Appendix B

Addendum Report for the Tajiguas Landfill Resource Recovery Project

ADDENDUM REPORT

FOR

TAJIGUAS LANDFILL RESOURCE RECOVERY PROJECT

14770 CALLE REAL

SANTA BARBARA COUNTY, CALIFORNIA

VT-24980-04

May 1, 2017

PREPARED FOR

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BY

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May 1, 2017

Project No.: VT-24980-04
Report No.: 17-5-2

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Project: Tajiguas Landfill Resource Recovery Project
Proposed Digester Building, Materials Recovery Facility, Anaerobic Digestion Facility, Composting Management Unit, Storage Tanks, and Landfill Maintenance Building
14770 Calle Real
Santa Barbara County, California

Subject: Addendum Report

References: 1) Engineering Geology and Geotechnical Engineering Report, Tajiguas Landfill Resource Recovery Project, 14770 Calle Real, Santa Barbara County, California, by Earth Systems Southern California, Project No. VT-24980-01, Report No. 14-10-47, dated December 10, 2014.

2) Update of Engineering Geology and Geotechnical Engineering Report, Tajiguas Landfill Resource Recovery Project, 14770 Calle Real, Santa Barbara County, California, by Earth Systems Southern California, Project No. VT-24980-02, Report No. 17-2-8, dated February 17, 2017.

As authorized, Earth Systems Southern California (Earth Systems) performed a geotechnical study for the relocation of the Dry Fermentation Anaerobic Digestion Facility (ADF) of the proposed Resource Recovery Project at the Tajiguas Landfill located at 14770 Calle Real in Santa Barbara County, California. In addition to the relocated ADF, Earth Systems also performed a geotechnical study for proposed 48-foot diameter and 26-foot diameter water tanks to be installed on Pad 7 at the Tajiguas Landfill. The accompanying Addendum Report presents the results of our subsurface exploration and laboratory testing programs, as well as our conclusions and recommendations pertaining to geotechnical aspects of project design.

We have appreciated the opportunity to be of service to you on this project. Please call if you have any questions, or if we can be of further service.

Respectfully submitted,

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INTRODUCTION

A. Project Description

This addendum report presents results of an Engineering Geology and Geotechnical Engineering study performed for the relocation of the Dry Fermentation Anaerobic Digestion Facility (ADF) of the proposed Resource Recovery Project at the Tajiguas Landfill located at 14770 Calle Real in Santa Barbara County, California. In addition to the relocated ADF, Earth Systems also performed a geotechnical study for proposed 48-foot diameter and 26-foot diameter above-ground water storage tanks to be installed on Pad 7, located along the eastern limits of the landfill.

The proposed ADF will be housed within an approximate 68,550 square foot building, and include an associated energy facility and percolate storage tanks that would convert all organics recovered from the municipal solid waste into bio-gas and digestate. The bio-gas would be used to produce electricity, whereas the digestate would be cured at the CMU into compost and/or soil amendments.

B. Purpose and Scope of Work

The purpose of this geotechnical study was to confirm the reported geology and soil conditions at the site with respect to the proposed improvements, and develop geotechnical recommendations based on all the available data. Conditions evaluated include potential geohazards, surface and subsurface soil and bedrock types, expansion potential, settlement potential, bearing capacity, and the presence or absence of subsurface water. The scope of work included:

1. Reconnaissance and geological mapping of the site.
2. Reviewing available geotechnical reports pertinent to the project site.
3. Reviewing pertinent geologic literature.
4. Drilling, sampling, and logging ten (10) exploratory test borings to study geologic, soil/bedrock, and groundwater conditions
5. Laboratory testing of soil samples obtained from the subsurface exploration to determine their physical and engineering properties.
6. Consulting with Owner representatives and design professionals.
7. Analyzing the geotechnical data obtained.
8. Preparing this report.

Contained in this report are:

1. Descriptions and results of field and laboratory tests that were performed.
2. Discussions pertaining to the local geologic, soil, and groundwater conditions.
3. Conclusions pertaining to geohazards that could affect the site.
4. Conclusions and recommendations pertaining to site grading and structural design.

