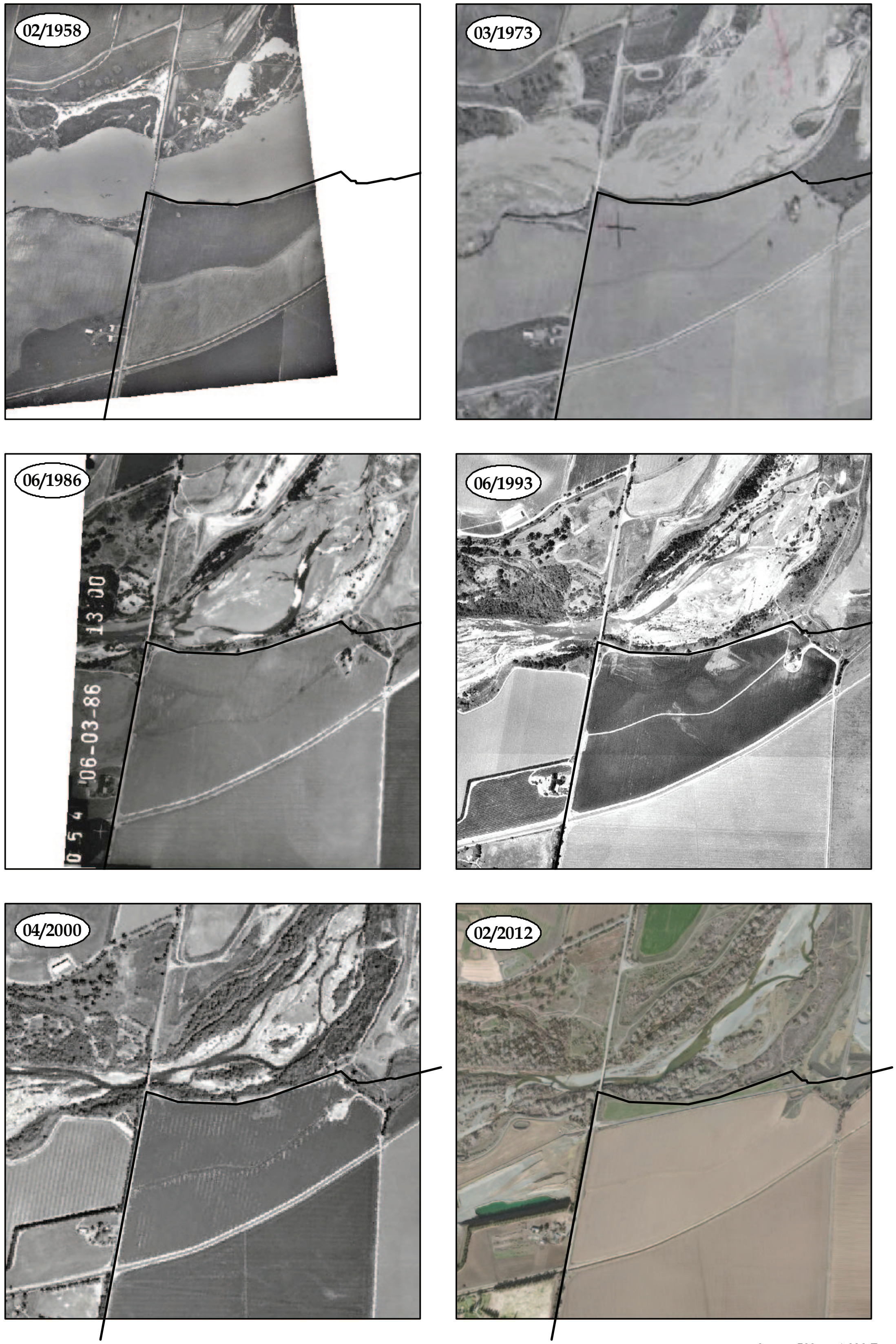
Teichert Shifler Mining and Reclamation Project

Yolo County,
California

TYPICAL SLOPE SECTIONS

S9534-05-04	May 2016	Figure 5



0 500 1,000 F

Ref: Teichert Aggregates, 4/23/14

HISTORIC AERIAL PHOTOGRAPHS

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Teichert Shifler Mining and Reclamation Project

Yolo County,
California

S9534-05-04	May 2014	Figure 6

APPENDIX A

APPENDIX A

FIELD EXPLORATION PROGRAM

Our field exploration program was performed on October 28, 2010, and February 20, 2014, and consisted of excavating six test pits (TPSHF1 through TPSHF6) and drilling one exploratory boring (B1) at the approximate locations shown on the Site Plan, Figure 2.

Test pits were performed using a Caterpillar 385 excavator equipped with a 24-inch-wide bucket. Bulk samples were obtained from the test pits. Upon completion, the test pits were backfilled with the excavated material.

Exploratory borings were performed using a truck-mounted, CME 75 drill rig equipped with 8-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-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 SYSTEM

MAJOR DIVISIONS			SYMBOL	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 GRAVELS, 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/TEST PIT LOG LEGEND

pp	—	Pocket Penetrometer (tsf)
tsf	—	Tons Per Square Foot
LL	—	Liquid Limit
PI	—	Plasticity Index
	—	Shelby Tube Sample
	—	Bulk Sample
	—	SPT Sample
	—	Modified California Sample
	—	Groundwater Level (At Completion)
	—	Groundwater Level (First Encountered)

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 - 7	VERY SOFT	0 - 2	0 - 2	0 - 0.25
LOOSE	4-10	7 - 17	SOFT	2 - 3	2 - 4	0.25 - 0.50
MEDIUM DENSE	10-30	17 - 48	MEDIUM STIFF	3 - 8	4 - 10	0.50 - 1.0
DENSE	30-50	48 - 85	STIFF	8 - 15	10 - 20	1.0 - 2.0
VERY DENSE	OVER 50	OVER 85	VERY STIFF	15 - 30	20 - 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

GEOCON LOG LEGEND S9534-06-02 TEICHERT WOODLAND LAB TESTING.GPJ 3/7/14

GEOCON
Geocon Consultants, Inc.
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Fax: 916-852-9132

Key to Logs

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: A1

PROJECT NO. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

TEST PIT TPSHF1

ELEV. (MSL.) **110** DATE COMPLETED **10/28/10**

ENG./GEO. **MARK REPKING** DRILLER **TEICHERT**

EQUIPMENT **CAT 385 Excavator** HAMMER TYPE **N/A**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2	TPSHF1-0-9			CL	**ALLUVIUM** Medium stiff, moist, dark brown, Sandy lean CLAY, slightly plastic, trace roots and straw			
2 – 9				SM	Medium dense, moist, dark yellowish brown, Silty SAND, non-plastic, poorly graded and fine grained sand -caving from 2 to 18 feet			
9 – 18	TPSHF1-9-18			SP	Loose, slightly moist, dark gray to gray, poorly graded sand, 5 to 10% gravel, gravel is subrounded up to 1 inch, sand is fine to coarse grained			

TRENCH TERMINATED AT 18 FEET DUE TO CAVING
NO GROUNDWATER ENCOUNTERED

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

IN PROGRESS S9534-06-02 TEICHERT WOODLAND LAB TESTING.GPJ 03/19/14

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. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

TEST PIT TPSHF2

ELEV. (MSL.) **108** DATE COMPLETED **10/28/10**

ENG./GEO. **MARK REPKING** DRILLER **TEICHERT**

EQUIPMENT **CAT 385 Excavator** HAMMER TYPE **N/A**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TPSHF2-0-14.5			CL	**ALLUVIUM** Medium stiff, moist, dark brown, lean CLAY, slightly plastic, roots -becomes dark brown and dark yellowish brown -caving from 2 to 21 feet			
6				CL	Medium stiff, moist, yellowish brown, Sandy lean CLAY, slightly plastic			
9				SM	Loose, moist, yellowish brown, Silty SAND, non-plastic, poorly graded and fine grained sand			
14.5	TPSHF2-14.5-21			SP	Loose, moist, gray, poorly graded SAND, non-plastic, fine grained			
19				SP	Loose, moist, gray, poorly graded SAND with gravel and cobble, non-plastic, fine grained sand, cobbles up to 4 inches			
21					TRENCH TERMINATED AT 21 FEET DUE TO CAVING NO GROUNDWATER ENCOUNTERED			

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

IN PROGRESS S9534-06-02 TEICHERT WOODLAND LAB TESTING.GPJ 03/19/14

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. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

TEST PIT TPSHF3

ELEV. (MSL.) **106** DATE COMPLETED **10/28/10**

ENG./GEO. **MARK REPKING** DRILLER **TEICHERT**

EQUIPMENT **CAT 385 Excavator** HAMMER TYPE **N/A**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TPSHF3-0-11			CL	**ALLUVIUM** Medium stiff to stiff, moist, dark brown, lean CLAY, slightly plastic, roots and straw			
2					-becomes stiff, dark yellowish brown			
11	TPSHF3-11-20			SP	Loose, moist, dark gray, poorly graded SAND with gravel, non-plastic, fine to coarse sand, gravel to 1 inch, caving from 11 to 20 feet			
13				SP	Loose, moist, dark gray, poorly graded SAND, non-plastic, fine grained, trace gravel to 1 inch			
20					TRENCH TERMINATED AT 20 FEET DUE TO CAVING NO GROUNDWATER ENCOUNTERED			

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

IN PROGRESS S9534-06-02 TEICHERT WOODLAND LAB TESTING.GPJ 03/19/14

GEOCON

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

PROJECT NO. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

TEST PIT TPSHF4

ELEV. (MSL.) **106** DATE COMPLETED **10/28/10**

ENG./GEO. **MARK REPKING** DRILLER **TEICHERT**

EQUIPMENT **CAT 385 Excavator** HAMMER TYPE **N/A**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TPSHF4-0-16			CL	**ALLUVIUM** Medium stiff, moist, dark brown, lean CLAY, slightly plastic, roots and straw			
2					-becomes medium stiff to stiff, dark yellowish brown,			
4					-some interbedded seams of clayey SAND			
9				SC	Medium dense, moist, gray and dark yellowish brown, clayey SAND with gravel (interbedded lean clay and poorly graded sand with gravel), gravel to 1 inch, poorly graded sand seams are approximately 6 inches thick			
14					-caving from 13.5 to 18 feet			
16	TPSHF4-16-18			SP	Loose, moist, dark gray, poorly graded SAND with gravel, non-plastic, fine to coarse grained, gravel up to 3 inches			
18					TRENCH TERMINATED AT 18 FEET DUE TO CAVING NO GROUNDWATER ENCOUNTERED			

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

IN PROGRESS S9534-06-02 TEICHERT WOODLAND LAB TESTING.GPJ 03/19/14

GEOCON

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

PROJECT NO. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

TEST PIT TPSHF5

ELEV. (MSL.) 106 DATE COMPLETED 10/28/10

ENG./GEO. MARK REPKING DRILLER TEICHERT

EQUIPMENT CAT 385 Excavator HAMMER TYPE N/A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TPSHF5-0-14			CL-ML	**ALLUVIUM** Stiff, moist, very dark brown, Silty CLAY, slightly plastic, roots and straw			
1								
2								
3				CL	Medium stiff, moist, dark yellowish brown, Sandy lean CLAY, slightly plastic, caving from 3 to 18 feet			
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14	TPSHF14-18			GP	Loose, moist, dark gray, poorly graded GRAVEL with sand, non-plastic, sand is fine to coarse grained, gravel up to 1 inch but is mostly 3/8 inch			
15								
16								
17								
18					TRENCH TERMINATED AT 18 FEET DUE TO CAVING NO GROUNDWATER ENCOUNTERED			

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

IN PROGRESS S9534-06-02 TEICHERT WOODLAND LAB TESTING.GPJ 03/19/14

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. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

TEST PIT TPSHF6

ELEV. (MSL.) **106** DATE COMPLETED **10/28/10**

ENG./GEO. **MARK REPKING** DRILLER **TEICHERT**

EQUIPMENT **CAT 385 Excavator** HAMMER TYPE **N/A**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TPSHF6-0-18			CL	**ALLUVIUM** Soft, very moist, very dark brown to black, lean CLAY, slightly plastic, roots and straw			
1								
2					-becomes very dark brown and dark yellowish brown, plastic			
3								
4					-becomes dark yellowish brown			
5–11								
12				SC	Medium dense, very moist, dark yellowish brown, Clayey SAND, slightly plastic, fine grained and poorly graded sand			
13–17								
18	TPSHF6-18-21			GP	Medium dense, very moist, dark gray, poorly graded GRAVEL with sand, gravel to 2 inches			
19–20								
21					TRENCH TERMINATED AT 21 FEET NO GROUNDWATER ENCOUNTERED			

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

IN PROGRESS S9534-06-02 TEICHERT WOODLAND LAB TESTING.GPJ 03/19/14

GEOCON

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

PROJECT NO. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

BORING B1

ELEV. (MSL.) **109** DATE COMPLETED **2/20/14**

ENG./GEO. **Sean Dixon** DRILLER **PC EXPLORATION**

EQUIPMENT **CME 75 w/ HSA** HAMMER TYPE **Automatic**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**ALLUVIUM** Medium stiff, moist, brown, SILT			
1								
2								
3								
4								
5								
6	B1-6 B1-5-10					9		
7								
8								
9								
10								
11	B1-10.5 B1-11					26		
				GP	Medium dense, moist, gray, poorly graded GRAVEL with sand, gravel is rounded			
12								
13								
14								
15								
16	B1-15.5 B1-16 B1-15-20					29		
17								
				SP	Medium dense, moist, gray, poorly graded SAND with gravel			
18								
19								
20	B1-20					26		
21								
22								
23								
				GP	Dense, damp, gray, poorly graded GRAVEL with sand			
24								
25	B1-25					30		
26								
27								
28								
29								

Figure A8, Log of Boring, page 1 of 4

IN PROGRESS TEICHERT SHIFLER.GPJ 03/19/14

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.) **109** DATE COMPLETED **2/20/14**

ENG./GEO. **Sean Dixon** DRILLER **PC EXPLORATION**

EQUIPMENT **CME 75 w/ HSA** HAMMER TYPE **Automatic**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1-30					36		
31	B1-30-40							
32								
33								
34				GM	Dense, wet, gray, Silty GRAVEL with sand			
35	B1-35					60		
36								
37								
38								
39								
40	B1-40					17		
41				CL	Medium stiff, wet, brown, lean CLAY			
42								
43								
44								
45	B1-45.5			SP-SM	Medium dense, wet, brown, poorly graded SAND with silt, sand is fine grained			
46	B1-46			GP	Dense, damp, gray, poorly graded GRAVEL with sand, trace silt	64/11"		
47								
48								
49								
50	B1-50					90/10"		
51								
52								
53								
54								
55	B1-55					50/5"		
56	B1-55-65							
57								
58								
59								

Figure A9, 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

PROJECT NO. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

BORING B1

ELEV. (MSL.) 109 | DATE COMPLETED 2/20/14
ENG./GEO. Sean Dixon | DRILLER PC EXPLORATION
EQUIPMENT CME 75 w/ HSA | HAMMER TYPE Automatic

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60						
65	B1-65			58		
70			-becomes wet			
77		CL	Hard, wet, gray, lean CLAY			
85	B1-85-86					
86	B1-86			81		
89						

Figure A10, Log of Boring, page 3 of 4

IN PROGRESS TEICHERT SHIFLER.GPJ 03/19/14

GEOCON

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

PROJECT NO. **S9534-05-04** PROJECT NAME **Teichert Shifler Mining and Reclamation**

BORING B1

ELEV. (MSL.) **109** DATE COMPLETED **2/20/14**

ENG./GEO. **Sean Dixon** DRILLER **PC EXPLORATION**

EQUIPMENT **CME 75 w/ HSA** HAMMER TYPE **Automatic**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90								
91	B1-90.5 B1-91					43		
92								
93								
94								
95								
96	B1-95.5 B1-96					100		
97								
98								
99								
100								
101	B1-100.5 B1-101					100		

BORING TERMINATED AT 101.5 FEET
GROUNDWATER AT 70 FEET

Figure A11, Log of Boring, page 4 of 4

IN PROGRESS TEICHERT SHIFLER.GPJ 03/19/14

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.

TEST HOLE LOG

OWNER: SHIFLER
HOLE # SHF05DH-1 SHEET 1 OF 2

LOCATION: NW end near CRK
DATE STARTED: 10/26/05

DRILLING CO.: Layne Christensen
EL. TOP OF HOLE: 101 +/-

REMARKS: AP1000 HAMMER. Foremost Drill
INSPECTOR: ZAFFRAN

8:47

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS: Cloudy, Drizzly Till 10am
0			OVB
5'		5'	Clean (Gray) F. Gravel & CSE SAND.
10	#1 5-19 (2)	Clean Agg	great looking Agg, Typical of CACHE CRK less 2" Rounded Rock in clean
20	#2 19-29		CSE SAND.
26		26	
30 MOIST & STICKY	#3 29-39 (2)	CLAYEY SAND - GRAVEL	MOIST & STICKY & color changes to (pale yellow) ~~brown~~ Agg Holds Together in Clayey Matrix est. 5%/10% w/ clay seams CLAY MAX 2"
40	#4 39-49		As Above Maybe less clayey than prior run, Hi Moisture & CSE ang. QTZ SAND #4 size
49' SURGE OF H_2O			
50	(bag)		
51'	#5 51-55	51'	initially putty color & wet
Plugged @ Head/Hose	#6 55-58	CLAY	55' blue mottled, lam w/ FeOx
H_2O inj → 60			58' pale gray mottled, few organics Hi PLAST. CLAY - FAT Hard, dense
	#7 58-69 (6" diam cores)		As Above, Slow driving v. dense Hi PI CLAY
70	#8 69-78.5		
78.5		78.5	orange-red MUD
80 Hi FLOWS Tehema Fm?	#9 80-89 (BKT)	Clean Volc. Rich sand	SAND w/ tr. Pebbles & (CSE) well rounded sand. Red-orange WATER; yielding WATER, loose 5 blows/FT, clean
90			

HOLE #: 1 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: SHF05DH-1 SHEET 2 OF 2

DATE STARTED: 10/26/05

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90 Ø water	N/S		Clay, hard as above mottled gray - putty color Hi P.I. - FAT, v. dry
99 (TD) 11:45 am			
			backfill to 20' w/cuttings Grout 3 batches 11 bags total 1:50 done

HOLE #: 1 SHEET 2 OF 2

TEST HOLE LOG

OWNER: SHIFLER | HOLE # SHF05DH-2 SHEET 1 OF 1

LOCATION: Near Creek, NE Corner | DATE STARTED: 10/26/05

DRILLING CO.: Layne Christensen | EL. TOP OF HOLE: 99 +/-

REMARKS: Cloudy, breezy (SOUTH) Ø SUN TODAY | INSPECTOR: ZAFFRAN

2:35 PM

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0			OVB - TOP SOIL, CLAY
		4'	F. gravel in Cse Clean Gray Sand, MUCH #4
	#1 4-9	F. GRVL & SAND	
10 — Moist ↓	#2 9-19		AS ABOVE, ROUND Gravel <1.5" MOIST - F. SAND STICKS TO GRVL. Slight Fines Coating ~5% <
20	#3 19-26		
26'	#4 26-29	26'	1' STICKY SILT-CLAY Followed by clayey Agg - yellow-brown color
30	#5 29-39	CLAYEY GRVL SAND	F. gravel & MOSTLY SAND IN STICKY Clay MATRIX ESTM 10% CLAY - HOLDS TOGETHER In Hand MADE BALL.
40	#6 39-49		AS ABOVE <2" SIZE MOIST, CLAY COATING & AS MATRIX
50	#7 49-59	inc CLAY ↓	57 - SOFT, 1 blow/FT CLAYEY SAND 20% CL
60			
62' Moist ↓ dry	#8 bag 62-69	62 CLAY	Pale yellow color Hi Moisture SILT W/ Gravels From 61-62 Pale yellow - gray W/ FeOx laus, Tr. organics
3:45 70 — Hard, slow @76 start inj. H_{20}; ream ↓	#9 69-79	V. Hard pale gray	Hi Plasticity - white gypsum or Caliche Coating on Flat pancake pieces
80 — V. Hard Slow driving	#10 79-89		dark gray blue; putty color

(90) TD 5:30pm | Thurs, 10/27 am, back fill to 20' 10 bags | HOLE #: 2 SHEET 1 OF 1

TEST HOLE LOG

Photos of Material Taken

OWNER: SHIFLER

HOLE #: SHF05DH-3 SHEET 1 OF 2

LOCATION: N. CANAL IN CORNER S. OF TURNAROUND

DATE STARTED: 10.28.05

DRILLING CO.: LAYNE Christensen

EL. TOP OF HOLE:

REMARKS: CLOUDY, O'CAST, SPRINKLES

INSPECTOR: ZAFFRAN

2pm

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0 – 17'	N/S	OVB	CLAY, SOIL, CLOTS OF DIRT. SILTY JUST before SANDY
17'		17'	GRAY GRAVEL
20	#1 19–29 ②	Clean SANDY GRAVEL	80% Clean Sand w/ F. Gravel, Few cobbles
30	#2 29–38 ②	Special sample 38.5	Much #50 size Sand. GOLDEN brown color @ 37'
40	#3 39–44 bag		CLAY, MOIST, Like PUTTY, orange brown color
44'		44'	
50, Moist	#4 ① 44–49; #5 49–59 ②	CLAYEY SAND & GRAVEL	pale yellow CLAYEY SAND & Gravel. CSer THAN above Clean AGG. Much 3/8–1" size in CLAYEY SAND MATRIX. ESTM 5%–10% CL. – NOT WET YET –
60, getting wet ϕ Flow	#6 59–69 ②		MAX 3"
H2O			
69' / 70	#7 69–77 ②	Clean agg	Gray Clean washed agg. CSE [1" size common]. FINES WASH OUT in Groundwater
77.0		77	
80	#8 bag 77–79	CLAY	pale olive-gray color 77–81. V. Hard, w/ hi P.I. (PHOTOS Here of blue-gray color Clay) 81–87
	#9 79–89		pale gray 87–89
90			

HOLE #: 3 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: 3 SHEET 2 OF 2

DATE STARTED:

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90			90' same properties Now yellow-brown or putty color.
TD -100' 3:30 PM			
10/29/05 7:35 Am	Finish tripping out and begin abandon hole procedures.		

TEST HOLE LOG

OWNER: SHIFLER HOLE #: SHF05DH-4 SHEET 1 OF 2

LOCATION: NEXT TO ROAD 24B ACROSS FROM STORZ DATE STARTED: 10/25/05

DRILLING CO.: Layne Christensen EL. TOP OF HOLE: 103'

REMARKS: Breeze w/ Good Gusts From S, INSPECTOR: ZAFFRAN

2:05 PM

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0 – 11'	N/S	OVB	Soil, Roots, Clay. Little Return – Quick Drive
11'	#1 9-19'	11' Clean Sandy GRVL	Gray f. graded gravel in cse to f. sand. Clean, loose, sand lense from 18'–20'
20	#2 19-26		↓ csens quickly
29' Moist	#3 26-29	26' Clayey Agg	Soft, moist pale yellow brwn, clay holding Agg. together in moist clumps
30 (close to H2O!) lunch brk	#4 29-39	31' Well graded sand w/ F. GRVL & Clay	Estm. 10% clayey moist fines in well graded sand – f. GRVL. Max = 2" size (would need good washing)
40	#5 39-49		↓ Continues w/ 5-10% clay
H2O – 49' ↑ WET FLOWING ↓	#6 ② 49-59	"	Wet, sloppy Agg. w/ cobbles 3" size, 5% pale yellow clayey sand matrix supporting well graded rock.
60, 62' Ø WATER	#7 bag 59-69	62' Clay	Pale gray, dry & crumbly Med. P.I. 66' color now pale yellow brown
70	#8 72-77	72'	Gray, well cem. sandstone Hard.
80	#9 80-88	77	Clay, yellow brown color, wet ↓ dries quickly, v. hard, dense clay – mottled coloring
88 – 90		88 Moist, Sticky	Gray color

HOLE #: SHEET OF

TEST HOLE LOG

OWNER:	HOLE #: SHF05DH-4 SHEET 2 OF 2
LOCATION:	DATE STARTED:
DRILLING CO.:	EL. TOP OF HOLE:
REMARKS:	INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90	N/S		Crumbly, Soft, dark gray Color ~~silty~~ clay w/ low PI.
100 TD. 4:40pm			backfill to 18' Grout on Wed A.M. 2 batches

HOLE #: SHEET OF

TEST HOLE LOG

OWNER: SHIFLER — HOLE #: SHF05DH-5 SHEET 1 OF 2

LOCATION: N. CANAL, N. Field MID. — DATE STARTED: 10/27/05

DRILLING CO.: Layne Christensen — EL. TOP OF HOLE: +/- 101.00

REMARKS: P. CLOUDY, COOL A.M. Fog in @ 8:30am — INSPECTOR: ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
9:30 am 0	N/S	OVB	CLAY, ROOTS
9' (10)		9'	
10 – 20	#1 9-19	Clean SAND & GRAVEL	Clean gray CSE SAND & F. Gravel, MUCH #4 Size ↓ SLIGHT CSEN W/ DEPTH
20 – 30 easy fast driving	#2 19-29	26	MAX 1.5" size — SLIGHT MOIST
		26–28	SAND lense — Real clean well graded
30 – 35'		28	↓ inc MOISTURE, MUCH pea gravel
35'	#3 35-39	35'	inc. Clay & now pale yellow color ESTM 5% Fines
10:00 am 40		Clayey CSE gravel & SAND	CSE Rounded gravels to 2" size in SANDY CLAY MATRIX
GHOST WATER?	#4 39-49 ②		WET but NO FLOWING WATER YET
50			↓ inc. wet
54' WET	#5 49-59 ②	57'	Flowing sands @ 57'
60	#6 59-65		WET Clean CSE agg & SAND FINES WASH OUT
65' ∅ H_2O ↓ bag		65'	CLAY, V. Hard, Hi Plasticity
10:40 70 → inj. H_2O	#7 65-69		yellow-orange brown color
	#8 69-79		W/ FeO_x lams
80 Slow drilling ↓	#9 79-89		pale gray color @ 82' STILL V. Hard, Hi PI - FAT CLAY, STIFF
90			

HOLE #: SHEET OF

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: SHF05DH. 5 SHEET 2 OF 2

DATE STARTED:

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90			AS ABOVE
(100) TD 12:00pm			
	Monshuan here for @ 1:30pm	inspect. ✓	13 bags — 4 batches

HOLE #: SHEET OF

TEST HOLE LOG

OWNER: Shifler

LOCATION: N of canal E side

DRILLING CO.: Layne

REMARKS: small section between canal/ditch

HOLE #: SHF05DH6 SHEET 1 OF 2

DATE STARTED: 10/29/05

EL. TOP OF HOLE: 102

INSPECTOR: Chuck

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
8:58 Am 0	N/S	OB	brown sandy silt with clay (soil) poor return
10	N/S	OB	brown sandy silt with clay comes out in balls can roll (cohesive/plastic)
		SAND	SAND v. minor grl and clean sand ~19'
20	1 20-30	(not clean) SAND	brown silty SAND with minor gravel which incr. to bottom with 1.5" clasts max. minor clay
30	2 30-40	SAND + GRAVEL with Clay	Hgray to brown Sandy Gravel with Clay - moist - sand & clay stick to gravel (lenses/beds coarse/fine grl) - more moist above clay -
40	bag o clay 40-46	CLAY	brown sandy CLAY - high plastic roll >1" drills slow
		SAND	SAND - brown silty SAND ~49
50		Clay Sand	Clayey Sand
	3 50-60	Sandy Gravel	53 grl Brown sandy GRAVEL with minor clay clast to 2" (interbedded coarse & fine grls)
60	4 60-70	Sandy Gravel	Interbedded Gravels and Sands fine gravels ½" max coarser 2" max (minor clay) (damp)
70 ↓ Water	5 70-80	Clean GRAVEL	gray sandy GRAVEL - wet coarser to 2" [illegible] (in water sample washed)
80	6 80-86	GRAVEL	Clean gravel & H_2O to 86
		CLAY + GVL	Fine gravel w/ clay
90			

HOLE #: 6 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: 6 SHEET 2 OF 2

DATE STARTED:

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90	7 90-100	Clay w/ Gravel	Clay with minor gravel Cleaner gravel with water at 97-98 and again bottom of interval
100	8 100-104	GVL	Gravel with minor clay to 104'
	bag-o-clay 104-108	Clay	Clay - gray green with minor FeOx patches (ash?)
110			~114?
	9 115-120	SS	Cemented SAND (sandstone) (yellow brown silty SAND w/ clay. Starting to get much H_2O
120 TD 11:15am			

HOLE #: 6 SHEET 2 OF 2

13-38' Clean SANDY GVL
38-61' CLAYEY GRVL-SAND

BIT = 10"
ID = 6"
OD = 9¼"

TEST HOLE LOG

OWNER: SHIFLER
HOLE #: SHF05DH-7 SHEET 1 OF 2

LOCATION: W. side N. of CANAL
DATE STARTED: 10/25/05

DRILLING CO.: Layne Christensen AP1000 Hammer Rig
EL. TOP OF HOLE: +/- 108.0

REMARKS: Fracisco, Salvador, Jaime
INSPECTOR: L. ZAFFRAN

9:00 am

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0–13'	N/S	OVB	Dry Dusty Silt/Clay. Little Return – Mostly ~~ds~~ dust blowing away. – Few clay pieces
13'	#1 13-19		Clean sand grades v. quickly to wellgraded f. gravel & sand; Subround gray gravels in cse sand (loose, clean)
29' Moist	#2 19-29 ②	F. GRVL IN Clean SAND	– Slight change in Moisture & slightly cser at 29' – ~~Seems~~ causes fines to stick to grvels.
inc moist ↓	#3 29-35		– Max 2"
38'	#4 35-~~39~~	38'	– Cobbly w/ 5% clay. Real cse, much 2-4" size pale yellow color – Fines ~~stick~~
40	#5 39-49	GRVL & SAND W/CLAY	Material now comes out & forms stiff pile w/ Little slump; estm 15% Clayey Fines
50 Moist ↓	#6 49-59		Clean sandy p. gravel lense in otherwise cse wellgraded grvl w/ 15% clay (sticky)
61' H_2O	#7 59-67	61' CLEAN F. GVL	– Wet, clean f. gravels, much cse sand & p. grvl. (Flowing)
67'	(bag) #8 67-70	67'	Pale yellow clay
70 Slow ↓	#9 bag 70-77	CLAY	– cores large pieces cabbage size
77'		77'	w/ f. sand, (smaller clay cores) crumbly texture
80	#10 80-85	CLAY (SILTY)	Clay w/ low plasticity & on silty side
85'		85'	Mottled coloring w/ few organics,
Dark Gray 88'	#11 85-89	CLAY	pale gray color @ 85'

HOLE #: SHEET OF

WATER TRK DRVR - LOREN

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE # SHF050H-7 SHEET 2 OF 2

DATE STARTED: 10/25/05

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
11:00 am 90 ↓ slow	#12 bag 90-99	CLAY	Pale GRAY – dk blue gray slow drilling MED – Hi P.I. dense – ROLLS O.K., SMEARS – 99' color changes to buff – pale yellow.
100	N/S		
(110) TD 11:40			
12:15 start grout 1:40 clean up			16 bags grout/bent, pwd, 14+2
Moushumi here for inspect. 12:15 - 1:30			
			CRAZY, ANTIQUE looking GROUT PLANT.