C. Project Setting

The Tajiguas Landfill is an existing County-owned and operated municipal solid waste disposal facility located in a coastal canyon known as the Cañada de la Pila, approximately 26 miles west of the City of Santa Barbara, and approximately 1,600 feet north of U.S. Highway 101 in Santa Barbara County, California.

The new location of the proposed ADF is located along the eastern limits of the landfill. At the time of our field investigation, soil used for daily cover at the landfill was stockpiled on the western half of the ADF footprint. The maximum thickness of the stockpiled soil encountered in the exploratory test borings was on the order of 24 feet in Boring B-4. Thicker stockpiled material may be present within the western half of the ADF in areas not explored. The stockpiled material was underlain by fill material placed during construction activities for the liner system of the landfill in this area. Earth Systems understands that stockpiled soil will be removed prior to construction of the ADF. The eastern half of the ADF exposed formational bedrock.

The proposed 48-foot diameter and 26-foot diameter above-ground water storage tanks will be constructed on an engineered fill pad (Pad 7) along the eastern limits of the landfill. It is reported that documented fill (Geosyntec, 2009) generated from the Sespe Formation (Tsp) was placed up to existing grade at the location of the proposed water tanks. We understand that the documented fill underlying Pad 7 has a maximum fill depth of 70 feet as reported by GeoSolutions, Inc. in their Soils Engineering Report dated October 2013. At the time of our field investigation, the area of the proposed water tanks was covered with a thin veneer of base material in the western half and a moderate growth of weeds and grasses in the eastern half. Above-ground piping, associated with landfill operations, was present along the ground surface in the eastern half.

GEOLOGY

A. Regional Geology

The Tajiguas Landfill is located on the south flank of the Santa Ynez Mountains, a component of the Transverse Range Geomorphic Province. This geomorphic province is characterized by generally east-west trending mountain ranges and intervening valleys. Older uplifted bedrock is exposed in the mountains: the valleys are filled with sedimentary rocks and alluvial deposits. The Transverse Ranges are bordered by the Santa Monica fault to the south and the Santa Ynez fault to the north. The Santa Ynez Range extends from Gaviota Canyon eastward to the Matilija Gorge in Ventura County. The range is composed of a single main crest that is continuous for approximately 50 miles (80 km). The northern flank of the Santa Ynez Range is a steep escarpment created by uplift along the Santa Ynez fault. The southern flank, where the Tajiguas Landfill site is located is characterized by south-plunging ridges that separate incised drainage canyons. These canyons generally include a perennial stream bounded by steep east- and west-facing slopes. The indurated sandstone units typically form prominent, more resistant outcrops and generally support dense chaparral vegetation. The poorly indurated and finer-grained units typically form more gently-sloping, grass-covered hills (Geosyntec, 2007).

B. Stratigraphy

Bedrock

Bedrock underlying the water tank site is the Vaqueros Formation (Tvq), whereas bedrock underlying the ADF site is the Rincon Formation (Tr), as depicted on the Regional Geology Map. Dibblee, 1988a/b describes the early Miocene age (11-1.8 mybp) Vaqueros Formation as "light grey calcareous sandstone." The Vaquerous Formation, where observed near the proposed water tank, was generally found to consist of light brown dry, hard sandstones with minor indurated shale interbeds.

Dibblee, 1988a/b describes the early Miocene age (11-1.8 mybp) Rincon Formation as "poorly bedded grey clay shale or claystone." The Rincon Formation exposed in the existing cut slope above the proposed ADF building was observed to include light grey fresh to slightly weathered, moderately hard shales in a dry to slightly moist condition. Fractures within Rincon Formation units varied from friable at the surface to fractured.

Artificial Fill

Artificial fill material was encountered in each of the borings for the ADF. The artificial fill extended to depths ranging from 1 foot or less in Borings B-3 and B-6 to as much as 50 feet in Boring B-4. Of the 50 feet of artificial fill encountered in Boring B-4, approximately 24 feet is stockpiled soil to be used for daily cover at the landfill. Earth Systems understands that the stockpiled material will be removed prior to construction.

Documented Fill

Documented fill material was encountered in the areas of the proposed improvements. It is reported that documented fill (Geosyntec, 2009) generated from the Sespe Formation (Tsp) was placed up to existing grade at the location of the proposed water tanks on Pad 7. In the western half of the ADF, the stockpiled material was underlain by documented fill placed for construction of the eastern slopes for the landfill's liner system in this area. The documented fill material encountered in the exploratory test borings on both sites generally consisted of silty sands and silts with varying amounts of gravel- to cobble-sized particles and clay.

Municipal Solid Waste with Intermediate Soil Cover

MSW with intermediate soil cover was not present within the areas of the proposed improvements.

C. Structure

Bedding was observed within the Vaqueros and Rincon Formations in existing cut slopes running from above the proposed tank site to those areas above the proposed ADF building. Bedding exhibited northeasterly dips ranging from N60°E near the southern end of the current project area to N86°E in the central area of the proposed ADF building. Bedding was found to dip southward at angles ranging from 40° near the center of the ADF building to vertical near the tank site. These attitudes are similar to those depicted by Dibblee, 1988a/b.

GEOLOGIC HAZARDS

Geologic hazards that may impact a site include seismic shaking, fault rupture, landsliding, liquefaction, and flooding.

A. Seismicity and Seismic Design

It is assumed that the 2016 CBC and ASCE 7-10 guidelines will apply for the seismic design parameters. The 2016 CBC includes several seismic design parameters that are influenced by the geographic site location with respect to active and potentially active faults, and with respect to subsurface soil or rock conditions. The seismic design parameters presented herein were determined by the U.S. Seismic Design Maps "risk-targeted" calculator on the USGS website for the jobsite coordinates. The calculator adjusts for Soil Site Class and for Occupancy (Risk) Category.

The Soil Site Class was evaluated for Pad 7 and the ADF based on the standard blow counts recorded in the exploratory borings. Based on the depth of fill material on Pad 7, the site class was determined to be Site Class D. For the ADF, the site class was determined to be Site Class C.

The calculated 2016 California Building Code (CBC) and ASCE 7-10 seismic parameters typically used for structural design at each location are attached to this addendum report and summarized in the tables below.

Summary of Seismic Parameters for Water Storage Tanks

Site Class (Table 20.3-1 of ASCE 7-10 with 2013 update)	D
Occupancy (Risk) Category	I/II/III
Maximum Considered Earthquake (MCE) Ground Motion	
Spectral Response Acceleration, Short Period – S_s	2.277 g
Spectral Response Acceleration at 1 sec. – S_1	0.802 g
Site Coefficient – F_a	1.00
Site Coefficient – F_v	1.50
Site-Modified Spectral Response Acceleration, Short Period – S_{MS}	2.277 g
Site-Modified Spectral Response Acceleration at 1 sec. – S_{M1}	1.203 g
Design Earthquake Ground Motion	
Short Period Spectral Response – S_{DS}	1.518 g
One Second Spectral Response – S_{D1}	0.802 g
Reference: USGS, 2017 Latitude: 34.4852 N degrees; Longitude: 120.1251 W degrees	

Summary of Seismic Parameters for ADF

Site Class (Table 20.3-1 of ASCE 7-10 with 2013 update)	C
Occupancy (Risk) Category	I/II/III
Maximum Considered Earthquake (MCE) Ground Motion	
Spectral Response Acceleration, Short Period – S_s	2.274 g
Spectral Response Acceleration at 1 sec. – S_1	0.799 g
Site Coefficient – F_a	1.00
Site Coefficient – F_v	1.30
Site-Modified Spectral Response Acceleration, Short Period – S_{MS}	2.274g
Site-Modified Spectral Response Acceleration at 1 sec. – S_{M1}	1.039 g
Design Earthquake Ground Motion	
Short Period Spectral Response – S_{DS}	1.516 g
One Second Spectral Response – S_{D1}	0.693 g
Reference: USGS, 2017 Latitude: 34.4823 N degrees; Longitude: 120.1240 W degrees	

The values presented in the tables above are appropriate for a 2 percent probability of exceedance in 50 years. A listing of the calculated 2016 CBC and ASCE 7-10 seismic parameters is attached. The site peak ground acceleration (PGA) per Section 1803.5.12 of the 2016 CBC and Section 11.8.3 of ASCE 7-10 is 0.923 g for both sites.