HOLE #: SHEET OF

5 bags
Photos Taken

TEST HOLE LOG

OWNER: SHIFLER
HOLE #: SHF05DH-8 SHEET 1 OF 1

LOCATION: 100' N CANAL, E. corner
DATE STARTED: 10/27/05

DRILLING CO.: LAYNE ChristENSEN
EL. TOP OF HOLE: +/- 107

REMARKS: Good S. breeze (WIND) THIS @ NOON
INSPECTOR: L. ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
2:50 PM 0	N/S	OVB	Dry, Dusty Clay / Silt
10	N/S		10' SILT, dry FLOURY TAN COLOR V. SOFT
20	#1 19-29 ②	17 CLEAN SANDY GRAVEL	Gray SANDY GRAVEL well graded sand w/ F. gravel – cse lenses w/ well rounded 1-2" size Rock
30 Moist ↓	#2 29-39 ②	29 Clayey Gravel & SAND	Slight inc. in MOIST. @ 29' ESTM 5-10% MOIST CLAY ROCK TO 4" size but MOSTLY < 3/4" Clay as integrated matrix NOT lenses.
40	#3 39-49 ②		Seems COARSER Here MUCH 3/4-1" size – yellow brown color
50	#4 49-59 ②	CLAY F. GRAVEL w/ SAND	STILL QUITE MOIST but ∅ FLOWING H_2O – CLAYEY SAND lense @ 55' (can make Rock ball in Hands w/ enough MOIST / CLAY)
H_2O 60 WET ↓	#5 59-69 ②		Flowing cse Rock in well graded Sand, STILL 5% CLAY – MUDDY H_2O.
3:50 70	#6 69-72	69' CLAY	Yellow-brown color from 69-72 dark Gray V. Hard, dry, laminated
4:15 broken cable 80 Resume 11:40 am 10/28	#7 72-79		Hi Plast. Clay
TD 12:10 (90)	#8 79-89		yellow-brown color

Lunch backfill TO 18'
HOLE #: 8 SHEET 1 OF 1

12:45 Grout 1:20 Grout TO Aquif. – Called Monshum OK TO grout on own

TEST HOLE LOG

OWNER: Shifler
HOLE #: SHF05 DH-9 SHEET 1 OF 2

LOCATION: S of canal center road
DATE STARTED: 10/29/05

DRILLING CO.: Layne
EL. TOP OF HOLE: ~106

REMARKS: East side AB road between fields
INSPECTOR: Chuck

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0	N/S	OB	Soil for row crops (beans?) poor return; some sand and gvl?
10 (2:25)	1 (2 buckets) 10-20	Gravely SAND	brown gravely SAND 60 sand/40 gvl most gvl less than 1" (1/2" minus) GVl inc ↓
20	2 20-30	Sandy Gvl	brown sandgravel - clasts to 2" inc silt/clay ↓
30	3 30-40 38	Sandy Gravel w/ clay	thin clay ~32 - moist; brown sandy gravel minor clay (size to clast 5) inc to bottom ↓ → 38' ← yellow sand brown 39-40
40 Yellow SAND	4 40-50 49	SAND with clay minor gvl	yellow brown SAND with clay (layers?) fine gvl at 45'; ← incr in gravel + size of gravel (to 1")
50	5 50-60 55	Clayey Gravel; Sandy Gravel	gvl w/clay brown clayey GRAVEL w/SAND moist ← clumps; Gray SANDY GRAVEL damp
60	6 60-70	Sandy Gravel	intbdd csand 2 to 3" fine gravels (yellow) with Sand - moist (trace clay only?)
70 Water	↑ bag sample	Sandy Clay; Clayey Sand	H2O at top of clay; (55'); brown sandy clay grading to cemented clayey sand with water at end of interval
80	bag 1 blue clay balls	Clay	light gray clay (sticky); big blue clay balls
90			

HOLE #: 9 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.: Layne

REMARKS:

HOLE #: SHF05DH9 SHEET 2 OF 2

DATE STARTED: 10/29/05

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:		REMARKS:
90	N/S	CLAY		Blue gray (anoxic?) CLAY slow drilling High Plastic rolls to 1/8" easily dia.
100 TD			TD	At site to grout hole at 6:30 (forgot about daylight savings) 10/30/05 Grouted at 7:30

HOLE #: 9 SHEET 2 OF 2

TEST HOLE LOG

OWNER: Shifler | HOLE #: SHFOSDH-10 SHEET 1 OF 2

LOCATION: South of Canal W end | DATE STARTED: 10/30/05

DRILLING CO.: Layne | EL. TOP OF HOLE: 109

REMARKS: | INSPECTOR: Chuck

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
12:05 0 – 10	N/S	OB	Tilled soil and overburden No Recovery
10 – 20	(1) 10-20	SAND with Gravel	Brown SAND with gravel (little silt) Clean sand ... to 1.5"
20 – 30	(2) 20-30	Sandy Gravel	Brown (slightly silty) sandy GRAVEL to 2"
30 – 40	(3) 30-40	Sandy Gravel ↑ Clean 40' Dirty ↓	Brown (slightly silty) sandy GRAVEL tr clay moist ... gravel size minor 2"+
40 – 50	(4) 40-50	Sandy Gravel	Brown (silty) sandy GRAVEL with clay moist – SAND at end of interval silty SAND
50 – 60	(5) 50-60	Sandy Gravel	... up to 4" ... Brown (silty) Sandy GRAVEL Tr Clay Damp
60 – 70 61' H_2O	(6) 60-70	61' (Sandy) Gravel 69'	– Water – Coarse and fine GRAVEL to 4" in water with SAND (prob. silty w/some clay) ... Clay at end
70 – 80	N/S a wet mess	Clay	Y. Brown sandy (fine) CLAY "sticky" rolls easily to 1/8" Setup for wet drilling (add H_2O) more sandy at 75' Grades to clayey SAND at end? ← SAND (clayey)?
80 – 90	(7) 80-90 V. wet	Clayey SAND w/GVL	Clayey SAND with gravel V. wet Sample fines (silt/clay may be washed out)

HOLE #: 10 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: 10 SHEET 2 OF 2

DATE STARTED: 10/30/05

EL. TOP OF HOLE:

INSPECTOR:

	DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
	90			clay balls
		bag-o-clay	CLAY	Brown "highly plastic" CLAY stiff moist roll 1/8" dia to 2"
1:45	100 — TP			TP — ended hole in clay and poor sampling conditions due to weather

TEST HOLE LOG

OWNER: SHIFLER | HOLE #: SHF05DH-11 SHEET 1 OF 2

LOCATION: | DATE STARTED: 10/31/05

DRILLING CO.: LAYNE CHRISTENSEN | EL. TOP OF HOLE:

REMARKS: | INSPECTOR: RIVAS

START 8:44

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0 – 13' (9)	N/S	OB	TOPSOIL, SILTY CLAY
13' – 18	SHF05DH-11 #1 ①	SAND	VERY FINE, SLIGHTLY SILTY SAND
18 – 30	SHF05DH-11 #2 ①	GRAVEL	GRAVEL TO 3" IN CLEAN MEDIUM GRAINED SAND. SOME MOISTURE
30 – 40 (35')	#3 ①	GRAVEL 35'	4" MAX COBBLE SIZE. MOISTURE, CLAY INCREASING W/DEPTH, ESP. BELOW 35'
9:09 40 – 50	#4 ①	DIRTY GRAVEL	WET, COATED WITH TAN CLAY. MUCH PEA GRAVEL FRACTION. FINER THAN ABOVE. 2" MAX
50 – 57'	#5	DIRTY GRAVEL	WET CLAYEY GRAVEL LIKE ABOVE TO 57'. ±3" MAX
57' – 67' (9:24 60; 9:30 - PLUGGED @ 67' CLEAR @ 9:32)	① #6 ①	GRAVEL	MOIST, CLEAN GRAVEL IN COARSE SAND CLAY INCREASING W/DEPTH
67' – 70	N/S	CLAY	TAN, SILTY, STICKY CLAY
70 – 80	#7 ①	SAND	WET, FAIRLY CLEAN FINE TO MEDIUM GRAINED SAND @ 70' FREE-FLOWING WATER
80 – 89'	N/S	SAND	FREE-FLOWING FINE TO MEDIUM SAND LIKE ABOVE
89' – 90		CLAY	CLAY @ 89'

HOLE #: SHF05DH-11 SHEET 1 OF 2

TEST HOLE LOG

OWNER: SHIFLER

HOLE #: SHF05DH-11 SHEET 2 OF 2

LOCATION:

DATE STARTED:

DRILLING CO.:

EL. TOP OF HOLE:

REMARKS:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90 – 94	N/S	CLAY	TAN, STICKY, SILTY CLAY. WET
TD 100 — 10:30 QUIT HOLE; 10:30-12:30 TRIP OUT/GROUT 4 BAGS		BLUE-GRAY SILT/CLAY	HARD, LITTLE MOISTURE. SLOW DRILLING, CLAYEY

TEST HOLE LOG

OWNER: SHIFLER HOLE #: SHF05DH-12 SHEET 1 OF 1

LOCATION: DATE STARTED: 10/31/05

DRILLING CO.: EL. TOP OF HOLE:

REMARKS: INSPECTOR: RIVAS

12:30-1:00 MOB, SET UP

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0 (1:00 START) – 13	N/S	OB	NO RECOVERY
13	SHF05DH-12 1 ①	GRAVEL	SLIGHTLY MOIST GRAVEL TO 2½" IN CLEAN, COARSE SAND
20	SHF05DH-12 2 ①	SAND	FINE TO MEDIUM-GRAINED BROWN SAND. CLEAN. <10% GRAVEL TO 2" BELOW 27'.
30 (1:30-1:55 LUNCH)	#3 ①	GRAVEL	GRADES TO FINE CLEAN GRAVEL BELOW 30', CLAY, MOISTURE INCREASES BELOW 35'.
40	N/S	CLAY	STICKY MOIST BROWN PUTTY CLAY
43'	#4 ①	DIRTY GRAVEL	MOIST, CLAY COATED SAND AND GRAVEL.
50	#5 ①	DIRTY GRAVEL	VERY MOIST, CLAY-COATED LIKE ABOVE. FAIRLY FINE GRAVELS - 1-2" MAX. COARSE SAND MATRIX
60 (2:14) – 62	N/S	CLAY	WET, BROWN PUTTY CLAY. THIN INTERBEDS OF SAND AND GRAVEL <6" DOWN TO 66', THEN HARD SILTY CLAY W/ LITTLE MOISTURE
70	N/S	CLAY	GRADES TO CEMENTED SAND @ 78'
80 TD (2:50)			

HOLE #: SHF05DH-12 SHEET 1 OF 1

TEST HOLE LOG

OWNER: SHIFLER — HOLE #: SHF05DH.13 SHEET 1 OF 1

LOCATION: S. Canal Mid of Field — DATE STARTED: 11/01/05

DRILLING CO.: Layne Christensen — EL. TOP OF HOLE:

REMARKS: Sunny, S. breeze, warm — INSPECTOR: ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
1:20 pm 0	N/S	OVB	Little to ∅ return. Clay - Row crop soil
12'	#1 12-19	12' SAND	Clean, brown-gray sand well graded w/ 20% gravel
20	#2 ② 19-35	SANDY GRAVEL	Quickly grades to sandy gravel - much 3/4 - 1" size rounded gravel. Still clean +/- moist
30			cobbles from 33-35 3"-4"
35'	(bag clay)	35'	pale yellow clayey agg. after 1' clay
40	#3 35-39	clayey SAND-GRAVEL	Much P. gravel size (CLAY = 5%). Moist clayey sand matrix
Moisture ~ close to H_2O	#4 39-49 ②		Mostly clayey sand - P. GRVL w/ 5% > 1" Max 3"
50			
Wet ∅ flow	#5 49-59 ②	Clayey Sand & F. Grvl	Wet gravels not flowing. 5-10% clayey matrix. Mostly 3/8 - 1" gravels (30%)
60			
62	#7 bag 62-64		62-64 Clay lense/layer
Wet. Flowing	#6 ② 64-69	clean WASH GRAVEL	Flowing cse rock in muddy H_2O washes clean
70			
71' inj. H_2O	#8 bag 72'	71' CLAY	pale yellow - ~~brown~~ softball size hard pieces. Gray @ 75'
80			Gray, hard, tough
(90) T.D. 2:47 PM			Hi plasticity clay. Drills slow

2:47 PM, 4:30 Mix Grout — HOLE #: DH.13 SHEET 1 OF 1

4 bags + Gel

TEST HOLE LOG

OWNER: Shifler
LOCATION: S of Canal
DRILLING CO.: Layne
REMARKS: E side AB road

HOLE #: SHF05DH 14 SHEET 1 OF 1
DATE STARTED: 10/30/05
EL. TOP OF HOLE: 106 ?
INSPECTOR: Chuck

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
816 0	N/S	OB	OB - soil - poor recovery
		Clean SAND	Brown (slightly) silty SAND at 8 or 9 ?
10	(1) 10-20	SAND	Brown SAND grading to sand with gravel (to 1.5") starting at ~16'
		Sand with gravel	
20	(2) 20-30	Sandy Gravel	Brown sandy GRAVEL - most pea gravel coarser to 2" at lower portion of interval thin sand layer ~26'
30	(3) 30-37 (some clay)	Sandy Gravel	
37'		37' Clay	yellow brown CLAY (slightly sandy, plastic) starts at 37
40 / 42'	(4) 42-50	42' Clayey SAND	Clayey SAND at 42' yellow brown
50	(5)	Sandy CLAY	clay — Yellow brown sandy CLAY with layers of CLAY at 52
54'	54-60	54 SANDY GRAVEL	Gvl at 54 — Brown sandy GRAVEL w/ some clay
60	(6) 60-65	Sandy GVL w/clay	Brown sandy GRAVEL w/clay - moist -
65'		CLAY	Gray med. plastic CLAY Big balls
70	N/S	CLAY	Blue gray CLAY; sandy at 75' becoming moist; more moisture
80	N/S	CLAY	start adding H_2O to drill; Gray CLAY stiff moist
90 TD			TD at 9:53 Grout at 11:16

(SE)

HOLE #: 14 SHEET 1 OF 1

TEST HOLE LOG

OWNER: Shifler

HOLE #: SHF05DH-15 SHEET 1 OF 2

LOCATION: SW Corner near RD 94B & Foot of Hill

DATE STARTED: 11/02/05

DRILLING CO.: Layne Christensen

EL. TOP OF HOLE:

REMARKS: P. Cloudy Chance Showers

INSPECTOR: L. Zaffran

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
7:55 am	N/S	OVB	Little Return — Soil, Dirt, Roots, Clay, Soft, Hammers Quickly
15'	#1 15-19; #2 19-29	15' Sandy Grvl	Sandy Gray Gravel Clean, Mostly cse sand w/ 20% F. Gravel, Max 1" w/ occassional Clay lenses
30'	#3 30-38	30' Clayey Sandy Grvl	yellow color clayey Moist Sandy Gravel - Much 3/8"-1" rounds, sticky clay coating
38'	#4 bag 38-43	38' Silt	orange-brown Silt w/ F. Sand
43'	#5 43-45	43 Clay	Clay w/ embedded pebbles
45'	#6 45-49	45 Clayey Sandy Grvl	clayey sand & P. Gravel 10% cl
inc. Moist	#7 49-58 ②		Cleans up a bit then clayey at 57+/-
58'	#8 59-66 ②	58' Washed Gravel	Wet Flowing Muddy H_2O + Agg (yellow mud) - Agg washes clean, Much 3/8 - 1" size. *Max 4"
66' dry	#9 66-78	66' Clay	buff color, w/ root casts & gypsum? Hard pieces; inc dry w/ depth, pale yellow color - Mottled, lams Med. P.I.
78'; 79' H_2O Flows		78 Silty Sand	Moist, sticky, clump of silt; Wet flowing dk gray sand Fine #40 size; similar to DH-4 only not cemented.
90			

HOLE #: 15 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: SHF05DH-15 SHEET 2 OF 2

DATE STARTED:

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90		91 Clay	WET, STICKY LOW PI
(100) TD 9:35	Tripout backfill Grout 4bags	by 10:20 to 20' 1batch	
110			

HOLE #: 15 SHEET 2 OF 2

Dirty Hole
∅ clean rock

TEST HOLE LOG

OWNER: SHIFLER

HOLE #: SHF05DH-16 SHEET 1 OF 1

LOCATION: S. end, JUST NW OF Monument Hill

DATE STARTED: 11/02/05

DRILLING CO.: Layne Christensen

EL. TOP OF HOLE:

REMARKS: Cloudy S breeze

INSPECTOR: L. ZAFFRAN

11:48 AM

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0–15'	N/S	OVB	Tilled clayey soil for Row crop
15'–19'	#1 bag 15-19	SILTY SAND 15'–19'	Golden brown SILTY SAND, Fine clean
19'–28'	#2 19-29 ②	CLAYEY SAND & GVL 28'	↓ grades into CLAYEY SANDY gravel, F. GRAVEL dk brown +/- 5% CLAY
28'– MOISTURE, WET, but NOT Flowing	#3 29-39 ②	(15-20% CLAY) CLAYEY SAND & GRAVEL	MOIST, STICKY yellow color clay coated gravel w/ CLAY lenses, 20% CL overall? * HOLDS TOGETHER in clumps. WET, but NOT Flowing
	#4 39-44 ②		As Above, STICKY gravels in clayey sand matrix w/ STICKY clay lenses
"	#5 49-59 ①		As Above, still wet w/ 15% CLAY, MAX ROUND GRVL 4" MOSTLY <1"
58 — 60 H2O; WET Flowing 67'	#6 59-67 ②	H2O 58; Cobbles 67'	Clean cse Agg, little SAND FINES WASH OUT in MUDDY yellow Ground WATER. cobbles 4"+ COMMON
70–80 DRY		CLAY	pale yellow clay by 73' & lite gray-yellow to white & Hard by 75 softer, MOIST yellow brown color
80– ↑ Ream, drill w/ H2O ↓			SOFT, WET, STICKY 82'
			Hard, cabbage size clay core pieces
(90) TD 1:50 pm			

Grout 1 batch by 3:25

HOLE #: 16 SHEET 1 OF 1

TEST HOLE LOG

OWNER: Shifler

LOCATION: S. end JUST N. OF Mon. Hill

DRILLING CO.: Layne Christensen

REMARKS:

HOLE #: SHF05DH-17 SHEET 1 OF 1

DATE STARTED: 11/01/05

EL. TOP OF HOLE:

INSPECTOR: ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0 – 16'	N/S	OVB	SOFT CLAY, Hammer Drops QUICKLY, No RETURN
16'	#1 16-19 #2 19-29 ②	SANDY GRAVEL	clean, cse sandy GRAVEL
28' – 44' 30 ↑ MOISTURE	#3 ① 29-39	SANDY GRAVEL w/ CLAY 5%	Slight color change (pale yellow brown) SLIGHT inc. IN CLAY AS MATRIX; well graded sandy GRAVEL, ROUND cobbles TO 2" - 2½" clay at END 39'
? 44' – 47'	#4 bag 44-47	44'	CLAY, hi plasticity
Fm ream ↑ 47' – 57' ↓ Inc. MOIST	#5 47-49 #6 49-57	47' MOD. CEM. SS. inc. MOIST ↓	dark brown MOD. CEM SandSTONE clean, well Rounded lithics (volc?) & QTZ (blk. organics) 3" diam flat Pieces
57' ↑ H2O	WET STICKY	57'	CLAY, STICKY w/ Sand, (brown muddy H2O) olive-gray color med plasticity
↑ Ream DRY	DRY N/S	CLAY	color change TO pale yellow-brown Hard, slow drilling
70 – 80	N/S		↓ inc. dry & hard pale ~~like~~ yellow to color
⑧⓪ TD 10:30	Tripout 10:30 - 11:15 — wait for Cement	12:15 – 12:45 Grout 4 bags	— Moushumi here till 12:05 PM.

HOLE #: 17 SHEET 1 OF 1

TEST HOLE LOG

OWNER: SHIFLER

HOLE #: SHF05DH-18 SHEET 1 OF ~~1~~ 2

LOCATION: E side S. of Ditch at Toe of Hill

DATE STARTED: 11/03/05

DRILLING CO.: LAYNE

EL. TOP OF HOLE:

REMARKS: Cool, breezy Fall A.M.

INSPECTOR: ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
7:40 AM 0			Clayey Soil & Roots Freshly cut wheat dk brown
10	N/S	OVB	Hard Clay, orange-brown color, Hi Plasticity, Tough.
20			Moist, Sticky ↓
25'	#1 25-29	25' SANDY GRVL	F. Silty Sand for 1' Followed by well graded Gray color gravel in cse sand
30			
33'	#2 29-39 ②	33' Clayey P.Grvl	6" Clay Lense Followed by cse sand - P. GRVL in slightly clayey sand matrix
40	#3 39-44		
44.5		44.5	burnt orange-brown clay initially soft & moist
50	#4 bag 45-59	CLAY	drills O.K. Not to Hard
59		59	embedded gravels
60	#5 ② 59-69	Clayey cse Agg	cse, cobbles, Hard driving by 65 looks cleaner, still +/-10% clay, but not bad Much Rounded 1" size 55% GVL.
68' H_2O			
70	#6 69-73		Muddy yellow H_2O & cobbles
73'	#7 bag 73-84	73'	Clay initially wet, dry & Tough by 75'
80			
84	#8 84-89	84	Flowing water & Rock. Much 1-2" Fines wash out leaving clean Agg
90			

HOLE #: 18 SHEET 1 OF ~~1~~ 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: 18 SHEET 2 OF 2

DATE STARTED:

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:		REMARKS:
90				
92'				
→ inj. H_2O		CLAY		gray, Hi Plasticity, cores as large cylinders.
(100)				
TD 9:35am				
10:00-10:30 -	backfilleng			
Grout	1 batch 4 bags ½ gel			

HOLE #: 18 SHEET 2 OF 2

TEST HOLE LOG

OWNER: SHIFLER
HOLE #: SHF05DH-19 SHEET 1 OF 1

LOCATION: FAR. SE Corner, Toe of Hill
DATE STARTED: 11/3/05

DRILLING CO.: Layne Christensen
EL. TOP OF HOLE:

REMARKS: P. Cloudy, beautiful breezy
INSPECTOR: ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
11:50 am 0 – 15'	N/S		SOFT, DIRT, FEW CLAY SOIL Pieces Little - NO RETURN (CUT WHEAT)
15' – 24'	#1 bag 15-19	SILTY SAND	SILTY SAND, FINE #50 - dark brown - GOLDEN
24' – 36'	#2 24-29	SAND	↓Grades into Sand w/ F. Gravel +/- 15% F. rounded gravel dark brown
	#3 29-36		↓CSENS TO 36'
36' – 38' (Moist)	#4 36-38		CLAY STICKY & MOIST HOLDS AGG TOGETHER
38' – 50' (→ inj. H_2O)	#5 bag 38-49	CLAY	STARTS STICKY, MOIST, gets dry hard Quickly - pale, orange color, hi plasticity, TOUGH, Tr. burnt organics
50' – 60'	N/S	CLAY	AS ABOVE, CUTS easily when inj. H_2O. yellow color
60' – 70'	N/S	↓	AS ABOVE
(70) TD	Tripout, backfilling @ 2:30, Grout @ 2:50		

HOLE #: 19 SHEET 1 OF 1

9 Total Buckets
SPT = 0

14' OB
75' S+G 9' CLAY Layer

TEST HOLE LOG

OWNER: Shifler
HOLE #: SHF06-DH20
SHEET 1 OF 2

LOCATION: Woodland
DATE STARTED: 10/23/06

DRILLING CO.: Great West
EL.. TOP OF HOLE:

REMARKS: 10am Start / Sunny - warm
INSPECTOR: BL / IR

DEPTH:	SAMPLE #:	MATERIAL:		REMARKS:
0 – 14	NS	Topsoil		0 – 14 Soft Dry Silt (OB) Brown • Topsoil
14 – 19	SHF06-DH20-#01 ①	SAND	~~SP~~ SM	Silty SAND w/some gravel, brown, dry. 25% gravel 60% sand, 15% silt. gravels up to 2.5" dia / subrounded sand fine to med grained.
19 – 29 (Bit change out @ 29)	SHF06-DH20 ② 19 to 29' @ 1100	GRAVEL / CL	GM ~~GW~~ / GM ~~GW~~	Silty GRAVEL w/some sand, brown, dry. 60% gravel, 25% sand, ~~40~~ 15% silt. gravels well graded ¼" to 2.5" subrounded. Sand fine to coarse grained. clay layer at 25 feet 2-3" thick, very soft, low plasticity.
29 – 33 (Damp)	③ 29 to 33' @ 1145		~~GW~~ GM	Sandy GRAVEL w/some silt, 40% gravel, 40% sand, 1?% silt, ?% clay. brown, damp @ 31 feet,
33 – 39	④ 33 to 39' @ 11 46		GM ~~GW~~	Increasing clay content at 36'
39 – 49 (wet)	NS	(41)	CL	CLAY @ 41', light brown, damp, med plasticity, soft. Increasing silt content @ 48', loses plasticity. 49' end clay
49 – 59 (▽ WATER @ 51)	⑤ 49 to 59' @ 1210		~~SW~~ SC	gravelly SAND, brown, damp, w/trace clay clumps, gravels up to 2" diameter rounded.
59 – 69	⑥ 59 to 69' @ 1220		SW	gravelly SAND, brown, wet w/ trace fines but most have been washed away. well graded sand, gravels up to 1.5". Saturated, in water table.
69 – 79	⑦ 69 to 79' @ 1240		SW	~~SP~~ gravelly SAND, wet, fines washed away. Sand fine to coarse, gravels fine to coarse are sub rounded and up to 3" diameter. Wet, Gray
79 – 89	⑧ 79 to 89 @ 1255		SW	gravelly SAND w/Trace cobbles 70% sand, 25% gravel, 5% cobble Sand med to coarse, fines washed away. cobbles up to 3.5" Gravel mainly coarse. Wet Gray, CLAY at very bottom of Run. 89'
90				

HOLE #: 20 SHEET 1 OF 2

TEST HOLE LOG

SHF06 DH-20

OWNER: SHIFLER

HOLE #: 20 SHEET 2 OF 2

LOCATION: WOODLAND

DATE STARTED: 10/23/06
Completed: same day

DRILLING CO.: GREAT WEST

EL. TOP OF HOLE:

REMARKS:

INSPECTOR: BL/IR

DEPTH:	SAMPLE #:	MATERIAL:		REMARKS:
90	(9) 89 to ~~99~~ 97 @ 1315		CL	gravelly CLAY w/ trace sand + trace silt, brown, wet sub rounded gravels, sand well graded. 65% clay 30% gravel, 5% sand + silt. ~~Note: fines may be getting washed~~
97			CL	VERY STIFF PURE CLAY @ 97' greenish-gray, dry.
100				Bit clogged @ 97'; even after addition of water.
TD97				TD 97
				Backfilled w/cuttings then plugged with neat cement grout top 20 feet, as directed by Yolo county.