The Fault Parameters table in Appendix C lists the significant "active" and "potentially active" faults within a 31-mile (50-kilometer) radius of the subject site. The distance between the site and the nearest portion of each fault is shown, as well as the respective estimated maximum earthquake magnitudes, and the deterministic mean site peak ground accelerations.

B. Fault Rupture

Surficial displacement along a fault trace is known as fault rupture. Fault rupture typically occurs along previously existing fault traces. As mentioned in the "Structure" section above, no existing fault traces were observed to be crossing the site. As a result, it is the opinion of this firm that the potential for fault rupture on this site is low.

C. Landsliding

No landslides were observed within the areas of the proposed water tank or ADF building during field mapping, reviews of the referenced geologic reports and maps, or during review of stereographic pairs of aerial photographs.

D. Liquefaction

Earthquake-induced vibrations can be the cause of several significant phenomena, including liquefaction in fine sands and silty sands. Liquefaction results in a loss of strength and can cause structures to settle or even overturn if it occurs in the bearing zone. Liquefaction is typically limited to the upper 50 feet of soils underlying a site.

Fine sands and silty sands that are poorly graded and lie below the groundwater table are the soils most susceptible to liquefaction. Soils that have plasticity indices greater than 7, sufficiently dense soils, and/or soils located above the groundwater table are not generally susceptible to liquefaction.

Based on the consistency and relative density of the existing fill soils beneath Pad 7 and the proposed ADF (excluding the soil stockpile, which will be removed), shallow bedrock within portions of the project area, and the depth to groundwater, it is the opinion of this firm that the potential for seismic liquefaction of soils at the site is very low.

E. Flooding

Earthquake-induced flooding types include tsunamis, seiches, and reservoir failure. Due to the inland location of the site, hazards from tsunamis and seiches are considered extremely unlikely. Any nearby reservoir that may fail would normally drain into established major drainage channels, and away from the site; therefore, flooding should not be considered a potential hazard.

The site is not located within an "area of 0.2% of annual chance flood" (FEMA, 2012); therefore, it appears that the hazard posed by storm-induced flooding is low.

SUBSURFACE CONDITIONS

Based on the exploratory test borings drilled on Pad 7 along the eastern limits of the landfill (B-1, B-1A, B-2, and B-2A), artificial fill material was encountered to depths ranging from approximately 38 feet below existing site grade in Boring B-1 to 35.5 feet in Boring B-2. It is reported that documented fill (Geosyntec, 2009) generated from the Sespe Formation (Tsp) was placed up to existing grade at the location of the proposed water tanks. The fill material encountered in the exploratory test borings drilled on Pad 7 is shown on the logs of the borings as "Documented Fill". The fill material generally consisted of silty sands and silts with varying amounts of gravel-sized particles and clay. Although not encountered in the test borings, there is the potential for cobble-sized particles to be present in the documented fill. Measured in-place dry densities of samples of the existing fill underlying the proposed water tanks ranged from 95.6 to 127.0 pounds per cubic foot (pcf). The documented fill was underlain by Rincon Formation bedrock to the maximum depths explored. Refer to the logs of the test borings contained in Appendix A for more detailed descriptions of the encountered subsurface conditions on Pad 7.

Based on the exploratory test borings Borings B-3 through B-8, drilled within the approximate limits of the proposed ADF, artificial fill material was encountered in each of the borings. The artificial fill extended to depths ranging from 1 foot or less in Borings B-3 and B-6 to as much as 50 feet in Boring B-4. Of the 50 feet of artificial fill encountered in Boring B-4, approximately 24 feet is stockpiled soil to be used for daily cover at the landfill. The stockpiled soil encountered in the exploratory test borings for the proposed ADF is shown on the logs of the borings as "Stockpiled Soil". Earth Systems understands that the stockpiled material will be removed prior to construction. In the western half of the ADF, the stockpiled material was underlain by documented fill placed for construction of the eastern slopes for the landfill's liner system in this area. The documented fill underlying the soil stockpile is shown on the logs of the borings as "Documented Fill". The documented fill was underlain by Rincon Formation bedrock to the maximum depths explored. In the eastern half of the ADF, the thin veneer of artificial fill was underlain by formational bedrock to the maximum depths explored. Refer to the logs of the test borings contained in Appendix A for more detailed descriptions of the encountered subsurface conditions at the location of the ADF.

Groundwater was not encountered in any of the exploratory test borings drilled for this study. During the geotechnical investigation, groundwater was not encountered in the maximum depth explored of 55.5 feet. It should also be noted that fluctuations in the groundwater levels and soil moisture conditions do occur due to change in seasons, variations in rainfall, irrigation practices, construction impacts, and other factors.

Testing indicates that the existing fills soils for Pad 7 lie in the "moderate" expansion potential range based on a measured expansion index of 51. Although not tested for this addendum report, previous expansion index testing on the Rincon formation bedrock indicates that it also lies in the "moderate" expansion potential range based on a measured expansion index of 65. The locally adopted version of this classification of soil expansion, (Minimum Foundation Design Table) is included in Appendix B of this addendum report.

Samples of the potential fill soils for the ADF and the existing fill soils on Pad 7 were tested for pH, resistivity, soluble sulfates, and soluble chlorides. The test results provided in Appendix B should be distributed to the design team for their interpretations pertaining to the corrosivity or reactivity of various construction materials (such as concrete and piping) with the near-surface materials.

It should be noted that the sulfate content of the potential fills soils for the ADF (5,400 mg/Kg) is in the "S3" exposure range (i.e. "severe" severity range) of Table 19.3.1.1 of ACI 318-14; therefore, special concrete designs may be necessary for the measured sulfate contents. Table 19.3.2.1 of ACI 318-14 recommends the concrete cast in contact with soils in this exposure class have a maximum water/cement ratio of 0.45, a minimum compressive strength of 4,500 psi, and Type V cement plus pozzolan or slag cement be used.

The sulfate content of the existing fill soils on Pad 7 (198 mg/Kg) is in the "S0" exposure class (i.e. "negligible" severity range) of Table 19.3.1.1 of ACI 318-14; therefore, it appears that special concrete designs will not be necessary for the measured sulfate content.

Based on criteria established by the County of Los Angeles, measurement of resistivity (3,800 Ohm-cm) on the existing fill soils on Pad 7 indicate that they are "moderately corrosive" to ferrous metal (i.e. cast iron, etc.) pipes. Measurement of resistivity (330 Ohm-cm) on the potential fills soils for the ADF indicate that they are "severely corrosive" to ferrous metal (i.e. cast iron, etc.) pipes.

GROSS (GLOBAL) SLOPE STABILITY

Slope stability analyses were previously performed for 2H:1V (horizontal to vertical) fill slope west of the proposed water tanks (GeoSolutions, Inc., 2013), and the proposed 2H:1V cut slope above the ADF. In GeoSolutions' study, the factors of safety for the 2H:1V fill slope under both static and seismic conditions were found to exceed the generally accepted minimum design factors of safety. A review of the shear strength parameters of the documented fill were higher than the values obtained from our laboratory testing. Therefore, the 2H:1V fill slope on the west side of Pad 7 was re-analyzed in addition to the proposed 2H:1V cut slope above the ADF.

Strength Parameters

The unit weights and shear strength values for the slope stability analyses were selected based primarily on results of laboratory testing on samples of site materials described herein. The strength parameters for the municipal solid waste (MSW) were selected based on review of published papers. The following geotechnical parameters were used for the documented fill and Rincon Formation bedrock in the slope stability analyses.