HOLE #: 20 SHEET 2 OF 2

TEST HOLE LOG

OWNER: SHIFLER

LOCATION: FAR E. Side at WINKENHOFER ℄

DRILLING CO.: Layne

REMARKS: Overcast, Strong S gust

HOLE #: SHF05DH.2 | SHEET 1 OF 2

DATE STARTED: 11/07/05

EL. TOP OF HOLE: +/- 102

INSPECTOR: ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0	N/S	OVB	Resume Mon. at 9:55 am after 3 day break edge of Rows preped for Planting NOT allowed on Field
10			DRY, CLAY LITTLE RETURN CLAY CLOTS
13'		13' 14'	> MOIST CLAY Layer 1' w/ Gravel, FOLLOWED by F. Gravel - CSE SAND w/ 5% CLAY
20	#1 14-19	SANDY GRAVEL +/-5% CL	
	#2 19-29 ②		AS Above — MOIST Gray color MUCH 3/4 - 1" size, MAX 2"
30			
33' 36'	#3 33-36	33' SAND 36	Clean Sand, brown color Mostly #50 size w/ 10% GRAVEL
40	#4 36-39		SILT, SOFT, DRY, orange-brown color
	#5 bag 39-49	SILT w/ F. SAND	golden brown color ∅ MOISTURE w/ V. Fine SAND < #50
50	#6 bag 49-59	56'	SLIGHT inc. in plasticity
60	#7 bag 59-66	CLAY	↓ Grades TO clay w/ SAND
66'		66'	↓ inc. MOISTURE SANDY FINE GRAVEL w/ 5-10% CLAY - MUCH 2" size ROUNDED
H2O 70	#8 66-69		
FLOWING	#9 69-79	WET Agg	WET FLOWING gravels - Fines & SILTS WASH OUT leaving Clean agg MAX 4"
80	② #10 79-89 ②		CONTINUES

HOLE #: SHEET 1 OF 2

TEST HOLE LOG

OWNER:

HOLE #: 21 SHEET 2 OF 2

LOCATION:

DATE STARTED:

DRILLING CO.:

EL. TOP OF HOLE:

REMARKS:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
90 — Flowing ↓	#11 89-99 ②	WET Agg.	WASHED CLEAN GRAVEL & CSE SAND 1' CLAY LITE brown-yellow MAY 3" — FLOWING MUDDY H_2O
100 — Loosing Fines in water ↓	#12 ② 99-109		— SANDY SURGES, STRONG FLOW TR. yellow SAND - DISTINCT COLOR IN OTHERWISE GRAY COLOR ROUN[D] ROCK — CHERT,
LUNCH BRK 11:45 12:20 110 —	#13 109-118 ①		
118.5		118.5	
120 — DRY ↓		123 blue clay	CLAY yellow-putty color, lams w/ organics & Feox DRY
(130) — TD			

HOLE #: 21 SHEET 2 OF 2

8 TOTAL BUCKETS
1 SPT

9-15' = OB
59' = S+G w/ (25' layer Clay + silt)

TEST HOLE LOG

OWNER: Shifler
LOCATION: Woodland
DRILLING CO.: Great West / Jim
REMARKS: Start #22e 4:25PM Monday

SHF06-DH22
HOLE #: 22 SHEET 1 OF 2
DATE STARTED: 10/23/06 Monday
FINISHED: 10/24/06 TUE
EL. TOP OF HOLE:
INSPECTOR: BL

DEPTH: /RUN	SAMPLE #:	MATERIAL:		REMARKS:
0 – 0-9'	NS		ML	SILT w/some sand. Brown, Dry sand is very fine grained. 0-9'
10 – 9-19	NS		SW SP	SAND, brown, dry v.fine grained. well sorted Poorly graded. almost silt size.
15 – 19	SHF06-DH22 ① @ 15-19' 1655		SP SW	Gravelly SAND brown dry, fine to coarse sand, gravels up to 3/4". Trace silt. 15-19'
20 – 19-29'	SHF06-DH22 from 19 to 29' ② @ 1705		SP W	SAA, increasing gravels content and size up to 2"
			GW	Sandy GRAVEL, brown, dry, fine to coarse sand, gravels up to 2.5" diameter. subrounded gravels.
30 – 29-39'	SHF06 DH-22 from 29 to 36 ③ @ 1712		GW	Sandy GRAVEL, brown, dry, fine to coarse sand, gravels up to 2.0" diameter and rounded to subrounded.
36	NS		SP	SAND, brown, dry fine grained 36'-39'; Poorly graded
40 – 39'-49'	NS		ML	39 SILT, brown, damp, non cohesive, loose.
48.5-50 = SPT	3/4/5 SPT Blowcount (SPT)	10'	CL	44 CLAY w/some silt, very slight plasticity brown, damp SPT Collected 70% clay 30% silt.
50 – 49-59'	NS	15'	ML	49 ~~CLAY~~ SILT, brown, damp non plastic, 49'-59' soft
60 – WET @ 64'	NS		ML	SILT, brown, damp non plastic 59-64
59-69'	SHF06 DH22 from 64-69 ④ @ 1810		GW	Sandy GRAVEL w/trace silt. Sand well graded fine to coarse gravels up to 2" diameter subrounded, brown/wet
* 70 – 69'-79'	SHF06 DH22 from 69'-79' ⑤ 1/1		SW	SAND w/some gravel and trace silt. gray, wet sand well graded fine to coarse. gravels up to 2" diameter gravel subrounded. 80% sand, 15% gravel, 5% silt
80 – 79'-89'	SHF06 DH22 from 79-89' ⑥ 1/1 @ 0825		SW	gravelly SAND w/some silt. gray, wet, 60% SAND, 30% gravel 10% silt. Sand fine to coarse, gravels subrounded up to 2" diameter.
90				

HOLE #: 22 SHEET 1 OF 2

* end day 10/23/06 @ 69'

TEST HOLE LOG

OWNER: Shifler

SHF06 DHZZ
HOLE #: ZZ SHEET Z OF Z

LOCATION: Woodland

DATE STARTED: 10/23/06
Finished 10/24/06

DRILLING CO.: Great West

EL. TOP OF HOLE:

REMARKS: Yolo Co. Contacted for grout insp. @ 0900. Directed to continue without inspector.

INSPECTOR: BL

DEPTH:	SAMPLE #:	MATERIAL:		REMARKS:
90 — 89-99'	SHF06 DH22 from 89-99' ⑦ Y1		SW	gravelly SAND w/some Silt 50% sand, 40% gravel, 10% silt. Sand is fine to coarse, gravels subrounded up to 1.5" diameter. Some clay balls in recovery pile indicate thin layers of clay in formation. water very dirty.
100 — 99-109'	99 SHF06 DH22 from 99 to 104' 104 ⑧ @0900 Y1		SW	SAA, increasing clay content 50% sand 30% gravel 10% silt 10% clay (Clay balls in recovery)
			CL	CLAY, brown, damp. Lost recovery, clay plugged bit
110 — TD 109				

End boring @ 109 feet

backfilled w/cuttings to 20' BGS then plugged w/neat cement grout.

HOLE #: 22 SHEET 2 OF 2

4 TOTAL DAYS

25' GRVL w/ 3' CL

TEST HOLE LOG

OWNER: SHIFLER

HOLE # SHF06DH-23 SHEET 1 OF 2

LOCATION: E. SIDE

DATE STARTED: 10.25.06

DRILLING CO.: Great West

EL. TOP OF HOLE:

REMARKS: Still V. WINDY 1:30pm

INSPECTOR: L. ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0			TOPSOIL - TOMATOES - ROOTS
			SILT Grades QUICKLY TO CLAY
	N/S		
5		OVB	
10			
11	06DH-23 ① 11-19' 2/2	11' CSE GRVL	CSE - TO FINE gray gravel & silty SAND
		14' SAND 16'	by 14' SANDY lense to 16'
15			- clean - well graded, ROUNDED F. GRAVELS in MED - CSE SAND
	② 19-24 1/1	SANDY GRAVEL	
20			
		24	CSE, MUCH 2+" size, LOTS OF ANG. chips FROM HAMMER
25	③ 24-27 1/1	CL w/S 27	MOIST SAND, pebbles w/Clay estm 40% clay
	④ 27-36 2/2	SANDY GRAVEL	CSE AGG. — ROCK TO 4" SIZE
30			wellgraded as above, w/clay COATING GRAVEL
		33'	MOIST, w/ 5-10% CLAY (?)
35		36'	
		CLAY w/ SAND	pale yellow brown clay w/ F. SAND
39' SPT	5/7/10		Grades Ø SAND
40	bag sample ⑤ 39-49	CLAY	HARD, DENSE Hi plasticity clay (USING H_2O inj)
45			

HOLE #: 23 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: SHF06DH-23 SHEET 2 OF 2

DATE STARTED:

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
45		CLAY	yellow-brown color FAT CLAY Hi PI,
49' SPT	6/7/7		(USING H_2O INJECTION)
50			AS ↓
55			slightly SOFTER 55-59'
59			
60			AS ABOVE - MED-Hi PLASTICITY CLAY w/ 1' SILTY, SOFTER lenses.
65			
TD 3:35 PM			
70			backfill w/ CUTTINGS TO TRIPOUT, GROUT
75			

HOLE #: 23 SHEET 2 OF 2

3 BUCKETS TOTAL
2 SPT Samples

7' = OB
27' SHG

TEST HOLE LOG

OWNER: Shifler — HOLE #: SHF06 DH24 — SHEET 1 OF ~~2~~ 1

LOCATION: ~~Woodland~~, East side — DATE STARTED: 10/24/06, Completed : Sameday

DRILLING CO.: Great West Drilling / Jim Benson — EL. TOP OF HOLE:

REMARKS: — INSPECTOR: BL

DEPTH:/RUN	SAMPLE #:	MATERIAL:		REMARKS:
0–9	NS		ML	SILT Brown, Dry 0-7 FBG. Top Soil overburden
7–9	NS		SP	SAND, Brown, Dry w/Trace gravel 7-9 FBG sand is v. fine grained. gravel 1/2" diameter, R. 99% sand 1% gravel
9–19	SHF06 DH-24 from 9 to 19' ① 1/1		SW	SAND w/Trace gravel, brownish gray, dry. Sand is fine to med grained gravels are up to 3/4" diameter and rounded.
19–22	NS		SW	SAA ~~Sam~~
19–29	22 SHF06 DH24 @ 1220 ② 1/1 (29)	27'	GW	Sandy GRAVEL, brownish gray, dry, Sand 35% Gravel 65% Sand fine to coarse grain, gravel up to 2" diameter SubAngular.
29–39	SHF06 DH24 from 29-36' ③ 1/1		~~GW~~ GM	Sandy GRAVEL w/ trace silt + clay, brown, damp, Sand 40% gravel 58%, silt/clay 2%. sand fine to coarse, gravels up to 2" diameter, fines cause material to clump together slightly when squeezed.
36–39	NS		CL	CLAY MIXED 36 to 39'
39–40.5 SPT1; 8/4/7/ splitspoon = Silt w/some clay.	SPT ~~@ 40~~ 39 – 40.5		CL	CLAY, light brown, low plasticity, damp, clogging bit badly, poor recovery. trace silt, grittyness on teeth. Large clumps softball size. SPT1 from 39-40.5
46–47.5 SPT2	5/8/13 #SPT2			SPT2 from 46 to 47.5
49–59	NS		CL	CLAY w/some silt. light brown, damp, slightly plastic. water introduced to facilitate recovery, large softball size fragment continue to plug discharge hose
59–69	NS		CL	SAA.
70–90				End boring, TD 69 feet backfilled to 20FBG with cuttings, neat Cement grout placed from 20 - 0 FBG.

HOLE #: 24 — SHEET 1 OF 1

7 TOTAL BUCKETS

SPT = 0

8' OB

46' Sand+Gravel w/26' SILT Layer

TEST HOLE LOG

SHF06 DH-25

OWNER: Shifler

HOLE #: 25 SHEET 1 OF 1

LOCATION: East side

DATE STARTED: 10/26/06 @ 1200

DRILLING CO.: Great West

EL. TOP OF HOLE:

REMARKS: Sunny/warm ≈80°F (Afternoon)

INSPECTOR: BL

DEPTH:	SAMPLE #:	MATERIAL:		REMARKS:
0–9'	NS		ML	SILT, brown, dry, overburden topsoil. 8' gravelly SAND, sand is fine to coarse, gravels upto ½".
9–19'	SHF06DH-25 9-16' ① V1		SW	gravelly SAND, Gray, dry sand well graded, gravels up to 2.5" diameter are sub rounded. trace silt.
16	SHF06 DH-25 16-19 ② V1	9'	SP	SAND w/trace gravels. sand is fine grained, gravels up to 1" diameter. Clean.
19'–29' (19–25)	NS			
25	SHF06 DH-25 25-29 ③ V1		GM	Sandy GRAVEL, w/some silt. 50% gravel, 40% sand, 10% silt. sand well graded, gravels up to 3" some are angular and may have been cobbles broken during drilling.
29–39' (29–33)	SHF06 DH-25 29-33 ④ V1	8'		
33–39	NS		ML	SILT, light brown, damp, loose, soft. chose not to drive a SPT because of lack of clay content, no plasticity.
39–49'	NS			
49' to 59'	NS		ML / ML	Thin Layers of clay showing up as small golfball size chunck while drilling 56' to 57'. High silt content/non plastic.
59'–69' (59–63)	SHF06 DH-25 59-63 ⑤ V1		GM	Sandy GRAVEL w/ trace silt. 50% gravel, 45% sand, 5% silt. brown, damp. Sand well graded, gravels up to 2.5" diameter.
63	SHF06 DH-25 63-79 ⑥ V1		GW	GRAVEL, w/some sand. brown, wet, gravels up to 5" diameter. and trace cobbles. gravel 60% sand 30%, cobbles 10%. Clean!
69'–79'	SHF06 DH-25 from 69-79 ⑦ V1	22'	GW	SAA, less clean, trace fines. WET.
79'–89'	NS	81	CL	CLAY, Brown V. stiff pluged bit during drilling, have to introduce water to continue.
89				TD 89' Backfilled w/cuttings to 20 BGS then Neat Cement to Top.

HOLE #: 25 SHEET 1 OF 1

2 BUCKETS TOTAL
2 SPT Samples

25' OB
9' gravel/sand

TEST HOLE LOG

OWNER: Shifler

HOLE #: 26 (SHF06DH-26) SHEET 1 OF 1

LOCATION: E. Side

DATE STARTED: 10/26/06 @ 0800

DRILLING CO.: Great West

EL. TOP OF HOLE:

REMARKS: Clear/Cool ≈53°F (MORNING)

INSPECTOR: BL

DEPTH: /RUN	SAMPLE #:	MATERIAL:		REMARKS:
0 – 9 (0-9')	—		ML	SILT, brown, dry. OVERBURDEN/TOPSOIL very soft, 0-16'
9 – 19 (9-19')	—	25'		SAA
16				SILT w/some sand and trace clay. sand is very fine grained, clay causes material to clump slightly. brown, damp.
19 – 29 (19-29')				
25	SHF06DH-26 ① 1/1		SW	gravelly SAND w/some silt. brown, damp, 60% sand, 30% gravel, 10% silt. Sand is fine to coarse, gravels up to 2" diameter, subrounded to rounded. Clayballs appear from layers at approximately 34'.
29 – 39 (29-39')	SHF06DH-26 ② 1/1	9'		
34			CL	CLAY brown, damp, very stiff, SPT collected. only 6 of 18" was recovered in SPT, gravel blocked off sampler.
39 – 40.5	10/13/18 SPT 1			
39 – 49 (39'-49')	—			
49 – 50.5	SPT2 4/4/6 SPT 2	35'		CLAY, w/some silt. 80% clay, 20% silt. brown, damp, stiff, med plasticity.
49 – 59 (49-59')	—			
59 – 69 (59'-69')	—			SAA, end boring at 69' BGS.
70		TD 69'		Hole backfilled w/cuttings to 20 FBG then topped with neat cement grout. Contacted Yolo Co. for inspection @ 1030 am arrived @ 1100

HOLE #: SHF06DH-26 SHEET 1 OF 1

(4TH Hole)

(5 TOTAL BKTS)

13' OVB
27' GRVL

TEST HOLE LOG

OWNER: SHIFLER

HOLE #: SHF06DH-27 SHEET 1 OF 2

LOCATION: FAR SE CORNER

DATE STARTED: 10.25.06

DRILLING CO.: GREAT WEST

EL. TOP OF HOLE:

REMARKS: STRONG N. WINDS - CAN BEARLY HOLD MY GROUND.

INSPECTOR: L. ZAFFRAN

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
0–8'	N/S	CLAY	using little H_2O to push top pipe thru clay OVB.
8'		8' SM	Silty sand soft, ~~slight~~
13'	SHF06DH-27 (#1) 1/1 10-20'	13'	5% pebbles in silty sand
15'		15' GW	Cser now Sandy gravel, Rock to 2" 75% sand 25% gravel
20'	(#2) 2/2 20-30'		well graded sandy gravel <5% clay coating 1" sizes subround - well round. Damp, gray color. May 3" size, soft, easy advancing
30'	(#3) 1/1 30-35		
35'	(#4) 35-40 1/1	35' GC	inc moisture (GM) - yellow-brn gravel w/ clay 5-10% enough clay & moisture to clump together slightly
40'		40'	
41 SPT	2/3/7	CLAY	Moist - split spoon samples clay yellow brn color, lean orange-brn mottled clay
ADVANCING w/ water	bag sample (#5)		
45			

HOLE #: 27 SHEET 1 OF 2

TEST HOLE LOG

OWNER:

LOCATION:

DRILLING CO.:

REMARKS:

HOLE #: 06DH-27 SHEET 2 OF 2

DATE STARTED:

EL. TOP OF HOLE:

INSPECTOR:

DEPTH:	SAMPLE #:	MATERIAL:	REMARKS:
50 — 49 SPT 3/4/5			
55	(#6) 49-59 bag clay	CLAY	V. dense, Hi PI CLAY yellow-brown color
60			(USING H_2O inject.)
65			SOFTER, SAME color MED P.I. Clay
69 TD. 10:30AM			
70			
75			backfill to 20' grout to surface w/2 batches. Monshiuni gave go-ahead w/o her being here.
80			

HOLE #: SHEET OF

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.

Sample ID	Depth (feet)	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)
B1-6	6	36	21	15	---	91.7		
B1-15-20	15				---	17.7		
B1-30-40	30				---	4.7		
B1-55-65	55				---	37.9		
TPSHF1-9-18	0				---	0.7		
TPSHF-3&4	0	27	19	8	---	61.6		

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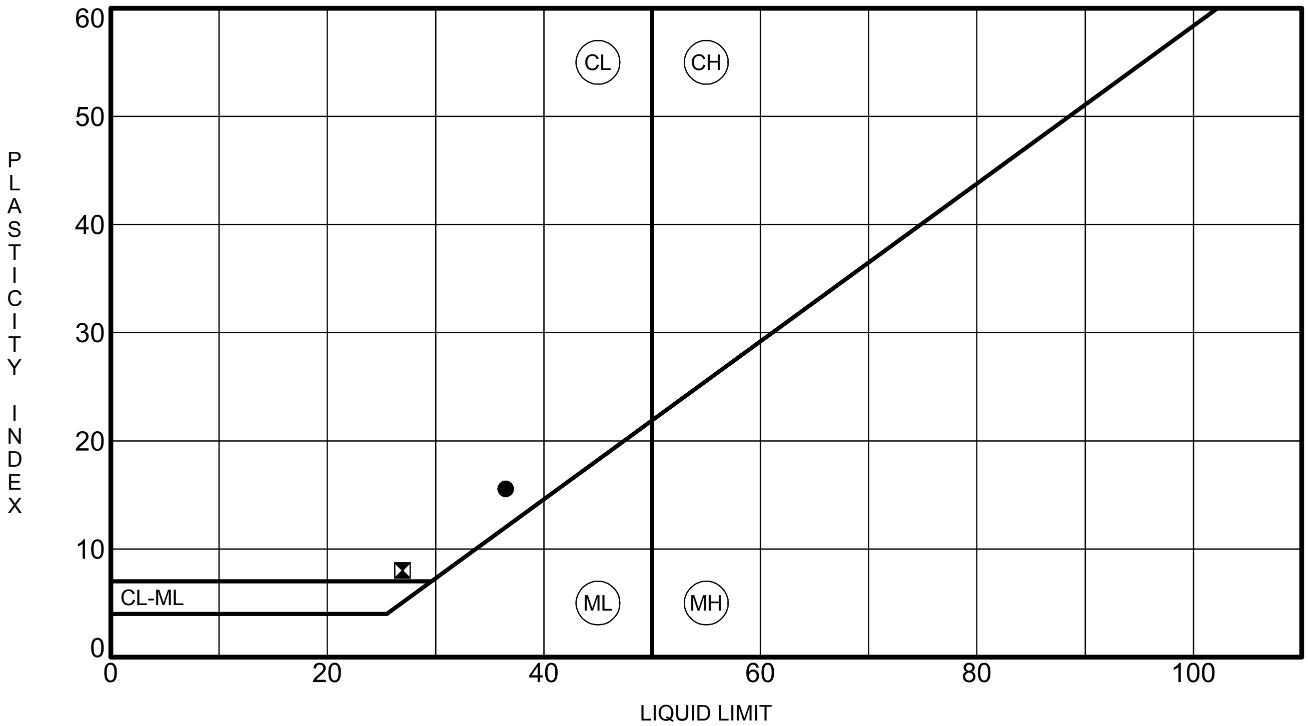
Summary of Laboratory Results

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B1



	Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	% Pass #200 Sieve	Unified Soil Classification Description	Preparation Method
●	**B1-6**	**36**	**21**	**15**	**91.7**	**Lean CLAY (CL)**	
⊠	**TPSHF-3&4**	**27**	**19**	**8**	**61.6**	**SANDY LEAN CLAY(CL)**	

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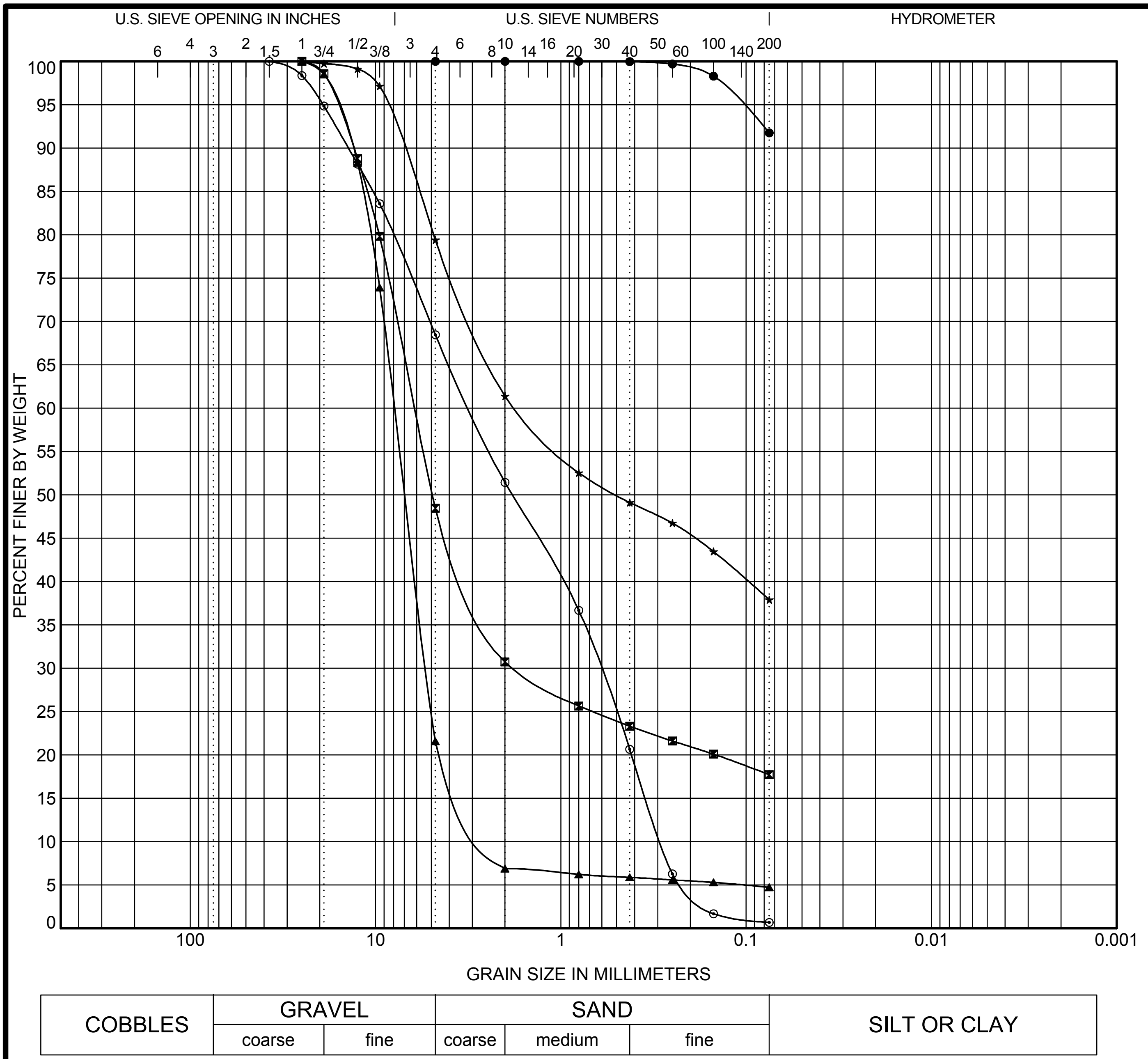
ATTERBERG LIMITS (ASTM D4318)

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B2



	Sample No.	Classification	LL	PL	PI	Cc	Cu
●	**B1-6**	**Lean CLAY (CL)**	**36**	**21**	**15**		
⧗	**B1-15-20**	**Silty GRAVEL with sand (GM)**					
▲	**B1-30-40**	**Poorly graded GRAVEL with sand (GP)**				**1.49**	**3.3**
★	**B1-55-65**	**Silty SAND with gravel (SM)**					
⊙	**TPSHF1-9-18**	**POORLY GRADED SAND with GRAVEL(SP)**				**0.43**	**10.8**

	Sample No.	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B1-6**	**4.75**				**0.0**	**8.3**	**91.7**	
⧗	**B1-15-20**	**25**	**6.132**	**1.754**		**51.6**	**30.7**	**17.7**	
▲	**B1-30-40**	**25**	**7.902**	**5.311**	**2.402**	**78.4**	**16.8**	**4.7**	
★	**B1-55-65**	**25**	**1.732**			**20.6**	**41.5**	**37.9**	
⊙	**TPSHF1-9-18**	**37.5**	**3.091**	**0.615**	**0.287**	**31.5**	**67.8**	**0.7**	

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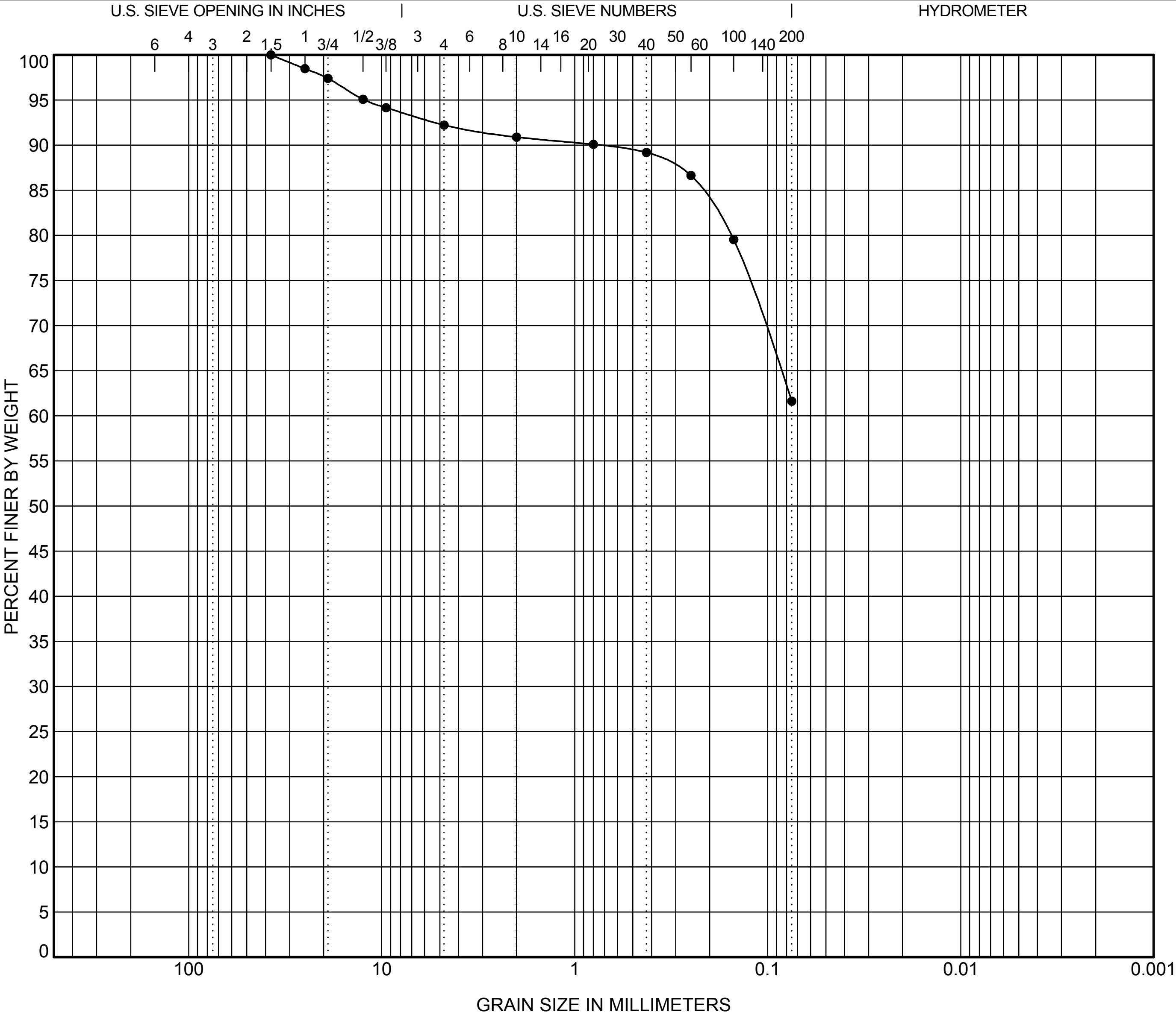
GRAIN SIZE DISTRIBUTION (ASTM D422, D6913)

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B3

GRAIN SIZE COPY 2 TEICHERT SHIFLER.GPJ US LAB.GDT 3/7/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample No.	Classification	LL	PL	PI	Cc	Cu
●	**TPSHF-3&4**	**SANDY LEAN CLAY(CL)**	**27**	**19**	**8**		

	Sample No.	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TPSHF-3&4**	**37.5**				**7.8**	**30.6**	**61.6**	

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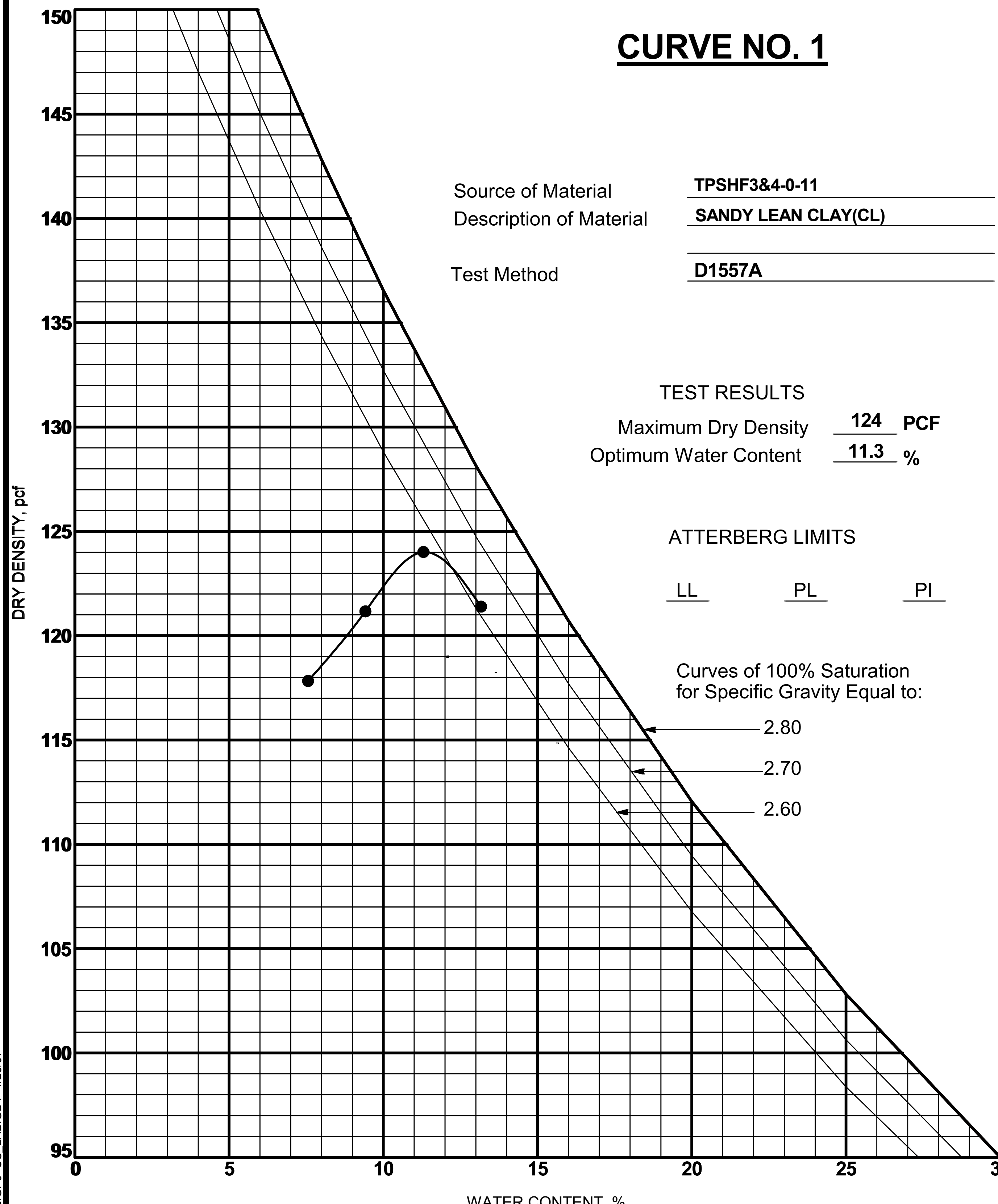
GRAIN SIZE DISTRIBUTION (ASTM D422, D6913)

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B4

CURVE NO. 1



Source of Material	TPSHF3&4-0-11
Description of Material	SANDY LEAN CLAY(CL)
Test Method	D1557A

TEST RESULTS

Maximum Dry Density 124 PCF

Optimum Water Content 11.3 %

ATTERBERG LIMITS

LL	PL	PI

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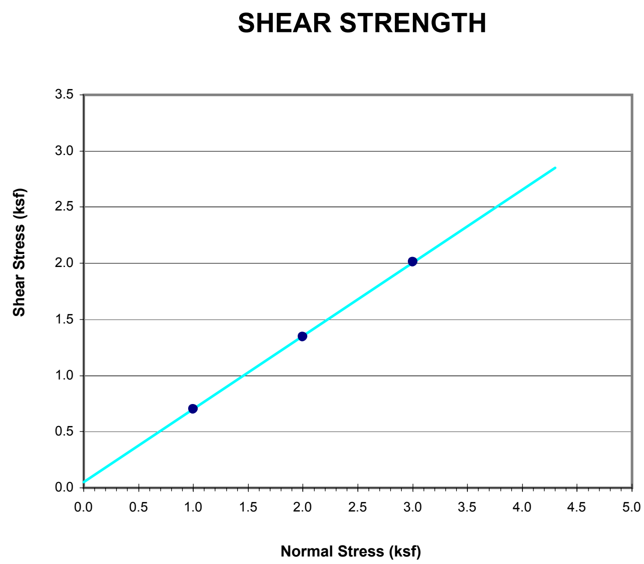
MOISTURE-DENSITY RELATIONSHIP

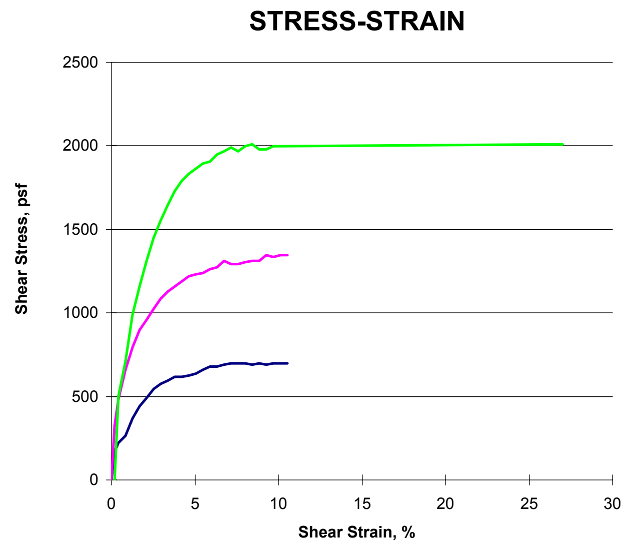
Project: Teichert Shifler Mining and Reclamation

Location: Woodland, CA

Number: S9534-05-04

Figure: B5





Sample Description			
Boring Number	TPSHF1		
Sample Depth (feet)	9-18'		
Material Description	Dark brown Silty SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**1000**	**2000**	**3000**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	4.8	4.3	4.4
Dry Density (pcf)	106.4	106.9	106.6
Estimated Specific Gravity	2.60	2.60	2.60
Saturation (%)	23.6	21.4	22.1
Shear Test Conditions			
Strain Rate (%/min)	0.752	0.694	0.638
Major Principle Stress at Failure (psf)	700	1344	2010
Strain at Failure (%)	7.60	10.53	8.00
Test Results			
ϕ, degrees	**33.1**		
c, psf	**50**		

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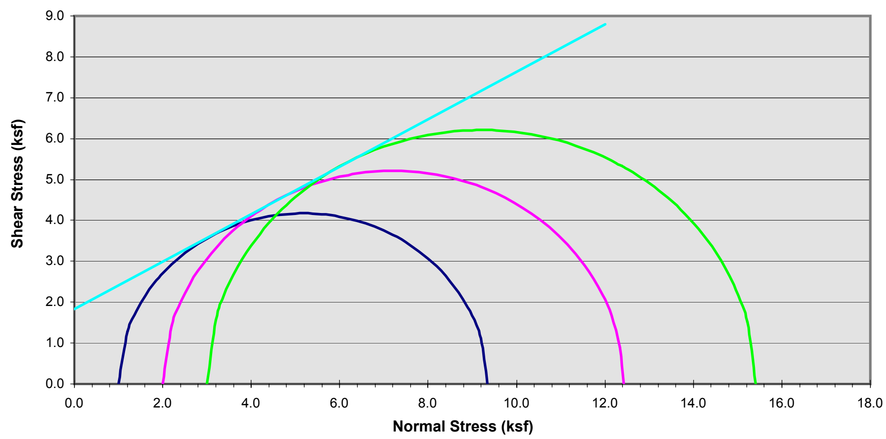
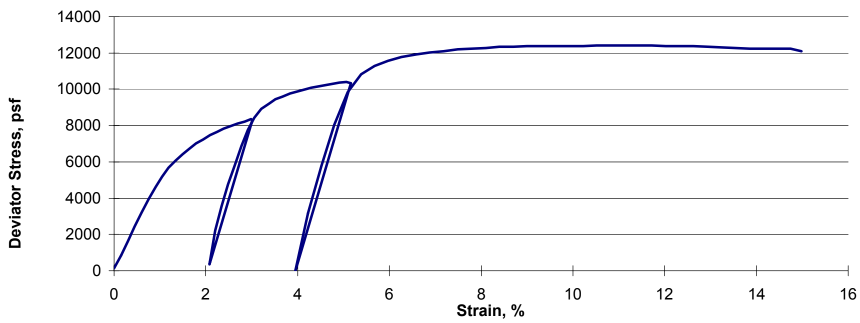
Direct Shear Strength Test

Project: Teichert Schifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B6

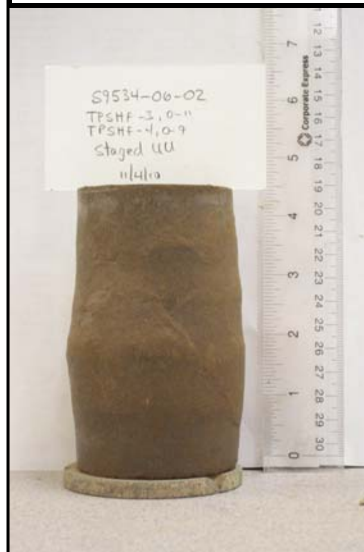
MOHR'S CIRCLES



STRESS-STRAIN



Failure Photo



Test Results

	ϕ, degrees	**30.2**
	c, psf	**1825**

Sample Description

	Sample Number	TPSHF3 and 4
	Sample Depth (feet)	0-11
	Material Description	Brown Sandy lean CLAY

Initial Conditions at Start of Stage

Sample ID (psf), minor principal stress	**1000**	**2000**	**2990**
Height (inch)	5.00	4.90	4.67
Diameter (inch)	2.4	2.43	2.46
Moisture Content (%)	13.3	13.3	13.3
Dry Density (pcf)	111.9	111.9	111.9
Saturation (%)	73.9	73.9	73.9

Shear Test Conditions

Strain Rate (%/min)	0.9855	0.9734	0.9970
Major Principle Stress at Failure (psf)	9340	12420	15410
Strain at failure (%)	2.99	5.06	10.82
Deviator Stress and Fail (psf)	8340	10420	12420

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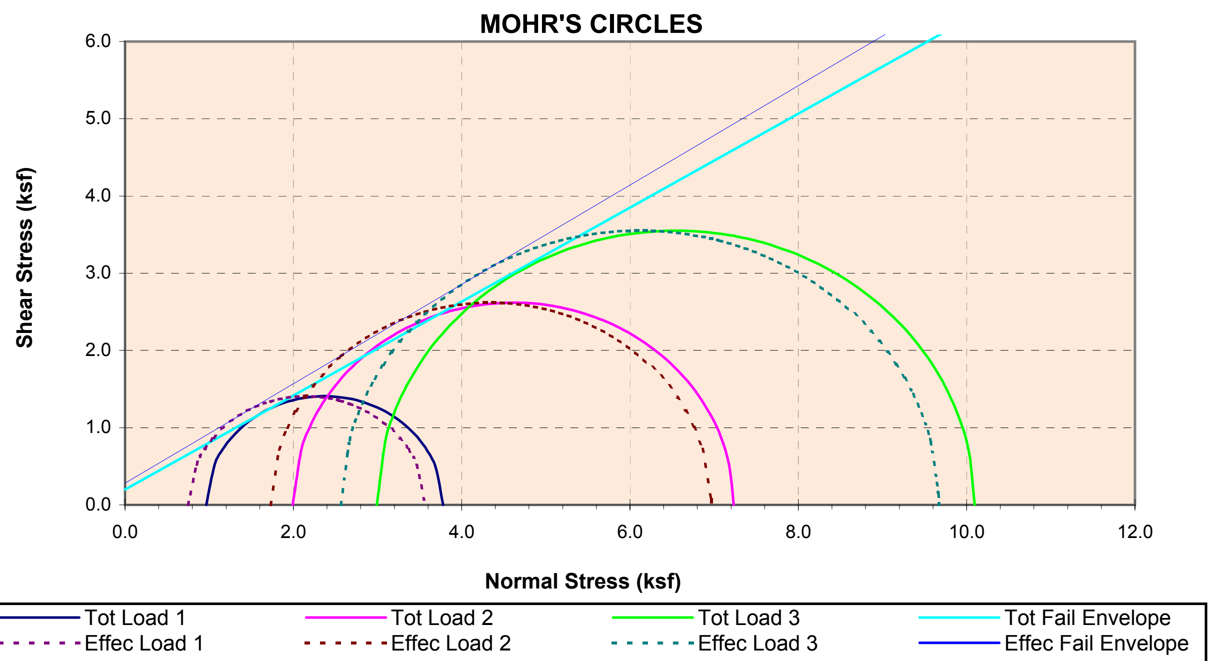
Triaxial Shear Strength - UU Test (staged)

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B7

Consolidated Undrained Triaxial Compression - ICU Test ASTM D4767

Boring Number	TPSHF3 & TPSHF4
Sample Number	TPSHF3-0-11 and TPSHF4-0-9
Sample Description	Dark brown Sandy lean CLAY



Test Results, At Maximum Principal Stress Ratio	Total		Effective
Friction Angle ϕ (degrees)	**31.3**		**32.8**
cohesion (psf)	**200**		**280**
Initial Conditions at Start of Test	stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure	**970**	**1990**	**2990**
Height (inch)	5.00	4.89	4.76
Diameter (inch)	2.4	2.42	2.44
Moisture Content (%)	13.8	--	--
Dry Density (pcf)	111.3	--	--
Saturation (%)	68.1	--	--
After Saturation			
Dry Density (pcf)	111.3	--	--
After Consolidation			
Dry Density (pcf)	112.0	--	--
Shear Test Conditions			
Dry Density (pcf)	112.0	112.9	113.7
Moisture Content (%)	--	--	19.1
Saturation (%)	--	--	99.8
Strain rate (%/hr)	2.44	2.98	2.15
Cell pressure (psf)	13160	14170	15160
Initial Back Pressure (psf)	12190	12180	12170
Initial Effective Confining Pressure (psf)	970	1990	2990
Total Major Principal Stress At Failure (psf)	3780	7230	10090
Effective Major Principal Stress At Failure (psf)	3560	6960	9670
Pore Pressure At Failure (psf)	220	270	430
Effective Minor Princial Stress At Failure (psf)	750	1730	2570

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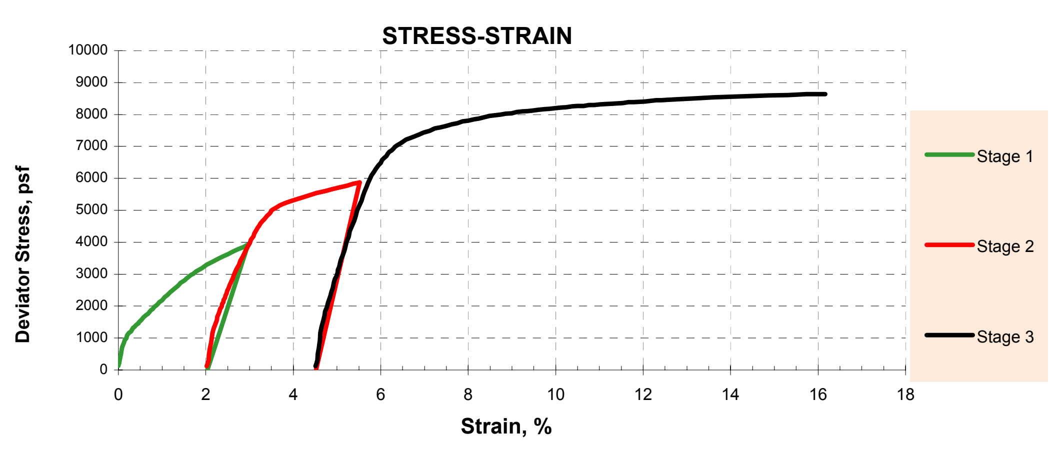
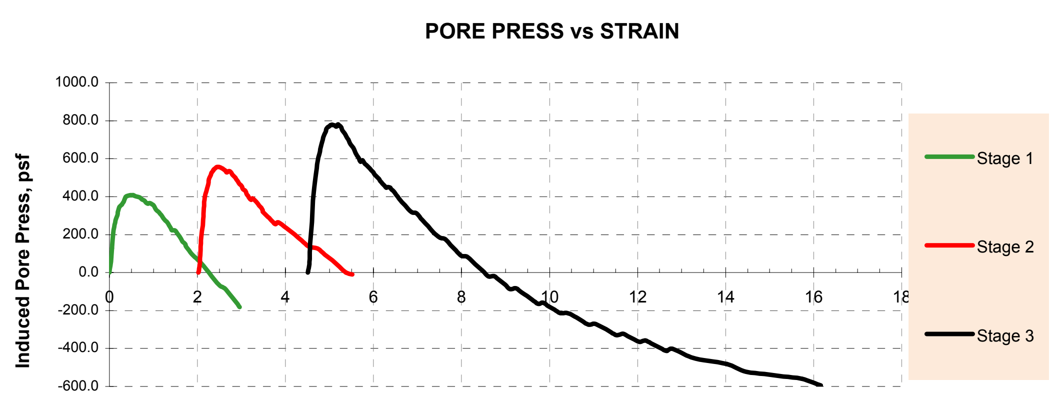
Triaxial Shear Strength - CU Test, ASTM D4767 with pore pressure measurements (staged)

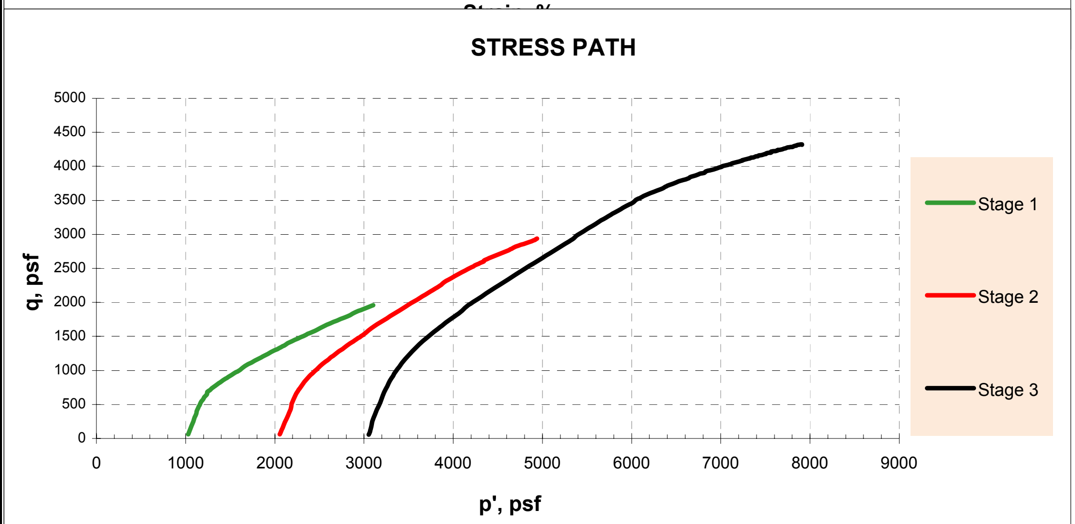
Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B8

CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION - ICU TEST ASTM D4767

Boring Number	TPSHF3 & TPSHF4
Sample Number	TPSHF3-0-11 and TPSHF4-0-9
Sample Description	Dark brown Sandy lean CLAY







After shear photo

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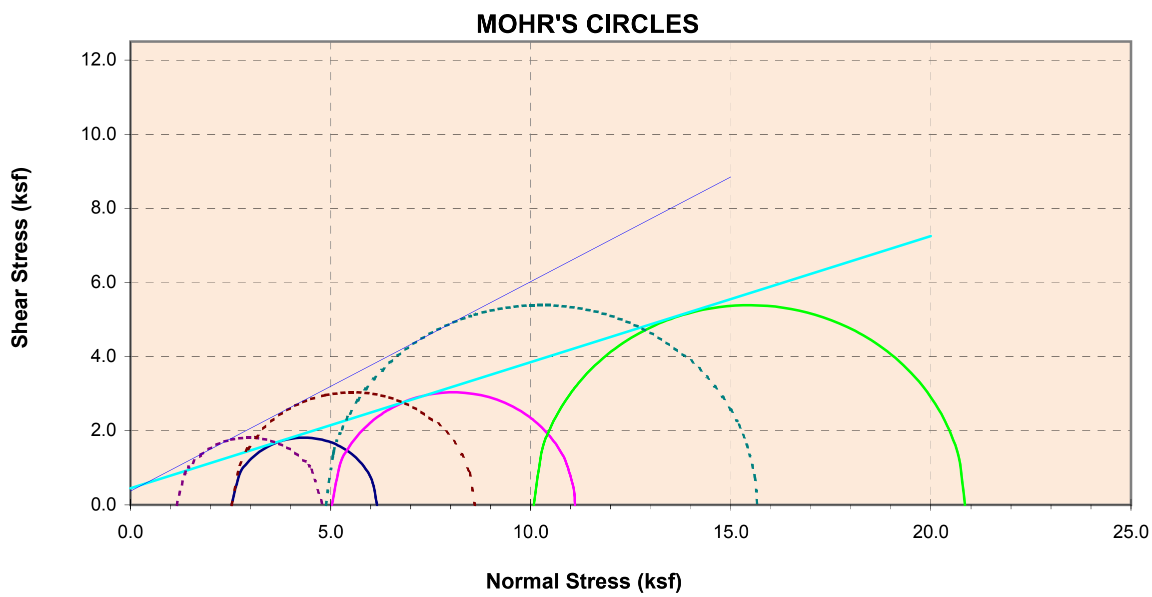
3160 Gold Valley Drive, Suite 800
Rancho Cordova, California 95742
Telephone: (916) 852-9118
Fax: (916) 852-9132

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

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B8

Consolidated Undrained Triaxial Compression - ICU Test ASTM D4767

Boring Number	B1
Sample Number	B1-91
Sample Description	Dark greenish gray Fat CLAY



Test Results, At Maximum Principal Stress Ratio	Total		Effective
Friction Angle ϕ (degrees)	18.8		29.5
cohesion (psf)	450		375
Initial Conditions at Start of Test	stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure	2530	5030	10080
Height (inch)	4.81	4.69	4.61
Diameter (inch)	2.42	2.41	2.41
Moisture Content (%)	30.9	--	--
Dry Density (pcf)	92.8	--	--
Saturation (%)	93.2	--	--
After Saturation			
Dry Density (pcf)	92.8	--	--
After Consolidation			
Dry Density (pcf)	95.9	--	--
Shear Test Conditions			
Dry Density (pcf)	95.9	97.2	99.0
Moisture Content (%)	--	--	28.9
Saturation (%)	--	--	100.0
Strain rate (%/hr)	1.41	1.33	0.99
Cell pressure (psf)	9780	12270	17320
Initial Back Pressure (psf)	7250	7240	7250
Initial Effective Confining Pressure (psf)	2530	5030	10080
Total Major Principal Stress At Failure (psf)	6160	11110	20850
Effective Major Principal Stress At Failure (psf)	4790	8600	15660
Pore Pressure At Failure (psf)	1370	2500	5200
Effective Minor Princial Stress At Failure (psf)	1160	2530	4880

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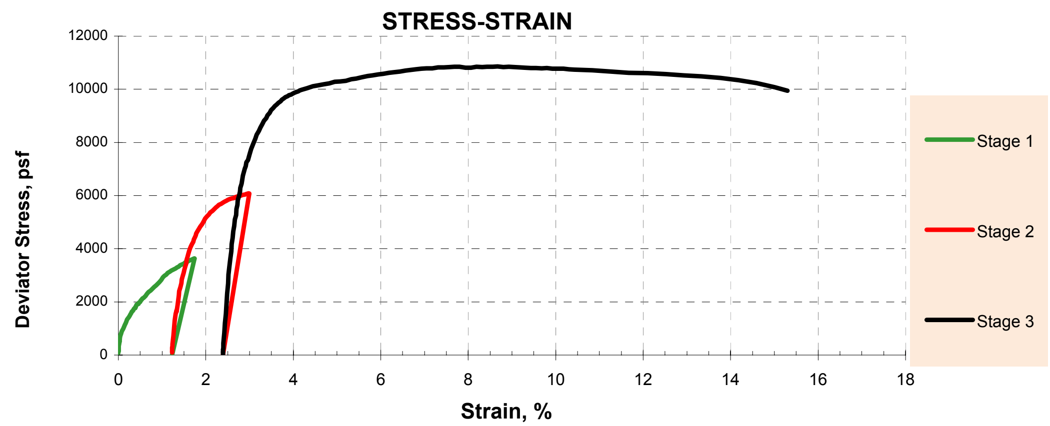
Triaxial Shear Strength - CU Test, ASTM D4767 with pore pressure measurements (staged)

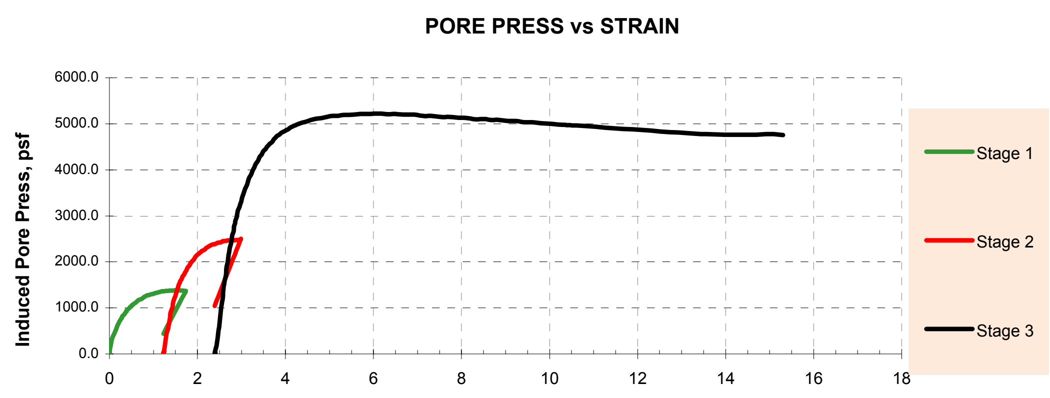
Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B9