Unit	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)
Municipal Solid Waste (MSW)	70 (moist)	250 (peak & ultimate)	22 (peak & ultimate)
Documented Fill Material	125 (moist)	720 (peak)	31 (peak)
		360 (ultimate)	32 (ultimate)
Bedrock (Rincon Formation)	130 (moist)	400 (peak)	27 (peak)
		400 (ultimate)	27 (ultimate)

Ultimate shear strength parameters were used in the analyses of static conditions, while peak shear strength parameters were used in the analyses of seismic (earthquake, pseudostatic) conditions.

Groundwater was not considered in the slope stability analyses.

Slope Stability Analysis

The stability of the 2H:1V fill slope west of Pad 7 and the proposed 2H:1V cut slope above the ADF was analyzed using the SLIDE6 program for circular failure surfaces. Both static and pseudostatic analyses were performed to evaluate the stability of the 2H:1V fill slopes under static conditions and under seismic motions. Circular failures were analyzed using the Spencer Method (SLIDE6). For a rotational analysis, approximately 112,200 circular failure surfaces were analyzed.

The County of Santa Barbara allows the use of a seismic coefficient of 0.15 g in pseudo-static slope stability analyses provided subsurface conditions or the proximity of active faults do not warrant the use of higher values. The County of Santa Barbara requires a minimum factor of safety for gross static stability is 1.50 for static loads, and a minimum factor of safety for pseudostatic stability is 1.10 for loading due to seismic shaking.

Results of Slope Stability Analyses

The following table summarizes the safety factors that were computed for gross (global) stability analyses:

Cross Section	Loading Condition	Type of Failure Surface	Minimum Safety Factor
2H:1V	Static	Circular	1.62
Fill Slope (Pad 7)	Seismic, k=0.15 g	Circular	1.13
2H:1V	Static	Circular	1.74
Cut Slope (ADF)	Seismic, k=0.15 g	Circular	1.32

As shown in the table above, the computed safety factors were 1.62 for the 2H:1V fill slope on the west side of Pad 7 under static loading conditions, and 1.13 for seismic loading conditions. The computed safety factors were 1.74 for the 2H:1V cut slope above the ADF under static loading conditions, and 1.32 for seismic loading conditions. These computed safety factors satisfy the minimum required values for both static and seismic loading conditions.

Refer to Appendix D for results of the slope stability analyses.

GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based on the data provided in this report, it appears that the two sites are suitable for the proposed development from Engineering Geology and Geotechnical Engineering standpoints provided the recommendations provided herein are properly implemented into the project. Given the site conditions encountered, we conclude that conventional spread foundations may be used for support of the proposed structures. The primary geotechnical consideration from a development standpoint is as follows:

- The expansion potential of the Rincon Formation bedrock that will be exposed in the cuts in the eastern half of the ADF footprint, and the use of this material as engineered fill beneath the proposed improvements. During grading in the eastern half of the ADF, there is the potential for alternating beds with different expansion potentials being exposed in the cut areas of the ADF.
- Testing indicates that materials derived from the Rincon Formation bedrock are severely corrosive to concrete, thus requiring special concrete requirements, and to ferrous metal (i.e. cast iron, etc.) pipes.

Therefore, we recommend that the exposed bedrock in the cut areas of the ADF be removed to a depth of 5 feet below finished subgrade or 3 feet below the bottoms of the foundations, whichever is deeper, properly moisture conditioned, and placed as engineered fill to provide a cap above the potentially swelling bedrock. Also, Earth Systems recommends that materials derived from the Rincon Formation bedrock not be used as backfill behind any proposed retaining walls.

Specific conclusions and recommendations addressing these geotechnical considerations, as well as general recommendations regarding the geotechnical aspects of design and construction, are presented in the following sections.

A. Grading

1. Pre-Grading Considerations
   a. Plans and specifications should be provided to Earth Systems prior to grading. Plans should include the grading plans, foundation plans, and foundation details.
   b. Roof draining systems, if required by the appropriate jurisdictional agency, should be designed so that water is not discharged into bearing soils or near structures.
   c. Final site grade should be designed so that all water is diverted away from structures over paved surfaces, or over landscaped surfaces in accordance with current codes. Water should not be allowed to pond anywhere on the pad.
   d. Shrinkage of the existing fill soils affected by compaction during the recommended removal and replacement is estimated to be about 10 to 15 percent based on an anticipated average compaction of 92 percent. Shrinkage of the excavated Rincon bedrock compacted to 92 percent relative compaction is estimated to be about 5 percent.
   e. Any improvements below ground level should be waterproofed and drained in accordance with the Project Engineer's recommendations.
   f. It is recommended that Earth Systems be retained to provide Geotechnical Engineering services during site development and grading, and foundation construction phases of the work to observe compliance with the design concepts, specifications and recommendations, and to allow design changes in

the event subsurface conditions differ from those anticipated prior to the start of construction.

g. Compaction tests shall be made to determine the relative compaction of the fills in accordance with the following minimum guidelines: one test for each 1.5-foot vertical lift; one test for each 500 cubic yards of material placed; and one test at finished subgrade elevation in the building pad.

h. Direct shear tests shall be performed on each soil type utilized to construct fill slopes steeper than 3:1 (horizontal to vertical), and higher than 5 feet.

2. Rough Grading/Areas of Development

a. Grading at a minimum should conform to Appendix J in the 2016 CBC, with the Santa Barbara County Grading Code, and with recommendations of the Geotechnical Engineer during construction. Where the recommendations of this report and the 2016 CBC and Santa Barbara County Grading Code are in conflict, the Owner should request clarification from the Geotechnical Engineer.

b. The existing ground surface should be initially prepared for grading by removing all vegetation, debris, other organic material and non-complying fill. Organics and debris should be stockpiled away from areas to be graded, and ultimately removed from the site to prevent their inclusion in fills. Voids created by removal of such material should be properly backfilled and compacted. No compacted fill should be placed unless the underlying soil has been observed by the Geotechnical Engineer.

c. Although not encountered or identified during our field investigation, it is possible that buried objects may exist within the limits of construction not explored. If encountered within the construction limits, these items should be removed and disposed of offsite. Existing utility pipelines that extend beyond the limits of the proposed construction and may be abandoned in-place, but should be plugged with cement grout to prevent migration of soil and/or water. All excavations resulting from removal activities should be cleaned of loose or disturbed material and dish-shaped with sides sloped 3H:1V (horizontal to vertical) or flatter, to permit access of compaction equipment. These excavations should be backfilled with engineered fill.

d. **For the Water Tanks on Pad 7, Earth Systems recommends the following:**

1) Native soils beneath these improvements should be excavated a minimum of 3 feet below the deepest foundation element. Remedial excavations should be performed to a distance of at least 3 feet laterally of the perimeter of the proposed improvements. The base of the remedial excavation across the structure should be a relatively level elevation. Structural plans and details should be checked carefully during grading to establish the actual bottom of foundation elevations in the field.

2) The bottom of the remedial excavation should be scarified to a depth of 6 inches; uniformly moisture conditioned to above optimum moisture

content, and compacted to achieve a relative compaction of between 90 percent of the ASTM D 1557 maximum dry density. **Compaction of the prepared subgrade should be verified by testing.**

3) The excavated soils may be reused to backfill the remedial excavations provided they are processed to remove any deleterious materials and debris, and are properly moisture conditioned and compacted.
4) Soils used to backfill the remedial excavations should be placed in a series of horizontal layers not exceeding 8 inches in loose thickness, uniformly moisture-conditioned to above optimum moisture content, and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. Additional fill lifts should not be placed if the previous lift did not meet the required relative compaction or if soil conditions are not stable. Discing, tilling, and/or blending may be required to uniformly moisture-condition soils used for engineered fill. **Field density tests should be taken to verify compaction of the engineered fill.**