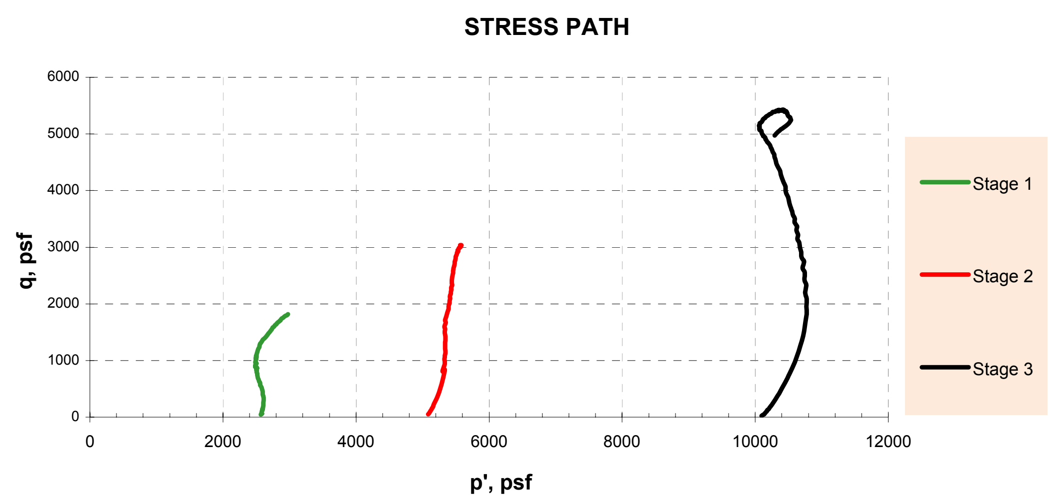
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION - ICU TEST ASTM D4767

Boring Number	B1
Sample Number	B1-91
Sample Description	Dark greenish gray Fat CLAY



After shear photo





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

Project: Teichert Shifler Mining and Reclamation
Location: Woodland, CA
Number: S9534-05-04
Figure: B9

Ausenco Vector

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-422

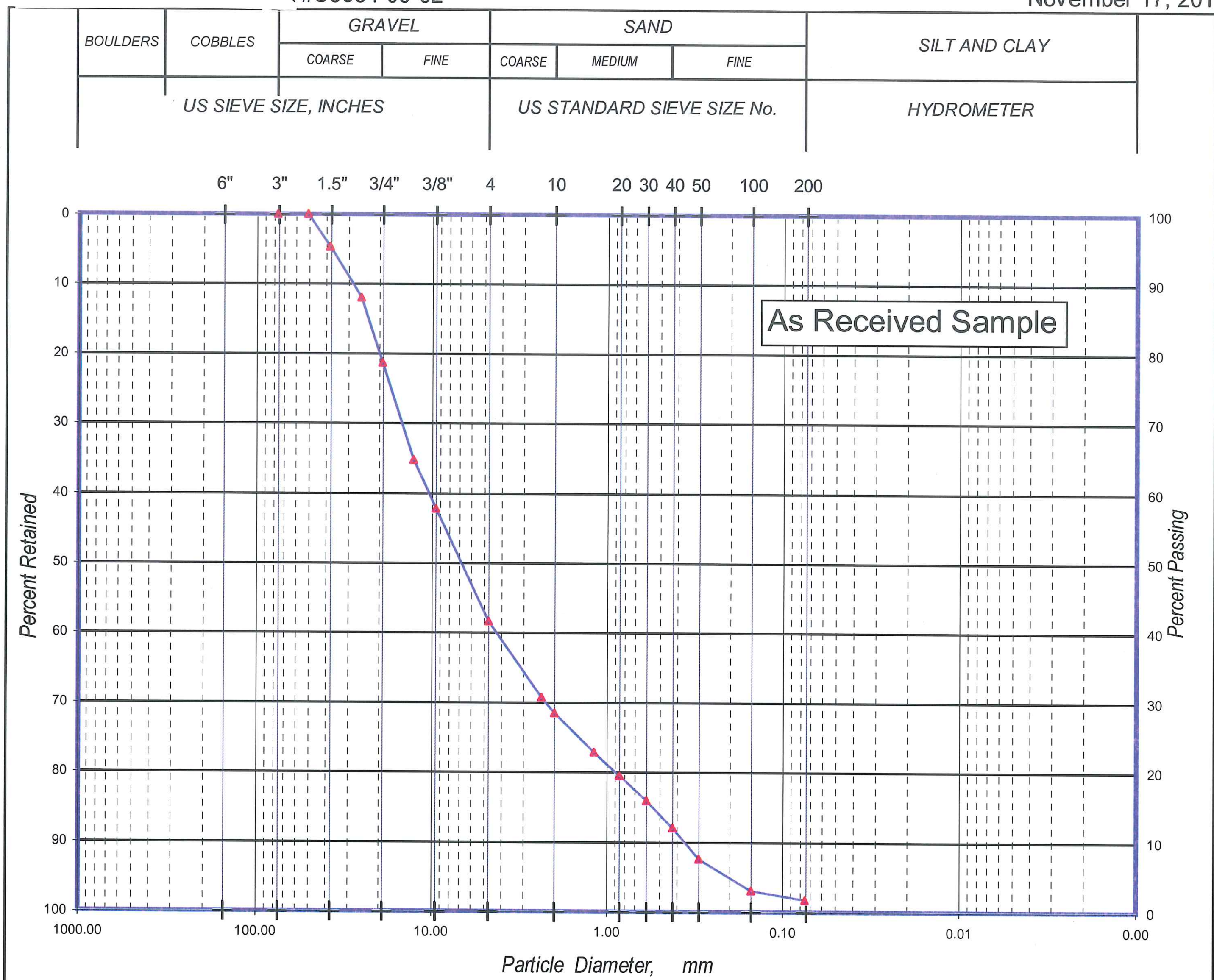
Client : GEOCON

Project No: USVC0009500

Lab Sample No: **3117C**

Project Name: #S9534-06-02

Report Date: November 17, 2010



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	Composite of TPSHF4 and TPSHF6	Well Graded Gravel w/ Sand	58.4	39.8	1.7

Size Passing, mm D_{60} = 10.55 D_{30} = 2.25 D_{10} = 0.37

Coefficient of Curvature, C_c: 1.30 Coefficient of Uniformity, C_u: 28.61 Fineness Modulus = 5.47

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

Ausenco Vector

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-422

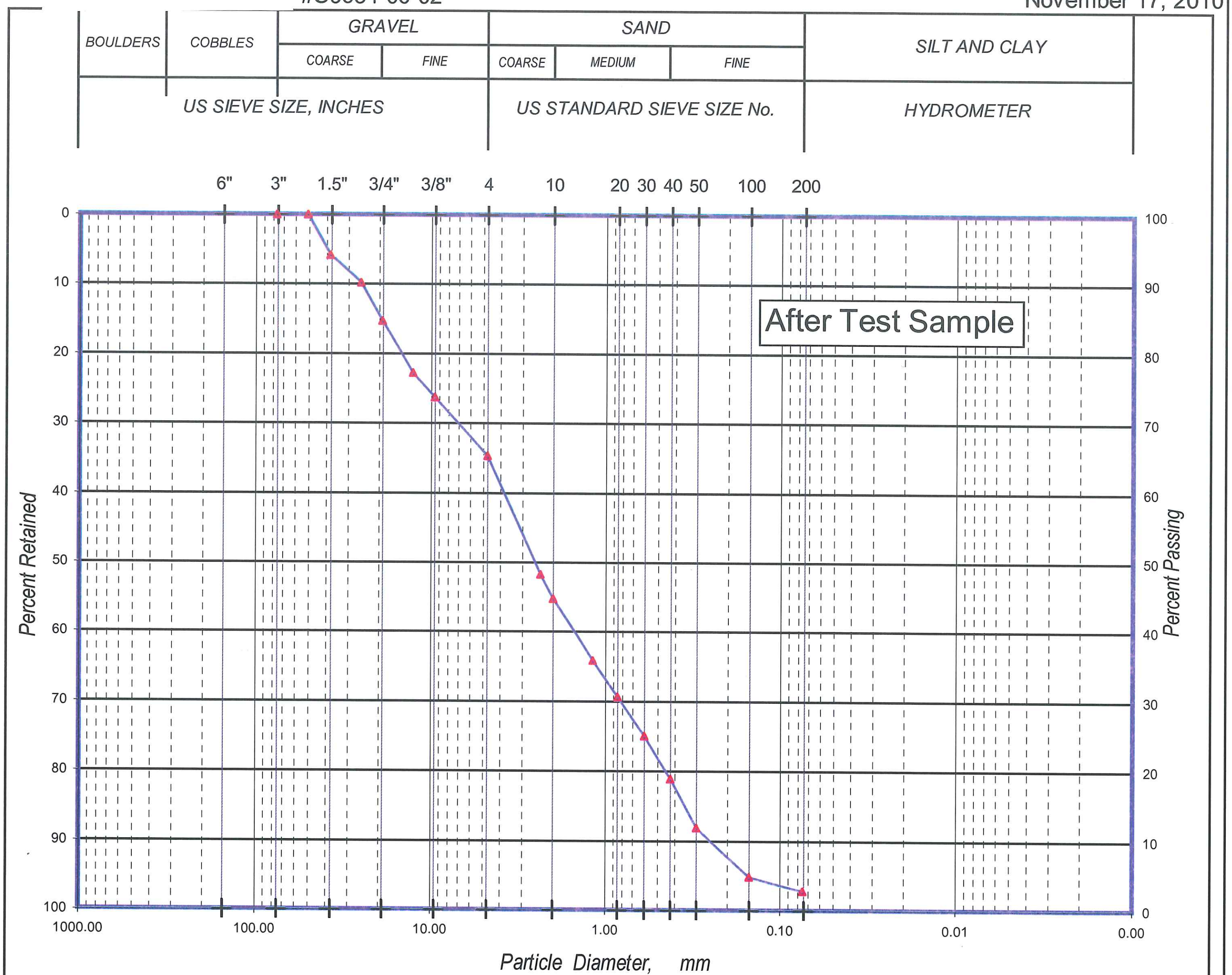
Client: GEOCON

Project No: USVC0009500

Lab Sample No: **3117C-1**

Project Name: #S9534-06-02

Report Date: November 17, 2010



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	Composite of TPSHF4 and TPSHF6	Poorly Graded Sand w/ Gravel (SP)	34.7	62.6	2.7

Size Passing, mm D_{60} = 4.01 D_{30} = 0.82 D_{10} = 0.26

Coefficient of Curvature, C_c: 0.65 Coefficient of Uniformity, C_u: 15.34 Fineness Modulus = 4.57

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

Ausenco Vector

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear

Report Date: November 17, 2010

Client Name: GEOCON   Project Name: #S9534-06-02   Project No: USVC0009500

Superstrate: ⇦ PVC Board

Material 1: ⇦ Composite of TPSHF4 and TPSHF6   LSN: 3117C   Remolded

Material 2: ⇨ Composite of TPSHF4 and TPSHF6   LSN: 3117C   Remolded

Substrate: ⇨ PVC Board

PEAK STRENGTH

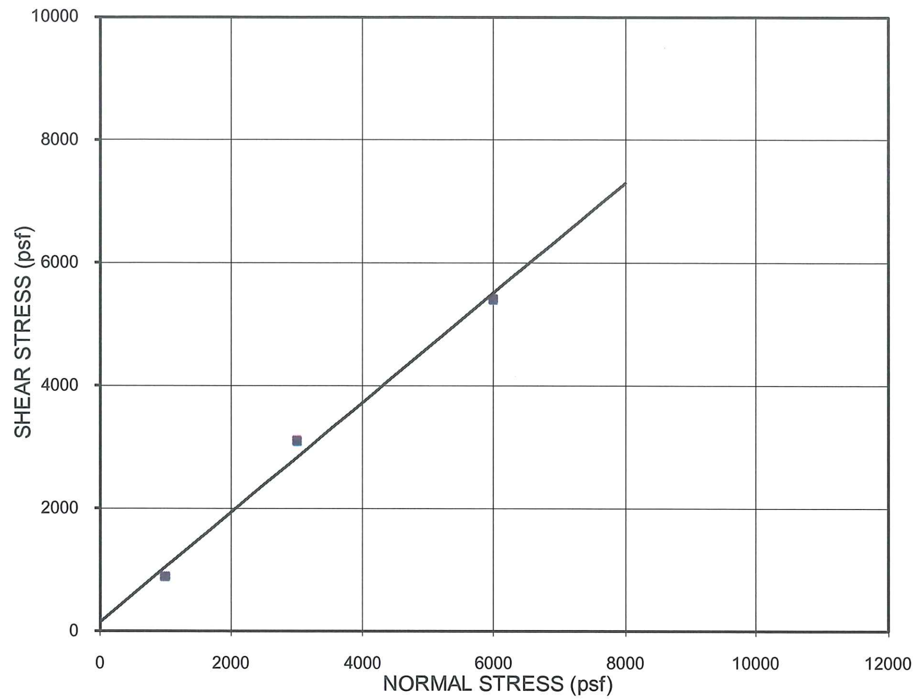
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	6.9	1000	890	42
2.	20.8	3000	3090	46
3.	41.7	6000	5400	42

Adhesion: 150 psf

Friction Angle: 42 degrees

Coefficient of Friction: 0.89

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 3.0 in. displacement)

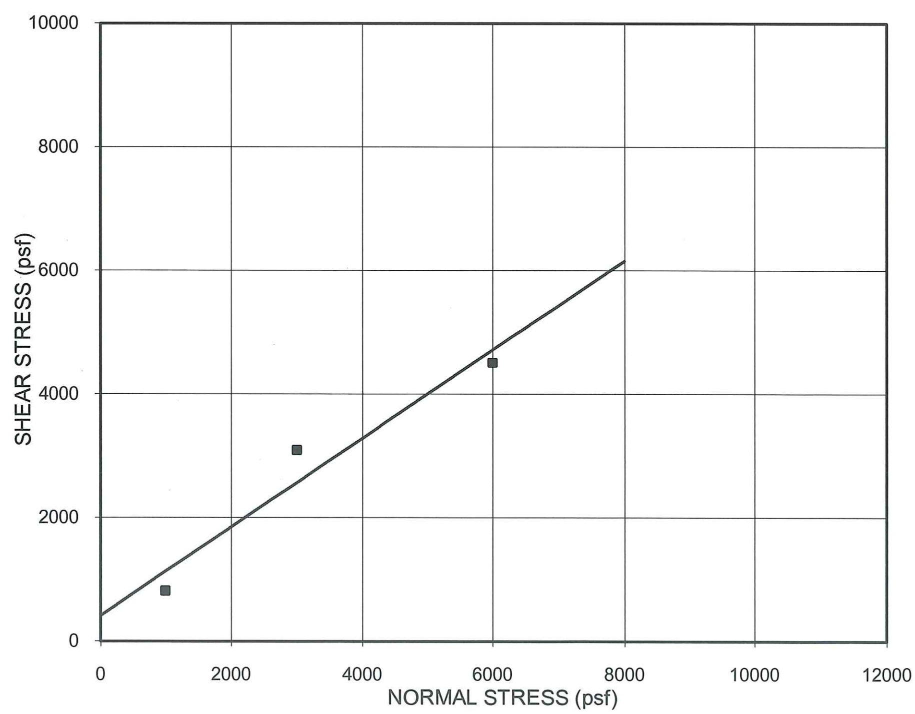
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	6.9	1000	820	39
2.	20.8	3000	3090	46
3.	41.7	6000	4510	37

Adhesion: 420 psf

Friction Angle: 36 degrees

Coefficient of Friction: 0.72

NOTE: GRAPH NOT TO SCALE



L:Labexcel \ Projects \ 20US \ USVC00 \ 3117C-LSDS-rp   Entered By: KH   Print Date: 11/18/10   Rev . By: Lab Log: 3117C

DCN: LSDS-rp (rev., 01/026/09)

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear

Report Date: November 17, 2010

Client Name: GEOCON

Project Name: #S9534-06-02

Project No: USVC0009500

Superstrate: ⇦	PVC Board			
Material 1: ⇦	Composite of TPSHF4 and TPSHF6	LSN:	3117C	Remolded
Material 2: ⇨	Composite of TPSHF4 and TPSHF6	LSN:	3117C	Remolded
Substrate: ⇨	PVC Board			

DISPLACEMENT vs. SHEAR STRESS

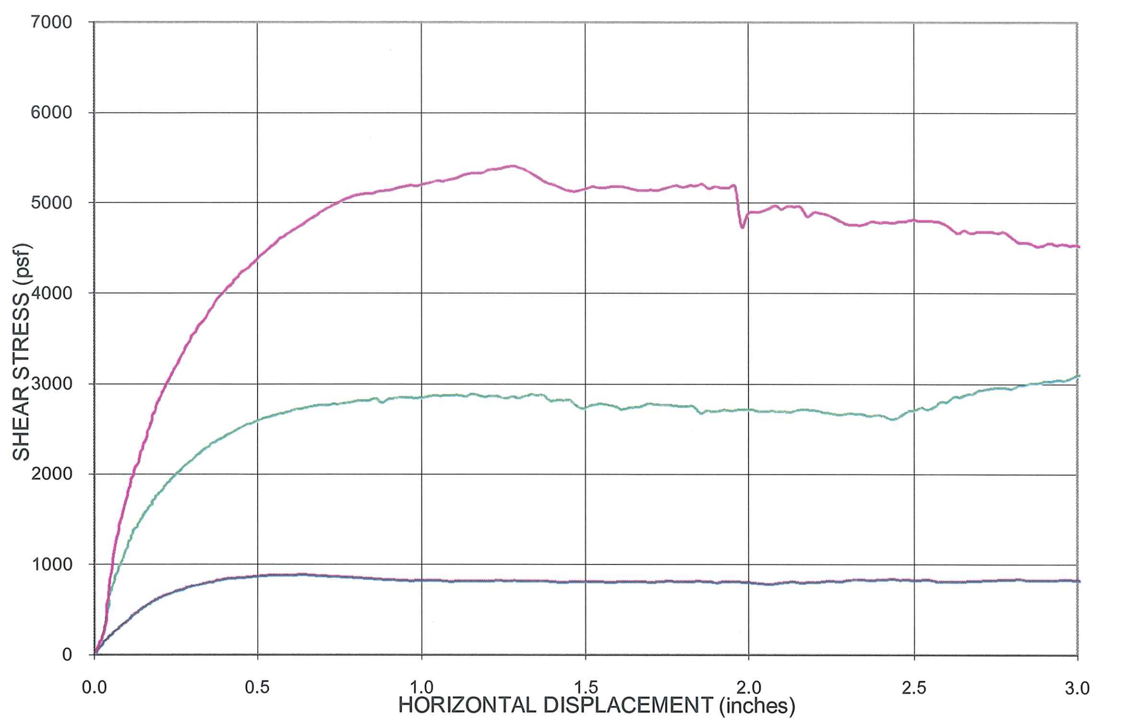
Test Point	*Normal Stress* psi	*Normal Stress* psf
1.	6.9	1000
2.	20.8	3000
3.	41.7	6000

MOISTURE DATA:

(Soil)

Initial Water Content: 2.3%

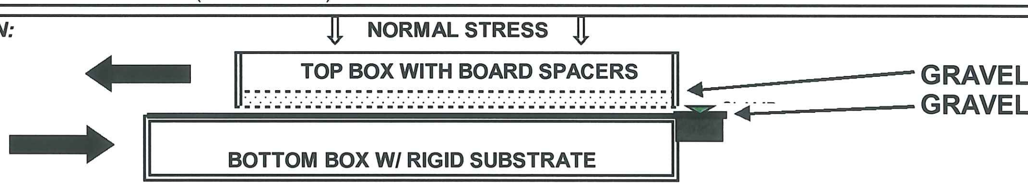
Initial Dry Density: 120.3 pcf



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

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure 3080 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

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

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 (FOS) 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 C1. Graphical representations of the seepage analyses, potential critical failure surfaces, and parameters used for each analysis are presented on Figures C1 through C18.

Proj. No. S9534-05-04

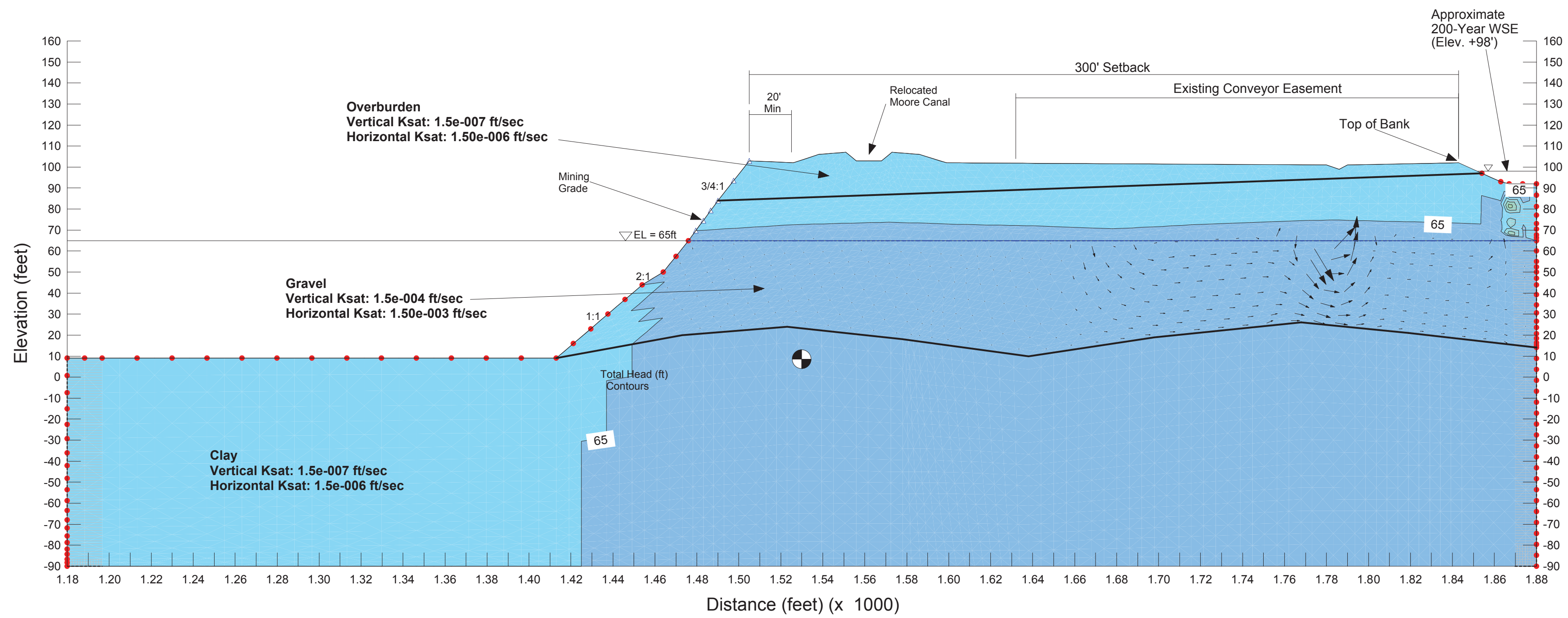
TEICHERT SHIFLER

TABLE C1 - SLOPE STABILITY SUMMARY

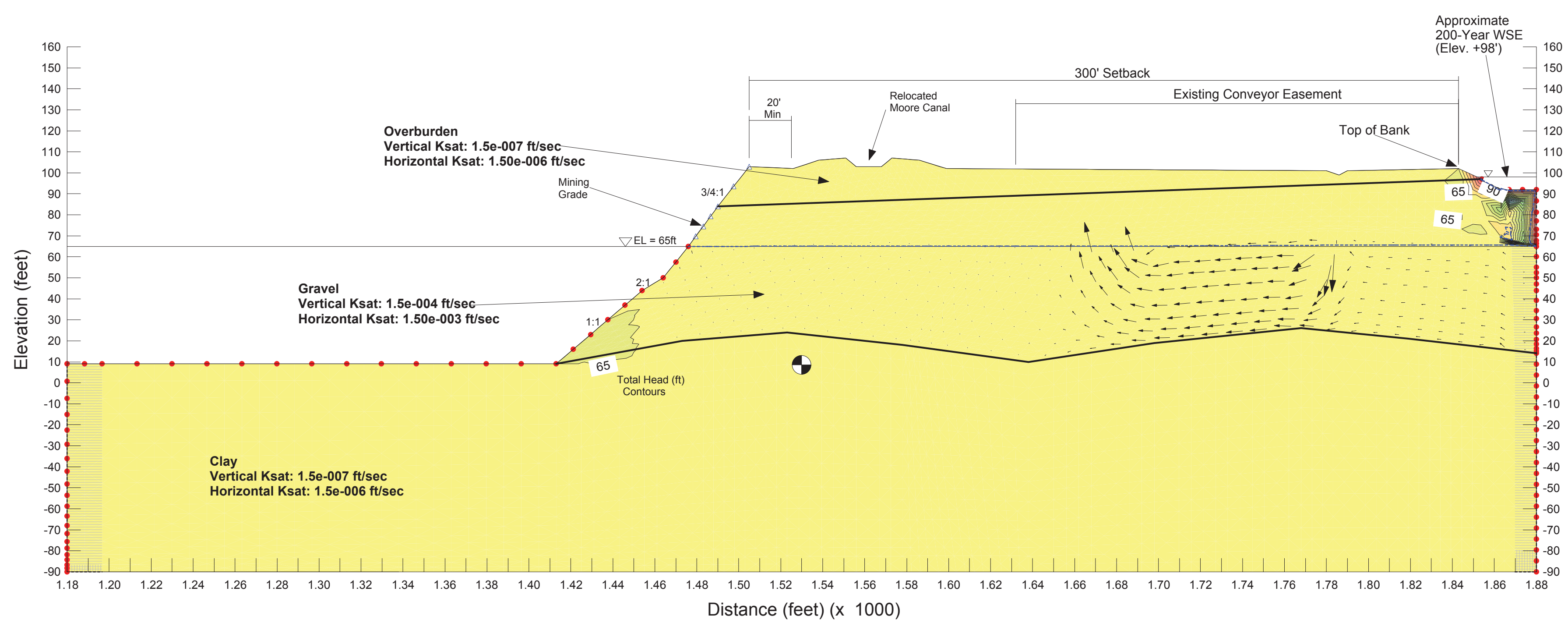
Condition	Portion of Pit	Overall Height	Water Elevation	Factor of Safety - Static Conditions, Distance From Top of Mining Slope: 10	25	50	Factor of Safety - Seismic Conditions, Distance From Top of Mining Slope: 10	25	50
Mining	Northeast Slope (A-A')	100	50	1.1	1.2	1.3	1.0	1.1	1.1
			65	1.1	1.1	1.2	1.0	1.0	1.0
Mining	West Slope (B-B')	65	50	1.2	1.3	1.7	1.0	1.1	1.1
			65	1.1	1.2	1.6	1.0	1.0	1.0
Mining	East Slope (C-C')	40	50	1.2	1.6	2.1	1.1	1.3	1.4
			65	1.2	1.6	2.1	1.1	1.3	1.3
Mining	North-Central Slope (D-D')	95	50	1.2	1.2	1.3	1.0	1.1	1.1
			65	1.1	1.1	1.3	1.0	1.0	1.0
Reclamation	Northeast Slope (A-A')	100	40	1.5			1.4		
			62	1.8			1.4		
Reclamation	West Slope (B-B')	35	40	3.7			2.3		
			62	3.7			2.0		
Reclamation	East Slope (C-C')	35	40	2.7			2.0		
			62	2.7			1.7		
Reclamation	North-Central Slope (D-D')	100	40	1.8			1.3		
			62	2.2			1.3		

Soil Properties

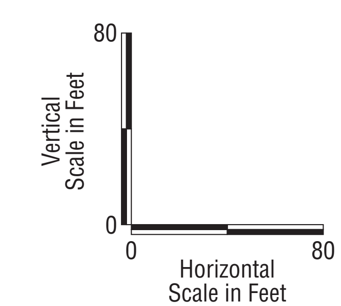
Soil	Unit Weight (pcf)	Cohesion (psf) Total	Cohesion (psf) Effective	Friction Angle (ϕ) Total	Friction Angle (ϕ) Effective
Overburden	125	350	---	20	---
Gravel	125	---	150	---	42
Clay	120	450	375	18	30
Reclamation Fill	125	2000	250	29	34



INITIAL CONDITION



200-YEAR FLOOD – 30 DAYS



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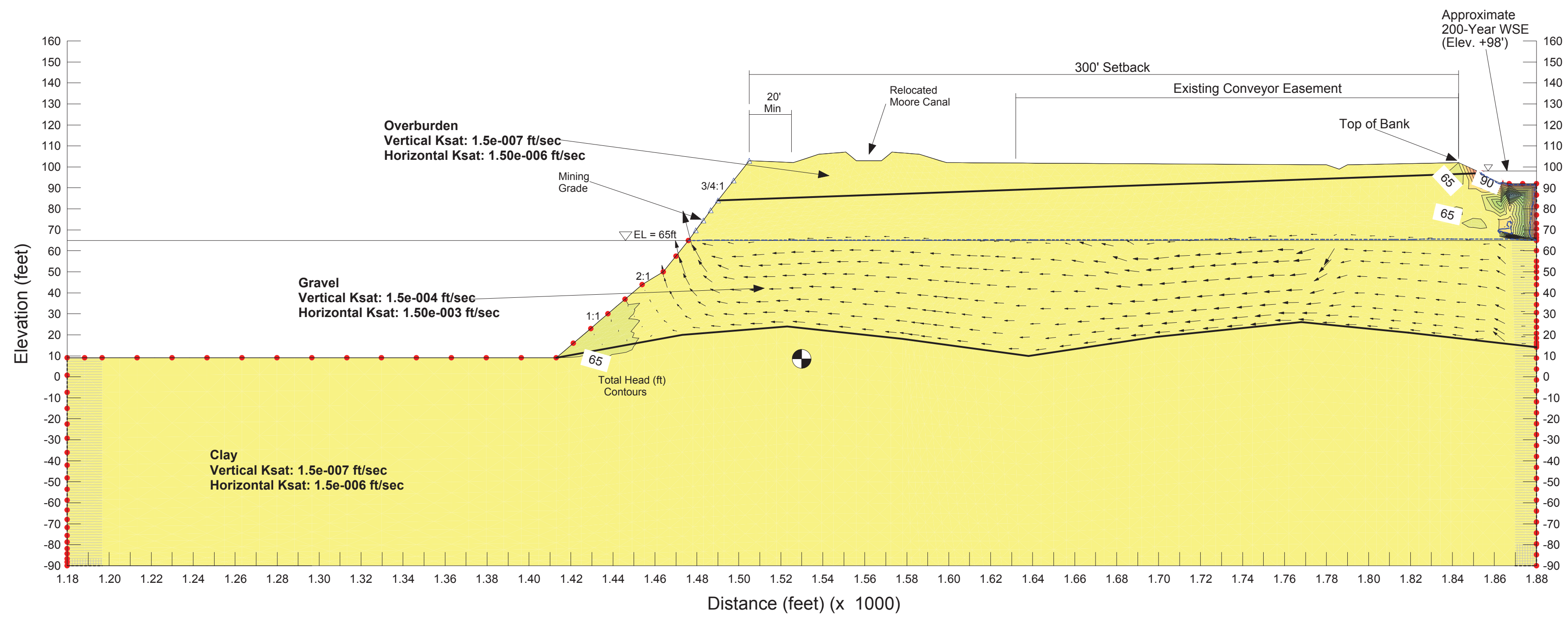
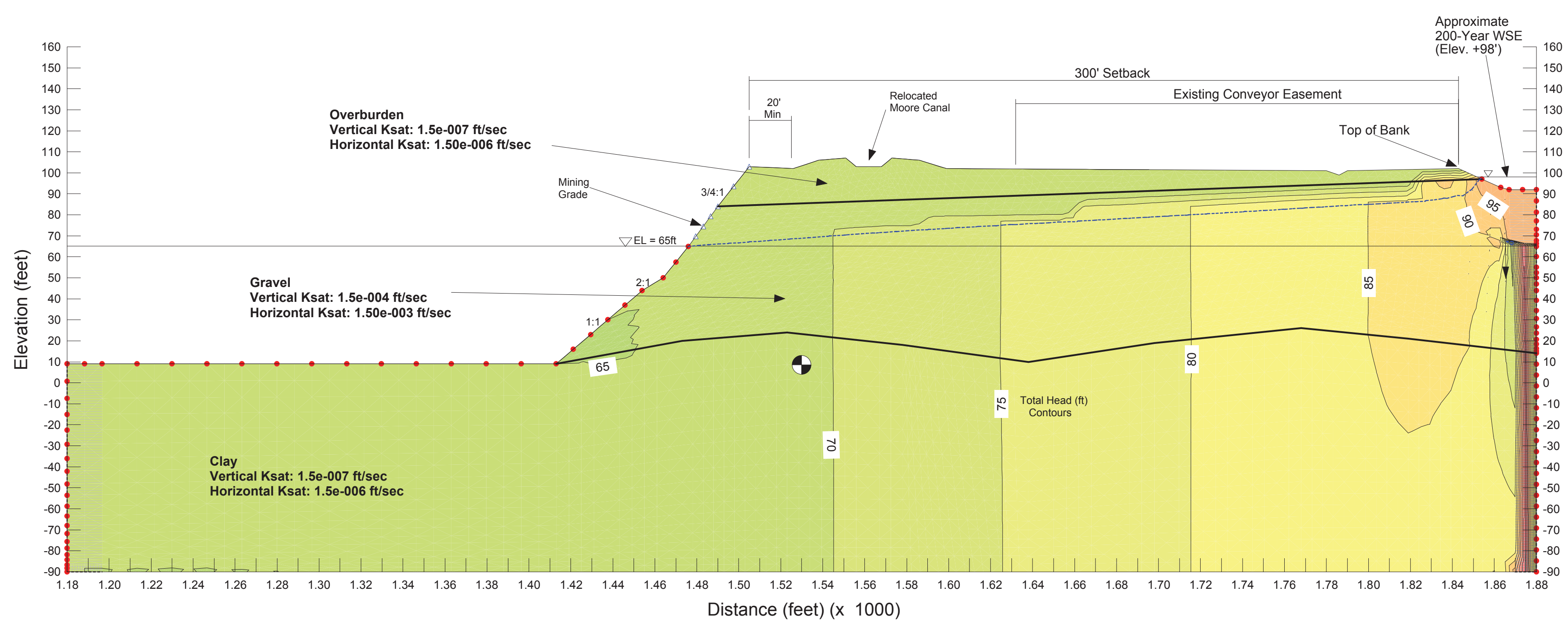
California

SEEPAGE ANALYSIS

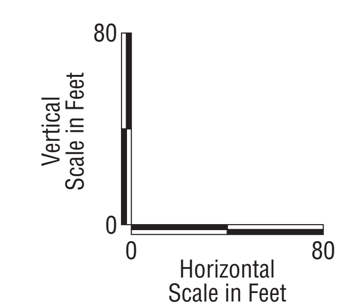
S9534-05-04	May 2014	Figure C1



200-YEAR FLOOD – 100 DAYS



200-YEAR FLOOD – 100 YEARS



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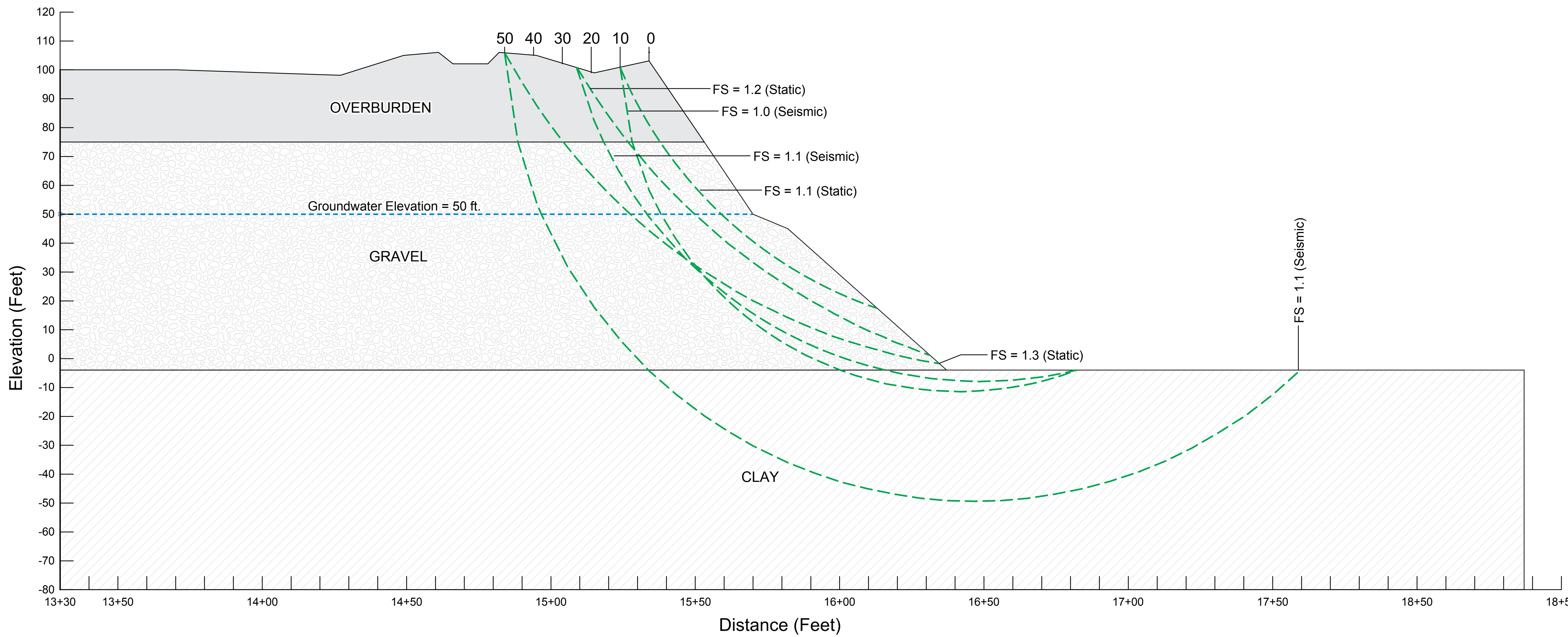
SEEPAGE ANALYSIS

S9534-05-04	May 2014	Figure C2

Northeast Slope (Mining) – Water @ 50 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS					
MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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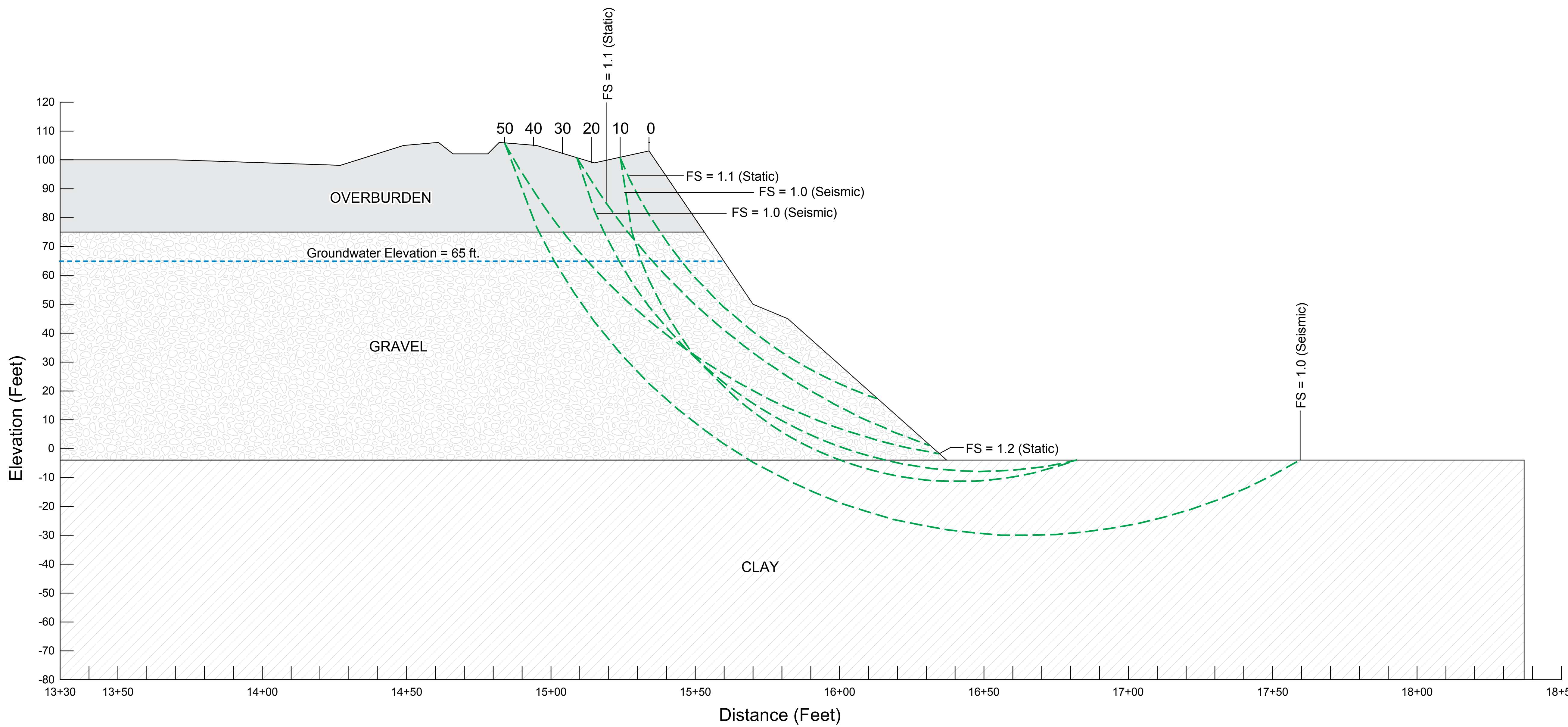
Yolo County, California

SLOPE STABILITY

S9534-05-04	May 2014	Figure C3

Northeast Slope (Mining) – Water @ 65 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS					
MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

– – – – Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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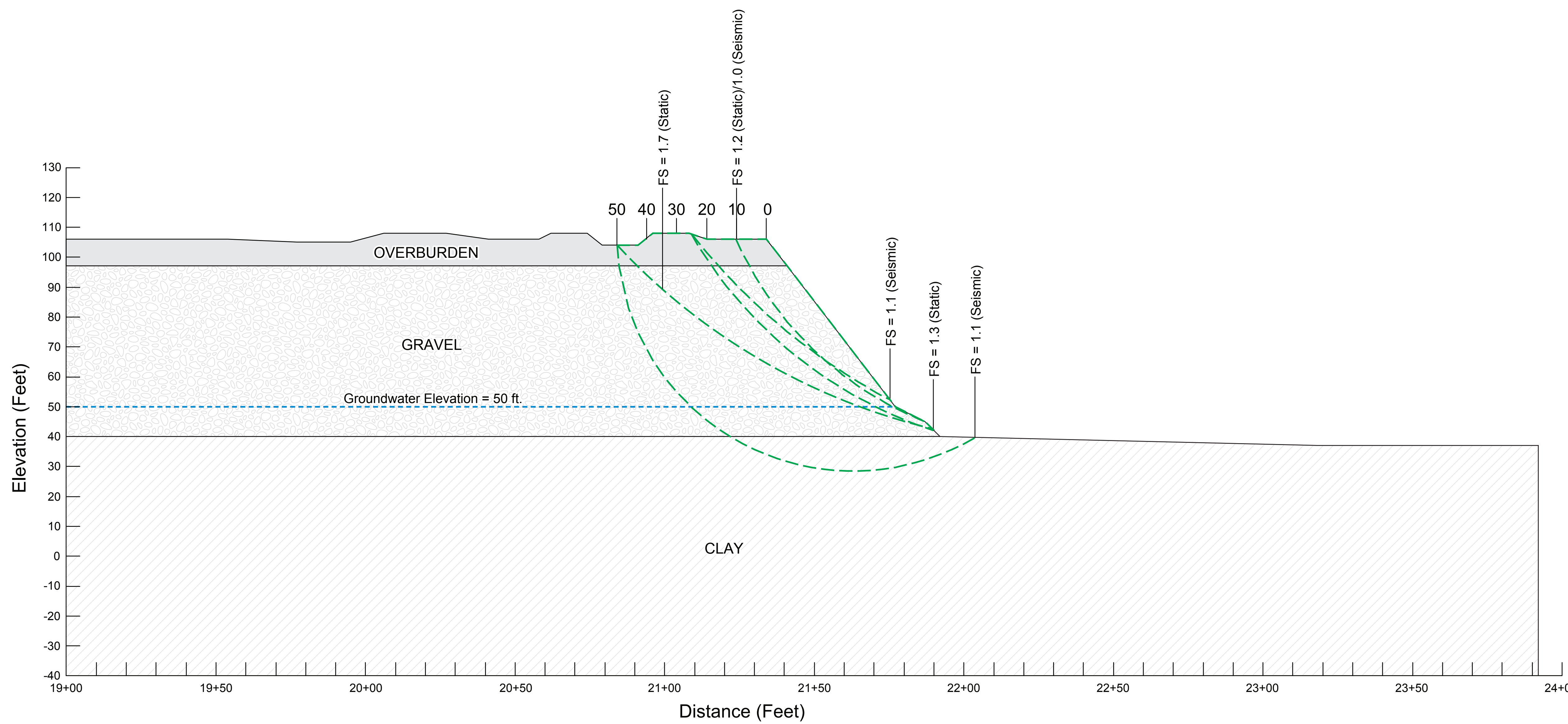
SLOPE STABILITY

S9534-05-04	May 2014	Figure C4

West Slope (Mining) – Water @ 50 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

- – – – Theoretical Failure Surface
- FS = 1.1 Factor of Safety Against Failure (Static/Seismic)

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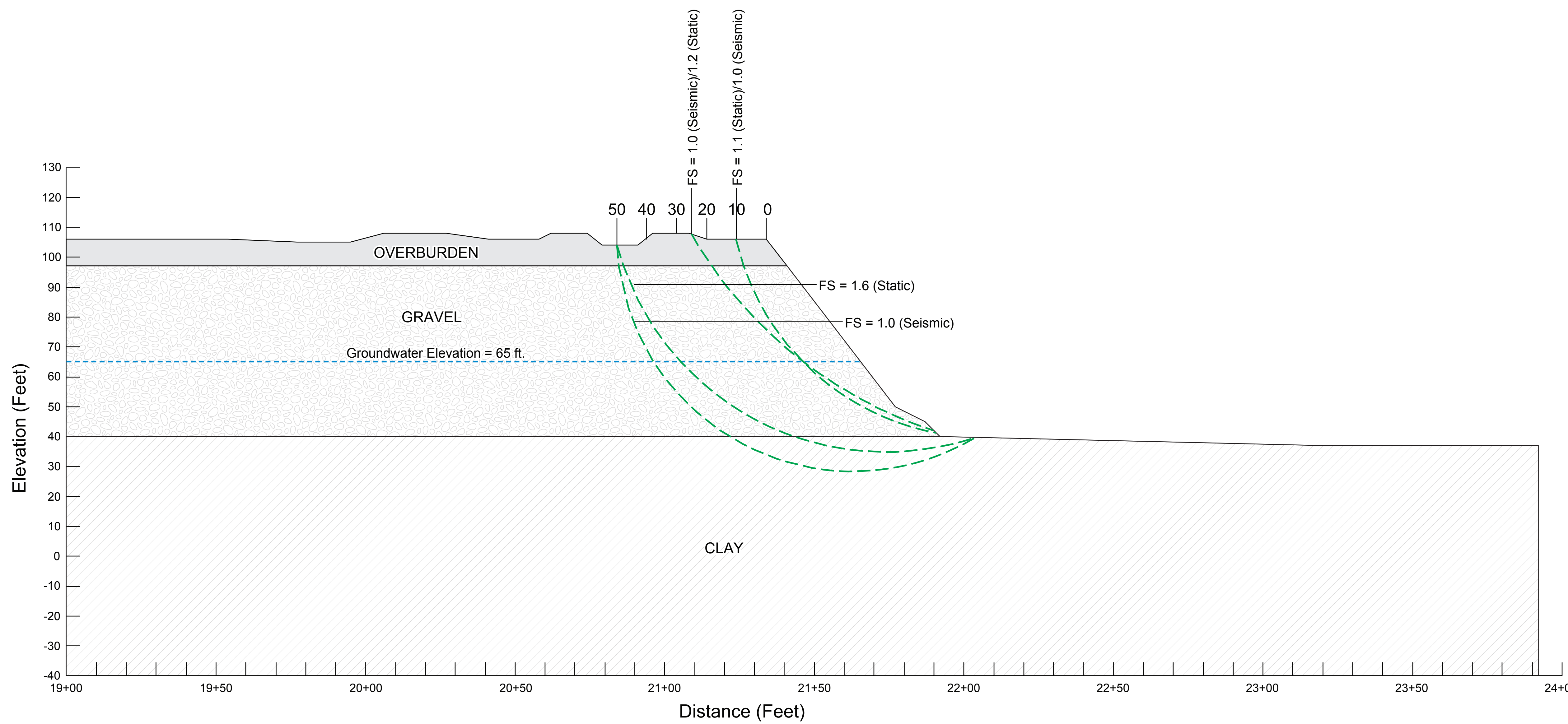
Yolo County, California

SLOPE STABILITY

S9534-05-04 | May 2014 | Figure C5

West Slope (Mining) – Water @ 65 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

- – – – Theoretical Failure Surface
- FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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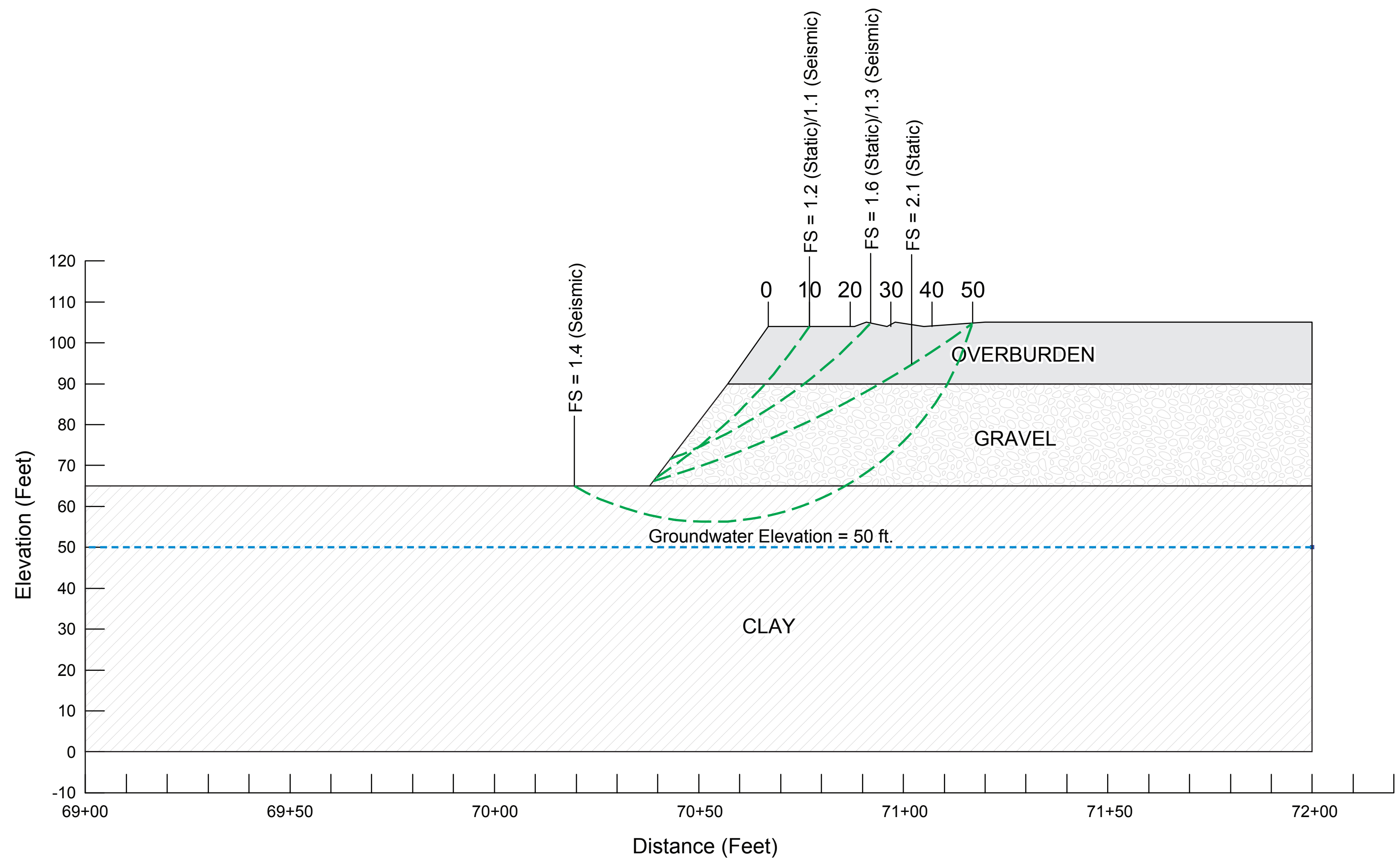
Yolo County, California

SLOPE STABILITY

S9534-05-04	May 2014	Figure C6

East Slope (Mining) – Water @ 50 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W,
VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

- - - - Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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Teichert Shifler Mining and Reclamation Project

Yolo County,
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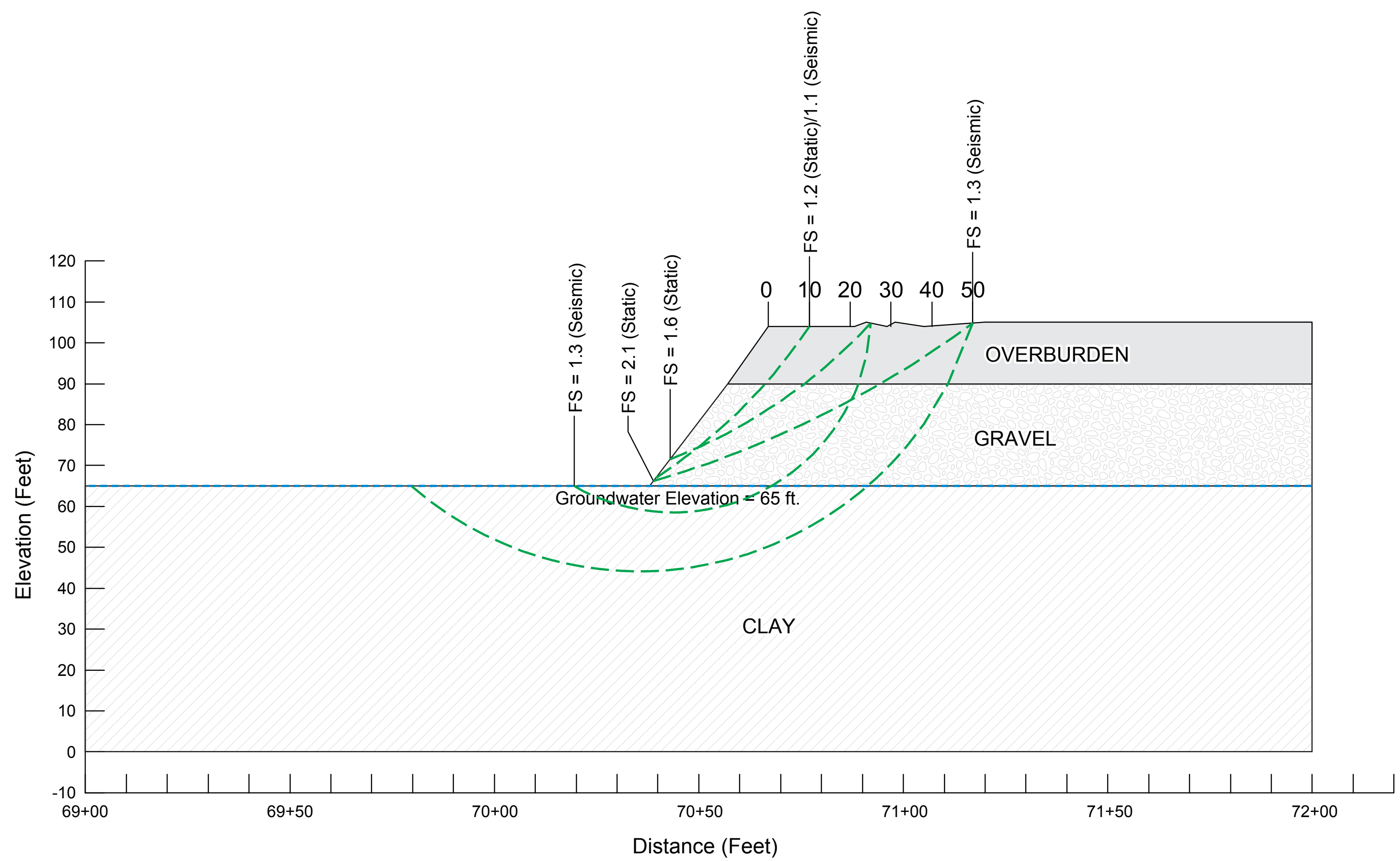
SLOPE STABILITY

S9534-05-04	May 2014	Figure C7

East Slope (Mining) – Water @ 65 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

– – – – Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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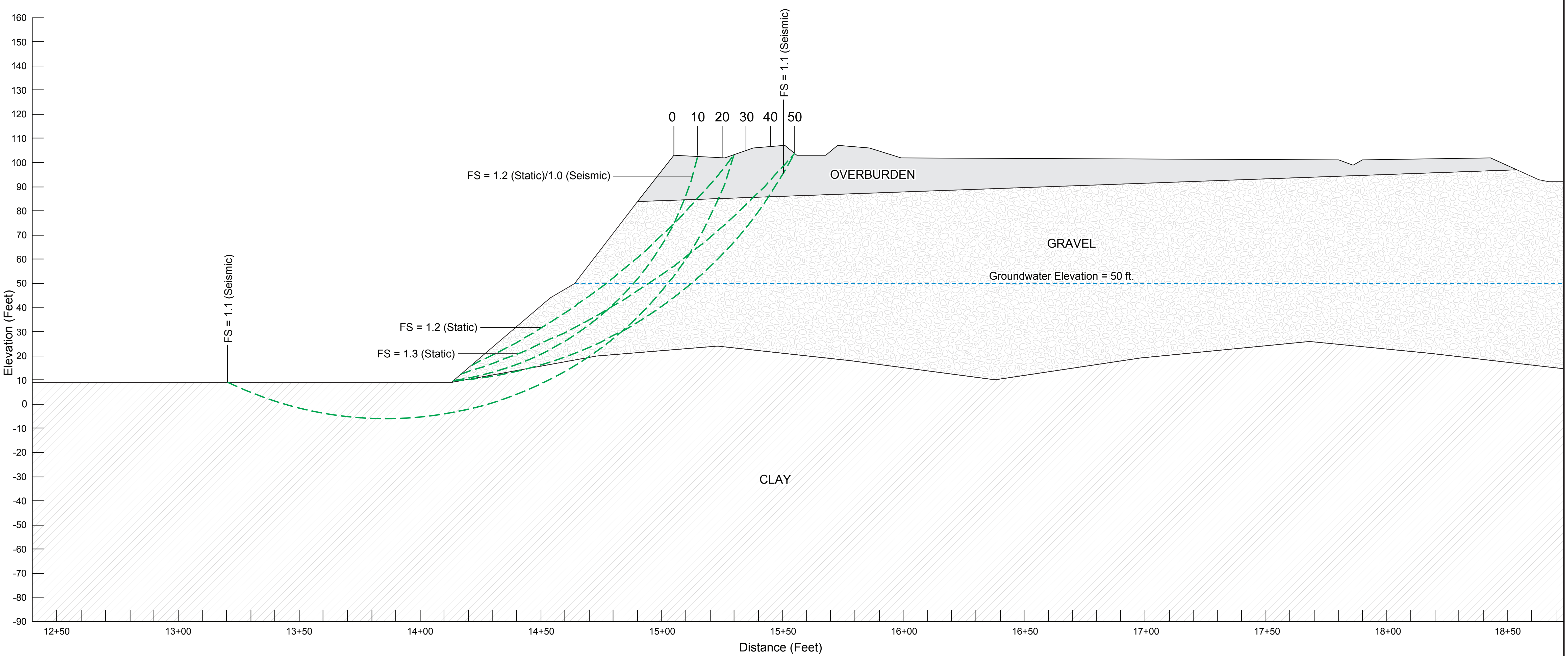
SLOPE STABILITY

S9534-05-04 | May 2014 | Figure C8

North-Central Slope (Mining) – Water @ 50 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS					
MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

– – – – Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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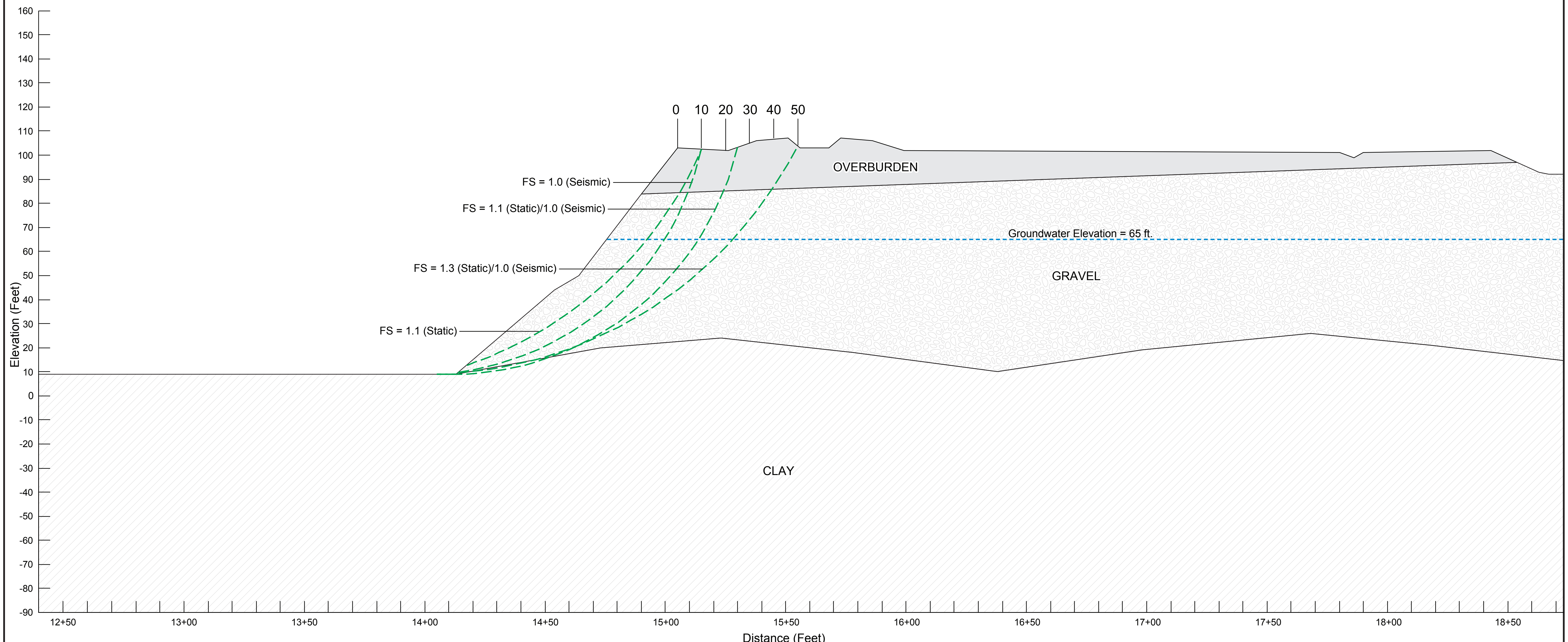
SLOPE STABILITY

S9534-05-04	May 2014	Figure C9

North-Central Slope (Mining) – Water @ 65 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS					
MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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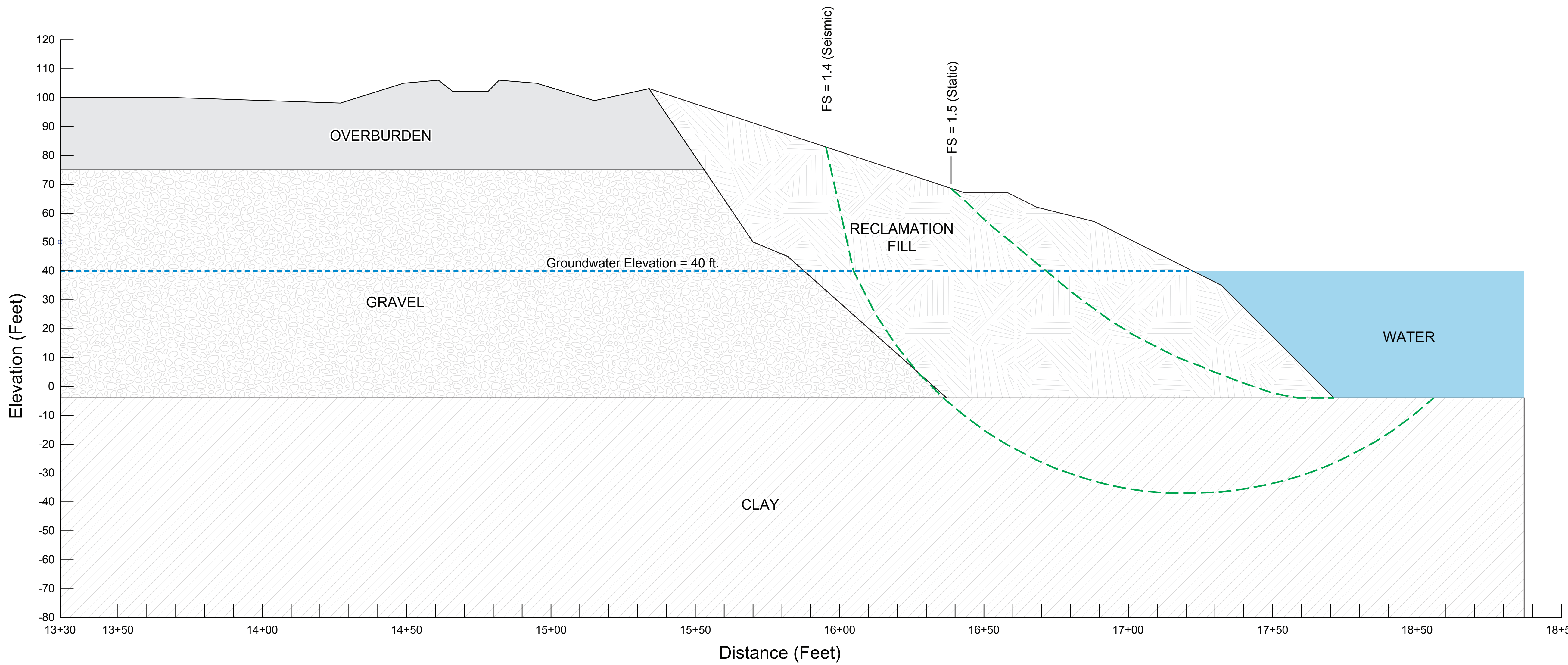
SLOPE STABILITY

S9534-05-04	May 2014	Figure C10

Northeast Slope (Reclamation) – Water @ 40 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

- - - - Theoretical Failure Surface

FS = 1.1 Factor of Safety Against Failure (Static/Seismic)

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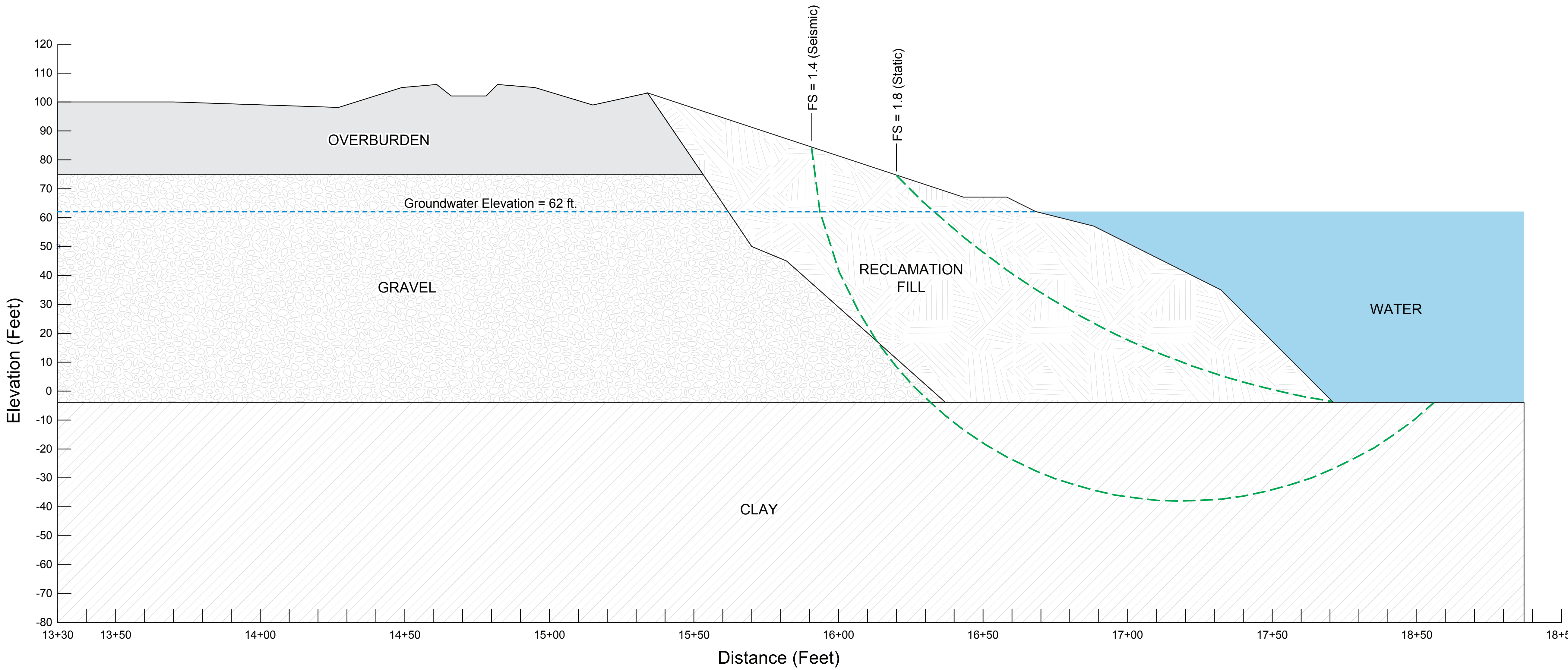
SLOPE STABILITY

S9534-05-04	May 2014	Figure C11

Northeast Slope (Reclamation) – Water @ 62 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

- - - - Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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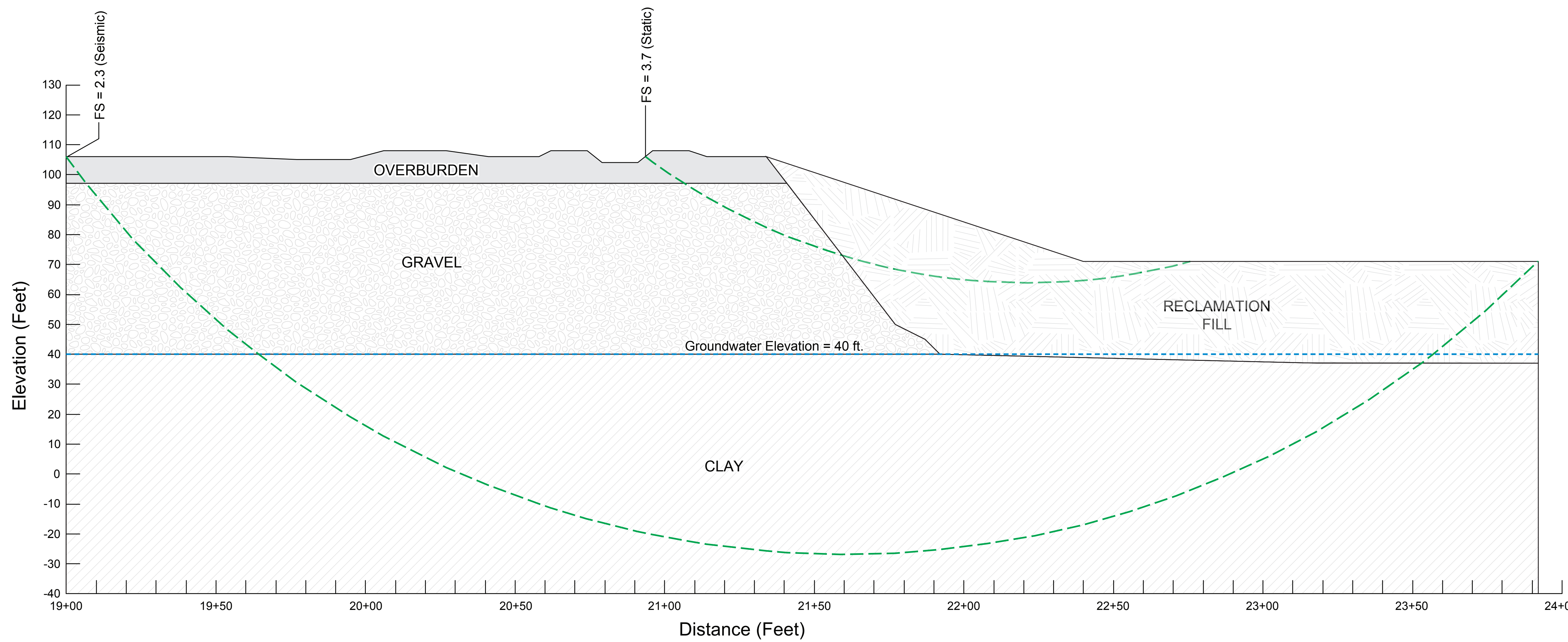
SLOPE STABILITY

S9534-05-04	May 2014	Figure C12

West Slope (Reclamation) – Water @ 40 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

– – – – Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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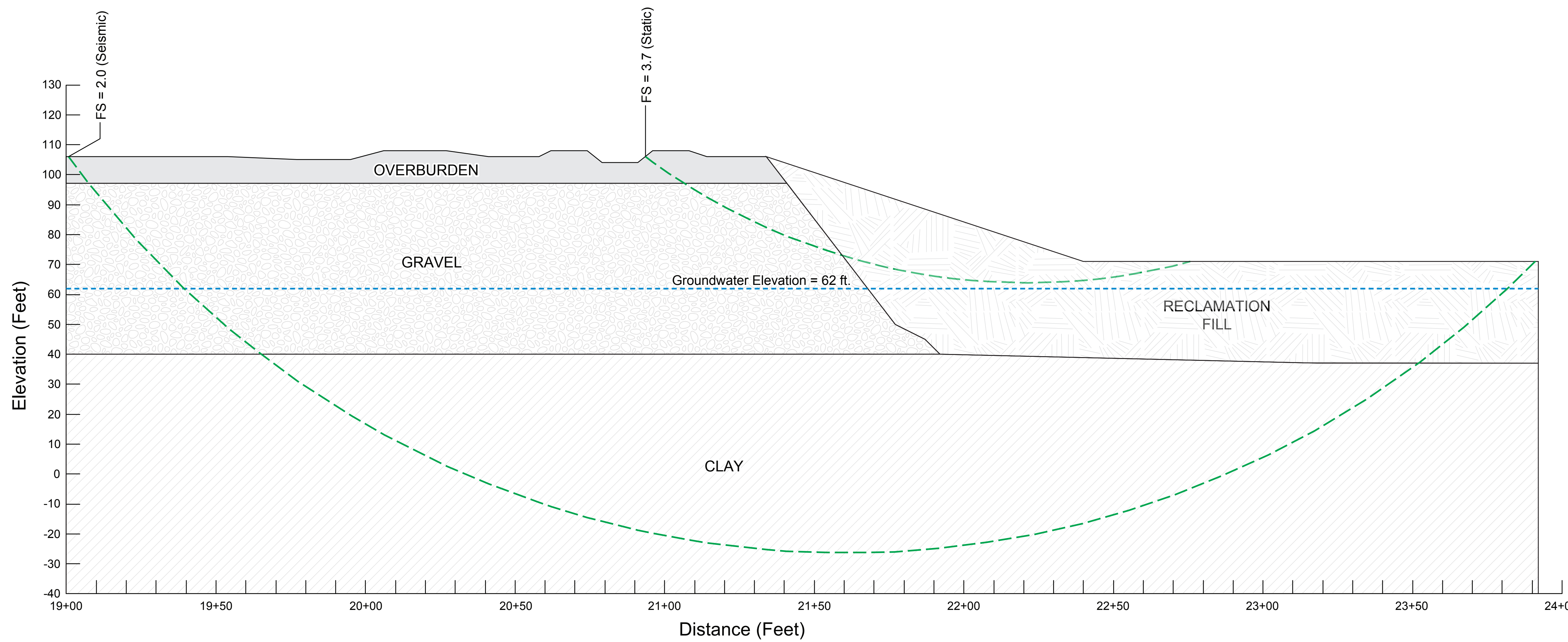
SLOPE STABILITY

S9534-05-04 | May 2014 | Figure C13

West Slope (Reclamation) – Water @ 62 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS					
MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

– – – – Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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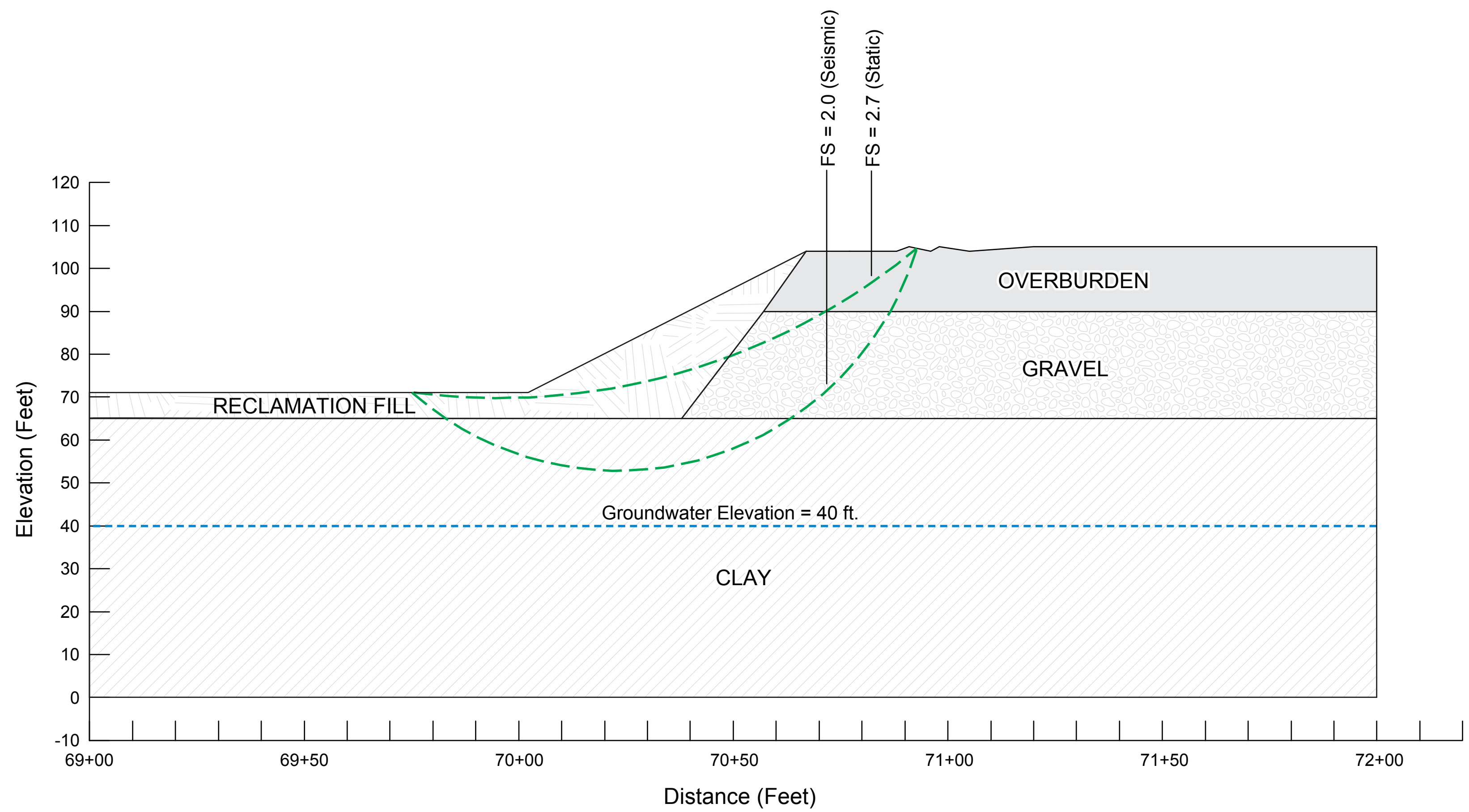
SLOPE STABILITY

S9534-05-04	May 2014	Figure C14

East Slope (Reclamation) – Water @ 40 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

— — — — Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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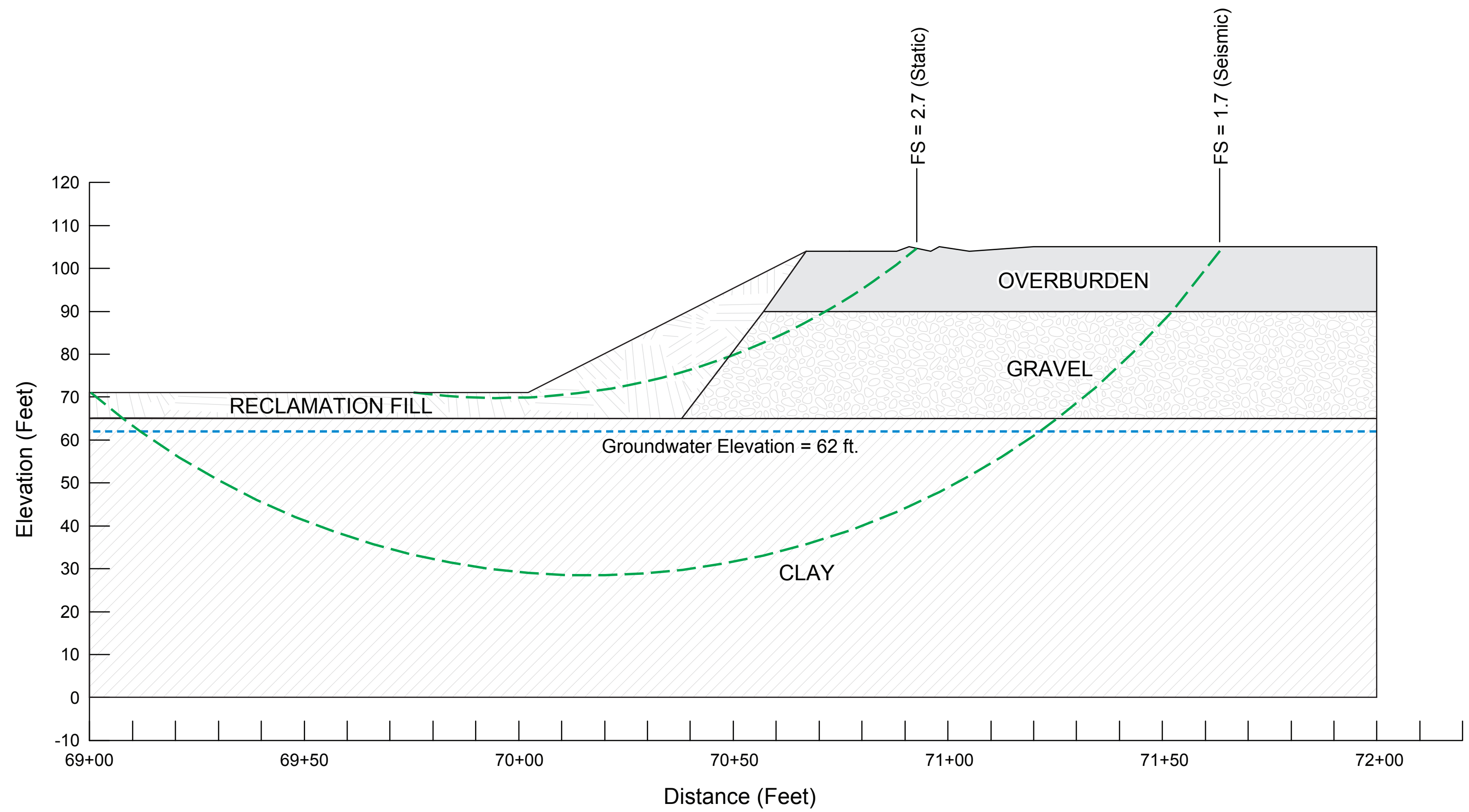
SLOPE STABILITY

S9534-05-04	May 2014	Figure C15

East Slope (Reclamation) – Water @ 62 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

– – – – Theoretical Failure Surface

FS = 1.1 Factor of Safety Against Failure (Static/Seismic)

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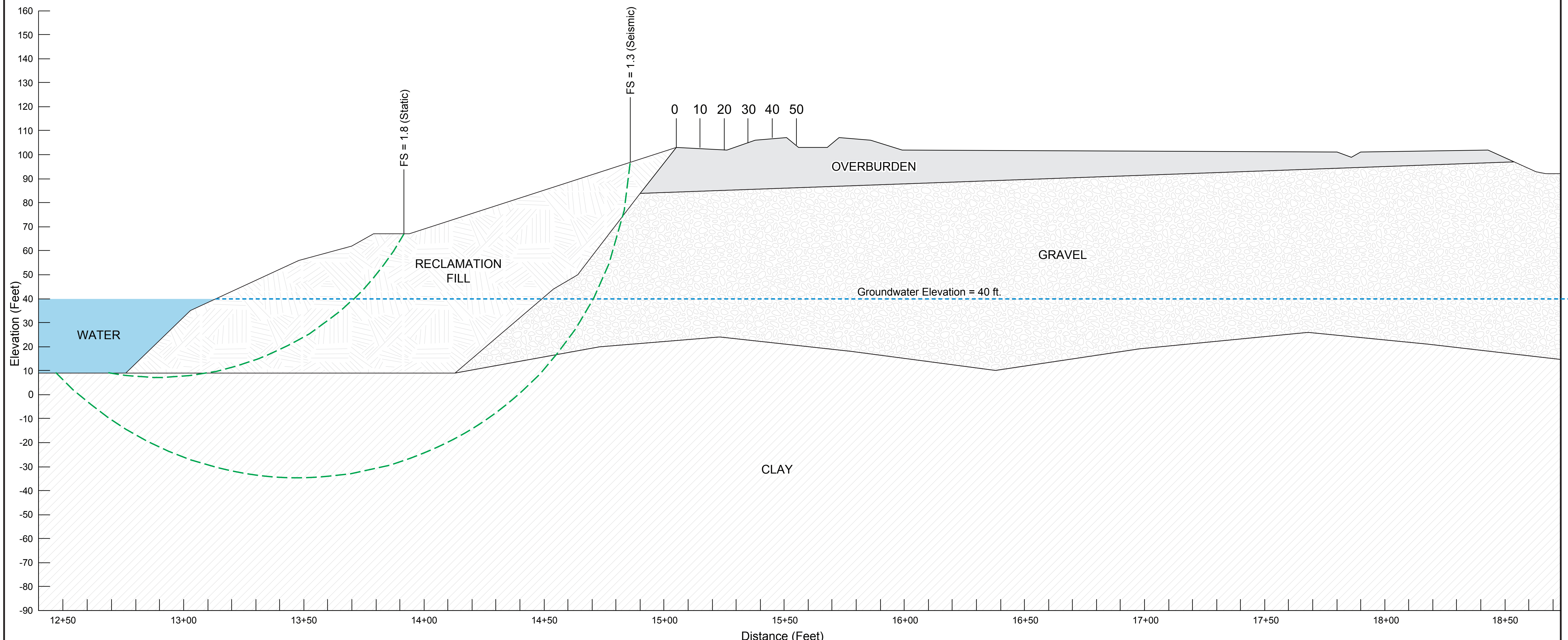
SLOPE STABILITY

S9534-05-04	May 2014	Figure C16

North-Central Slope (Reclamation) – Water @ 40 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS

MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

– – – – Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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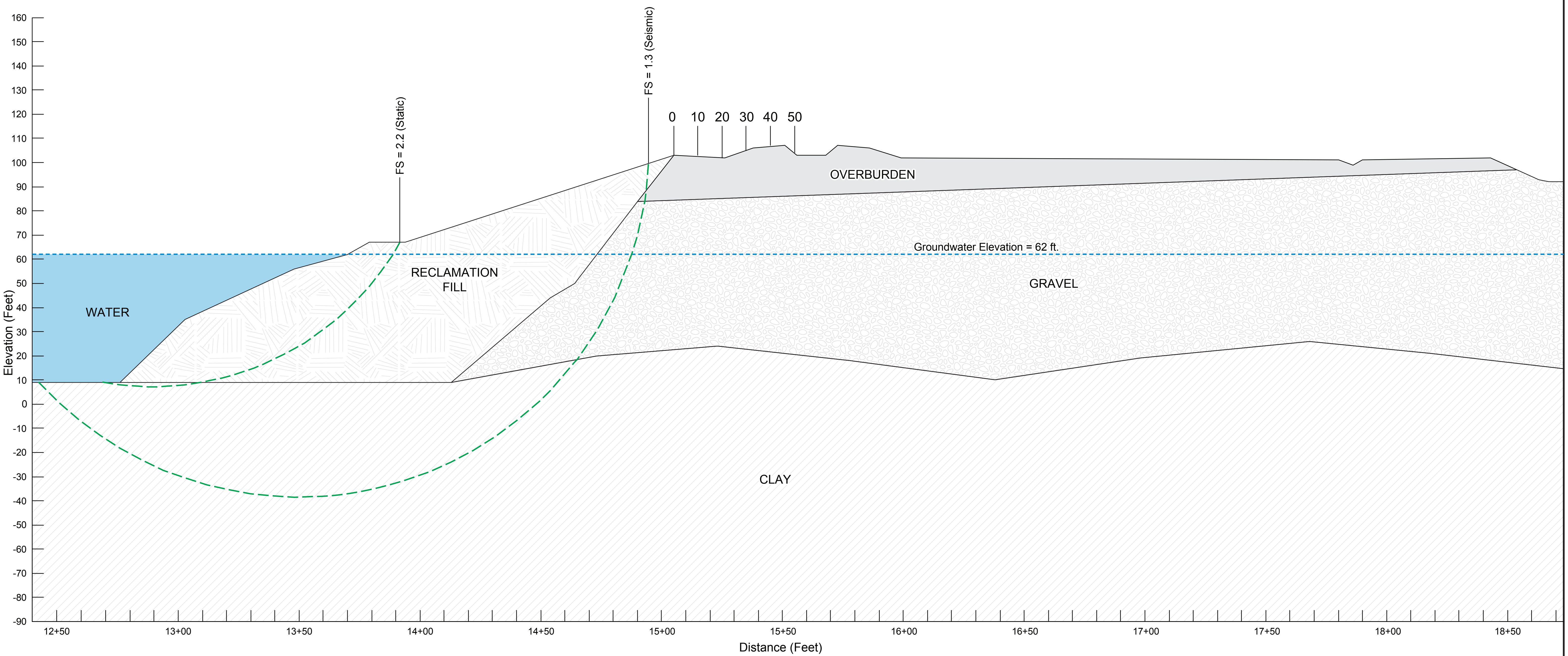
SLOPE STABILITY

S9534-05-04 | May 2014 | Figure C17

North-Central Slope (Reclamation) – Water @ 62 Ft.



SLOPE/W ANALYSIS INPUT MATERIAL PARAMETERS					
MATERIAL DESCRIPTION	UNIT WEIGHT (PCF)	Cohesion (psf)		Friction Angle (deg.)	
		Total	Effective	Total	Effective
Overburden	125	350	---	20	---
Gravel	125	150	150	42	42
Clay	120	450	375	18	30
Reclamation Fill	125	2,000	250	29	34

SLOPE STABILITY GEOMETRY AND FACTORS OF SAFETY DETERMINED USING SLOPE/W, VERSION 7.22 (GEO-SLOPE INTERNATIONAL, LTD 2007), MORGENSTERN-PRICE METHOD OF ANALYSIS
SEISMIC LOADING BASED ON A HORIZONTAL PSEUDOSTATIC ACCELERATION COEFFICIENT OF 0.1g

LEGEND:

- - - - Theoretical Failure Surface

FS = 1.1 — Factor of Safety Against Failure (Static/Seismic)

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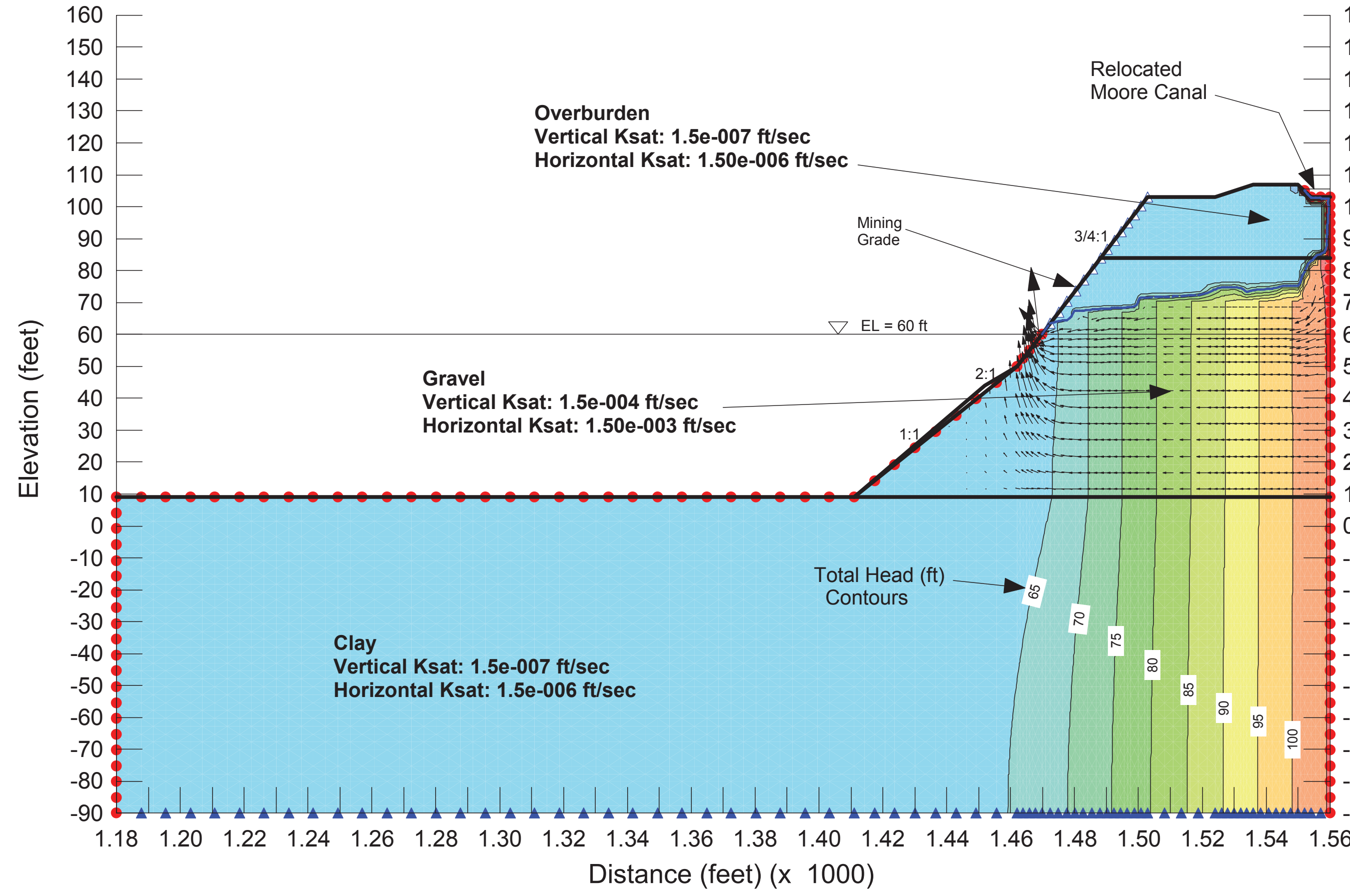
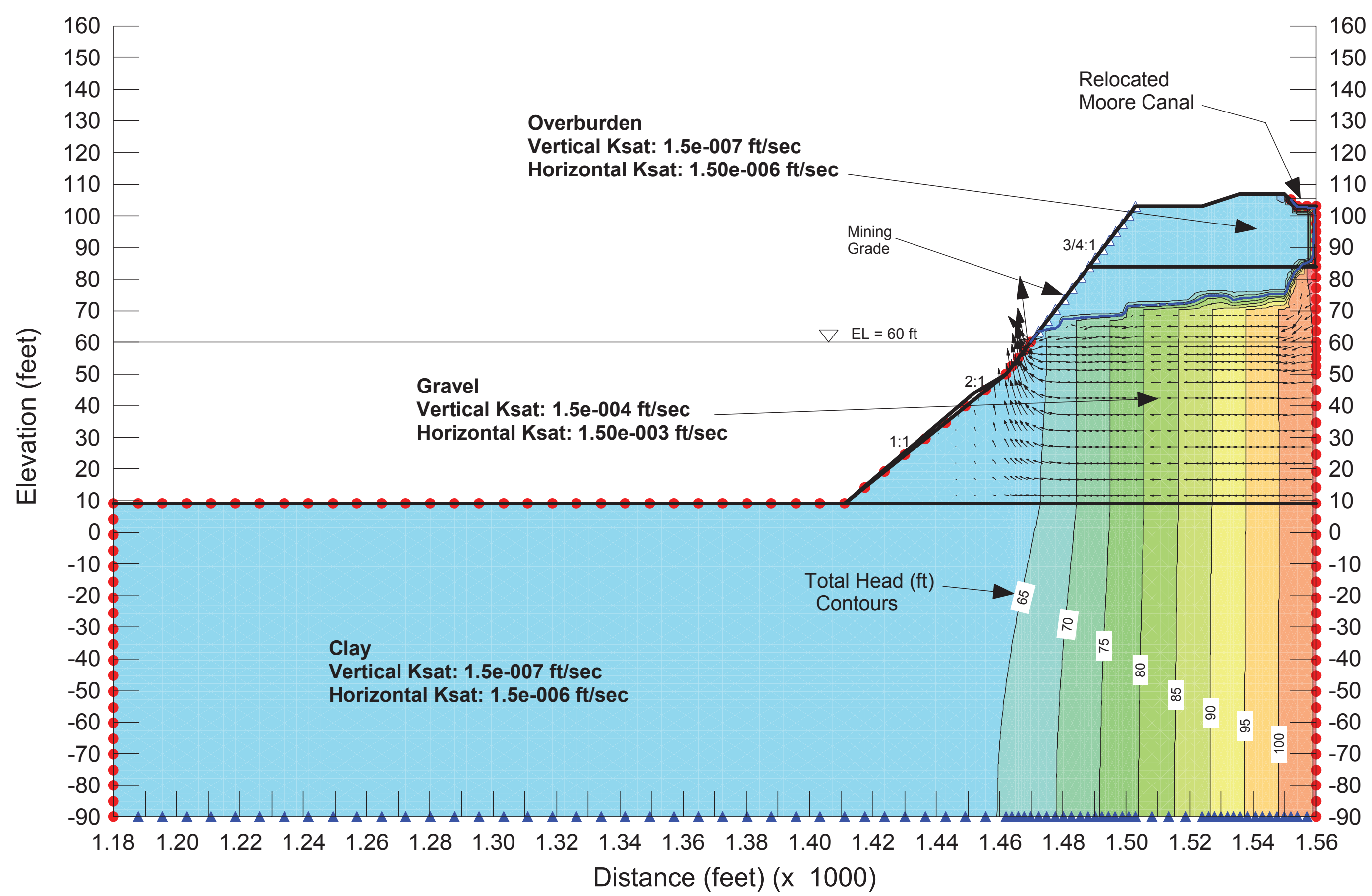
SLOPE STABILITY

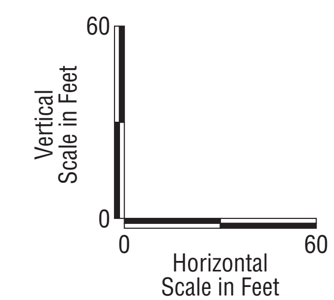
S9534-05-04	May 2014	Figure C18



OVERBURDEN – 30 DAYS



OVERBURDEN – 100 DAYS



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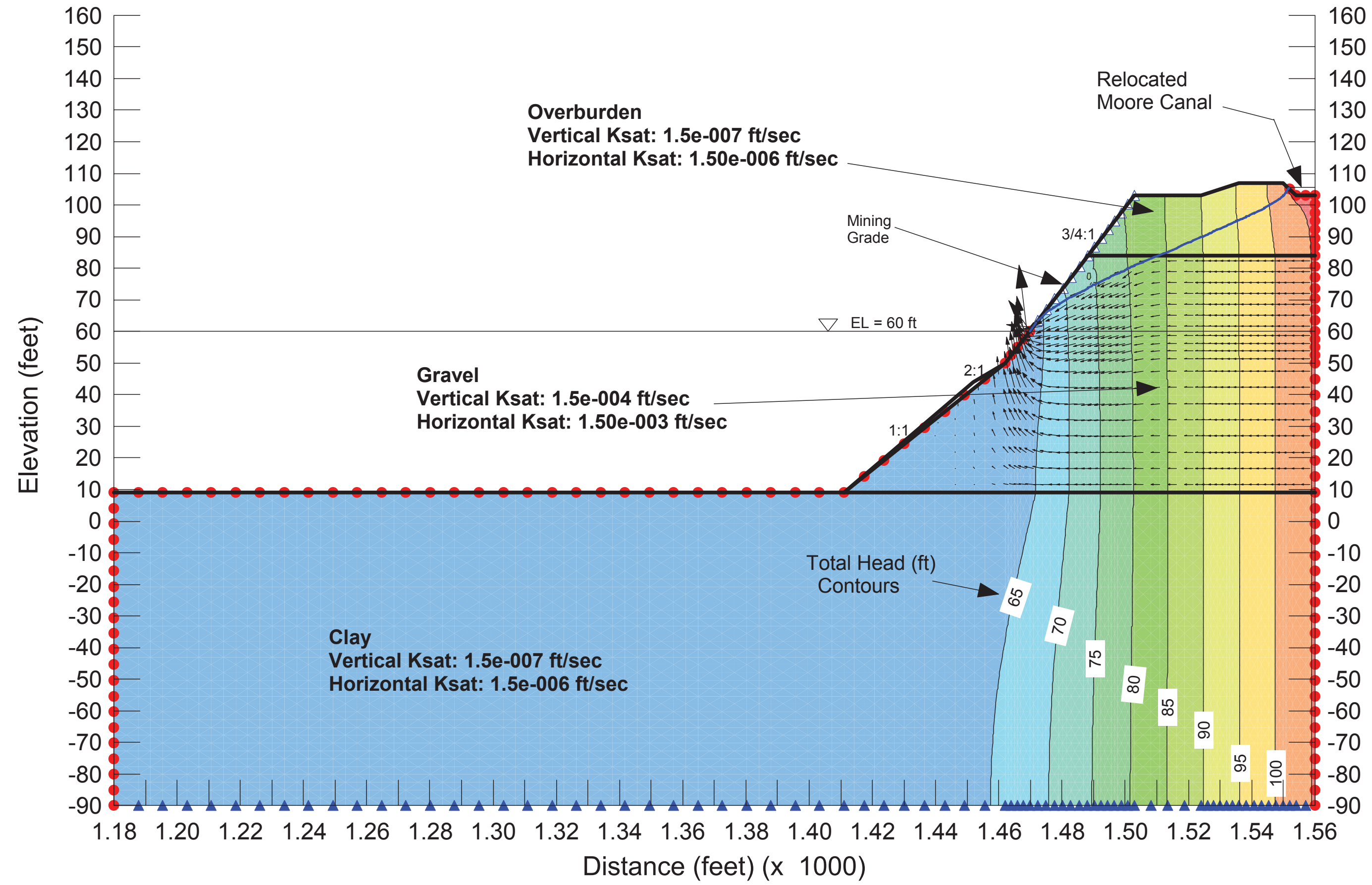
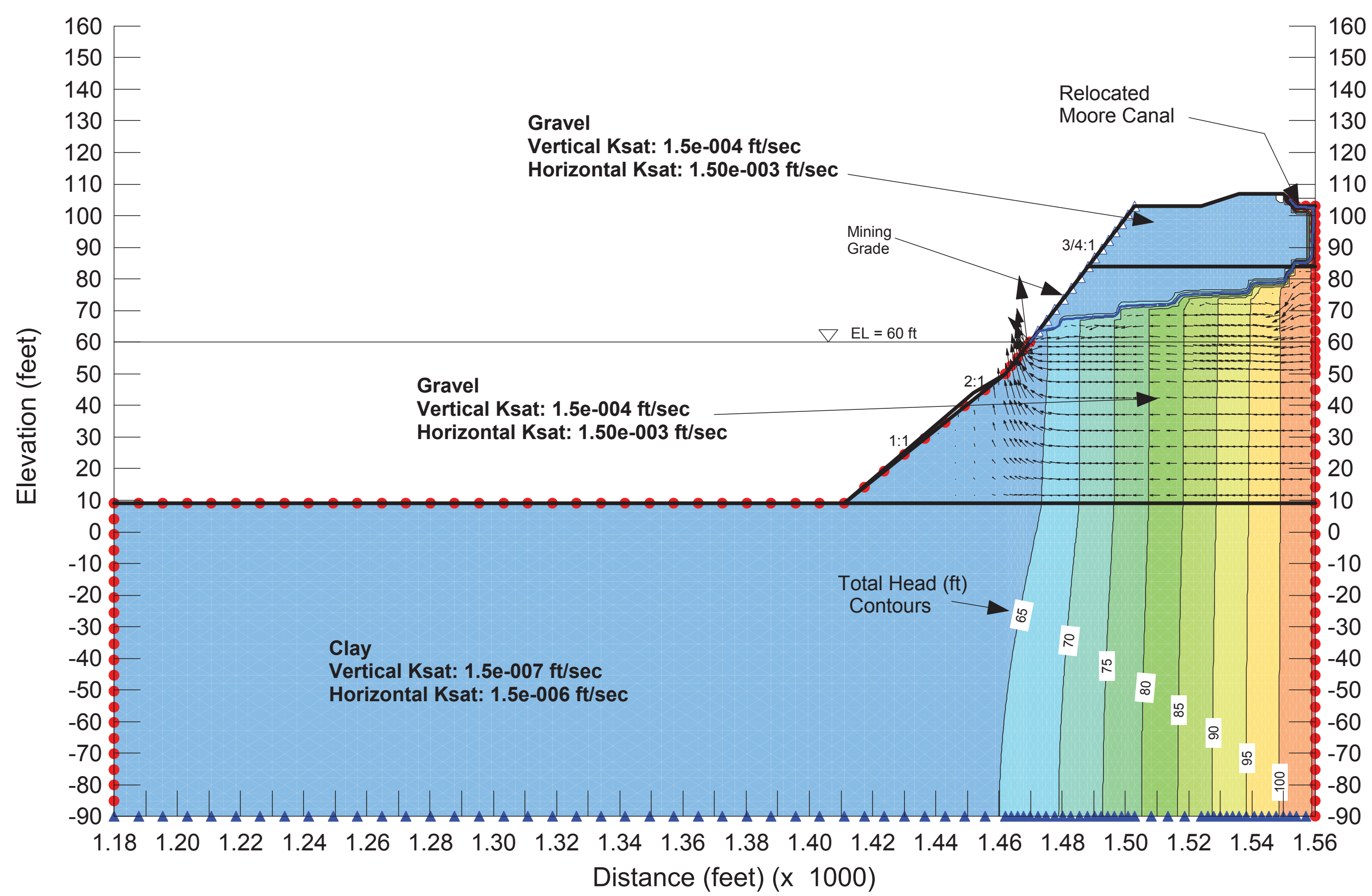
SEEPAGE ANALYSIS

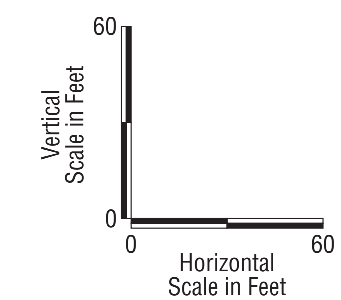
S9534-05-04	May 2016	Figure C19



OVERBURDEN – STEADY STATE



GRAVEL – 30 DAYS



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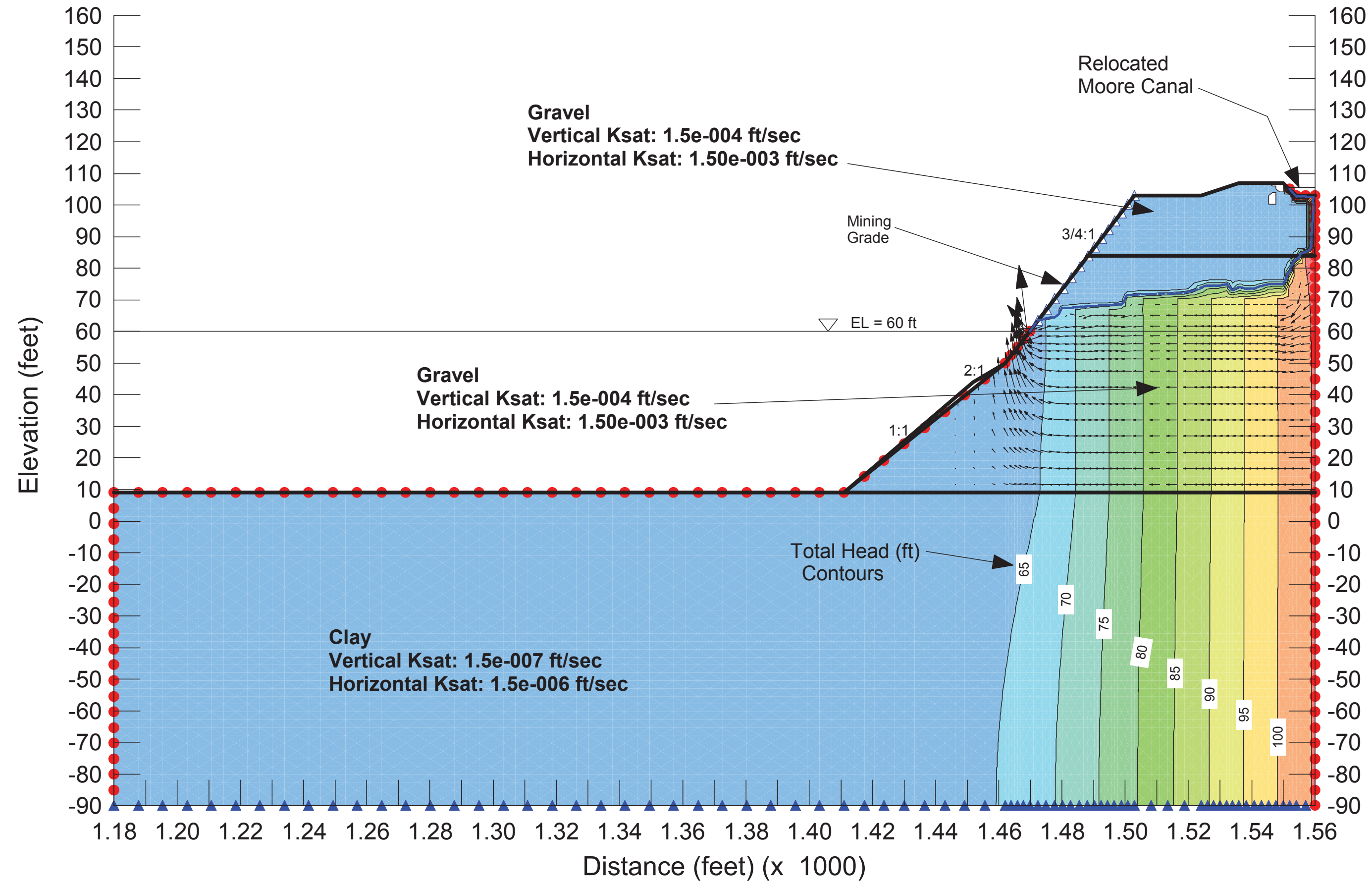
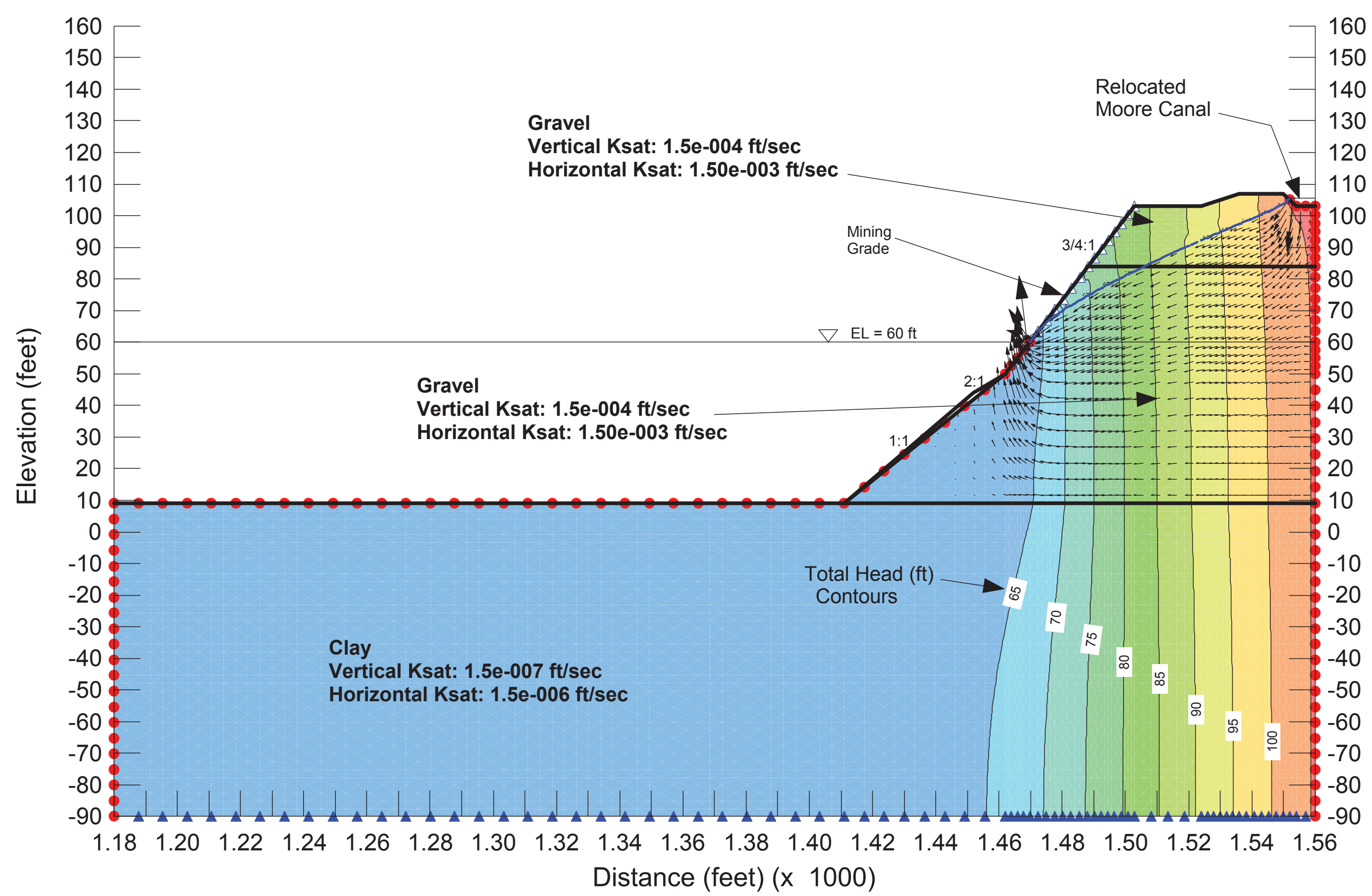
SEEPAGE ANALYSIS

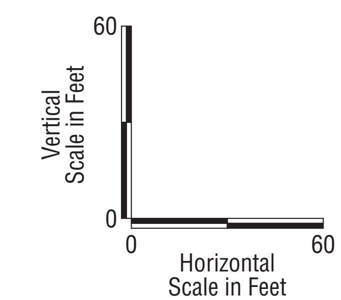
S9534-05-04	May 2016	Figure C20



GRAVEL – 100 DAYS



GRAVEL – STEADY STATE



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SEEPAGE ANALYSIS

S9534-05-04	May 2016	Figure C21