f. **For the proposed ADF, Earth Systems recommends the following:**

1) Following clearing operations, we recommend that exposed subgrade beneath the proposed ADF should be excavated 5 feet below finished subgrade or 3 feet below the bottoms of the foundations, whichever is deeper. Remedial excavations should be performed to a distance of at least 3 feet laterally beyond the outside edge of the foundation, where space is available. The base of the remedial excavation across the structure should be a relatively level elevation.
2) The exposed subgrade should be scarified to a depth of 8 inches; uniformly moisture conditioned to above optimum moisture content, and compacted to achieve a relative compaction of 90 percent of the ASTM D 1557 maximum dry density. **Field density tests should be taken to verify compaction of the prepared subgrade in this area.**
3) The excavated soils may be reused to backfill the remedial excavations provided they are processed to remove any deleterious materials and debris, and are properly moisture conditioned and compacted.
4) Soils used to backfill the remedial excavations should be placed in a series of horizontal layers not exceeding 8 inches in loose thickness, uniformly moisture-conditioned to above optimum moisture content, and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. Additional fill lifts should not be placed if the previous lift did not meet the required relative compaction or if soil conditions are not stable. Discing, tilling, and/or blending may be required to uniformly moisture-condition soils used for engineered fill. **Field density tests should be taken to verify compaction of the engineered fill.**

g. On-site soils may be used for fill once they are cleaned of all organic material, rock, debris and irreducible material larger than 8 inches.

h. Import soils used to raise site grade should be equal to, or better than, on-site soils in strength, expansion, and compressibility characteristics. Import soil can be evaluated, but will not be prequalified by the Geotechnical Engineer. Final comments on the characteristics of the import will be given after the material is at the project site.
i. Backfill around or adjacent to confined areas (i.e. interior utility trench excavations, etc.) may be performed with a lean sand/cement slurry (maximum 28-day compressive strength of 200 psi) or "flowable fill" material (a mixture of sand/cement/fly ash). The fluidity and lift placement thickness of any such material should be controlled in order to prevent "floating" of any "submerged" structure. Alternatively, a gravel mat be used, subject to approval by the Geotechnical Engineer and the City official.
j. The Geotechnical Engineer's representative should review the site grading prior to scarification of the bottom of the remedial excavations. Local variations in soil conditions may warrant increasing the depth of remedial excavation. Any deeper areas of loose soils should be removed and be replaced as compacted, engineered fill.

3. <u>Utility Trenches</u>
   a. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction standards. In general, on-site service lines may be backfilled with native soils compacted to 90 percent of maximum density. Backfill of offsite service lines will be subject to the specifications of the jurisdictional agency or this report, whichever are greater.
   b. Compacted native soils should be utilized for backfill below structures. Sand should not be used under structures because it provides a conduit for water to migrate under foundations.
   c. Backfill operations should be observed and tested by the Geotechnical Engineer to monitor compliance with these recommendations.
   d. Jetting of native soils is not recommended because of the fine-grained nature of near-surface on-site soils.

4. <u>Excavations</u>
   a. Excavations in the western portion of the ADF and on Pad 7 will typically encounter compacted engineered fill. Excavations in the eastern portion of the ADF will typically encounter Rincon Formation bedrock. These materials should be excavateable with conventional earthmoving equipment.
   b. Temporary unshored, unsurcharged, open excavations in the existing and/or new fill that are free of seeps and less than 10 feet deep in **<u>drained soils</u>** may be cut at least 1.5H:1V (horizontal to vertical) or flatter provided the adjacent ground is not subject to surcharge loading. Temporary unshored, unsurcharged, open excavations in formational bedrock that are free of seeps and less than 10 feet deep in **<u>drained conditions</u>** may be cut at least 0.75H:1V

(horizontal to vertical) or flatter provided the adjacent ground is not subject to surcharge loading. If excavations dry out, sloughing will occur. No excavation should be made within a 1:1 line projected downward from the outside edge at the base of any existing footing or slab.

c. During the time excavations are open, no heavy grading equipment or other surcharge loads (i.e. excavation spoils) should be allowed within a horizontal distance from the top of any slope equal to the depth of the excavation (both distances measured from the top of the excavation slope).

d. Adequate measures should be taken to protect any structural foundations, pavements, or utilities adjacent to any excavations.

e. All open cuts should be in compliance with applicable Occupational Safety Health Administration (OSHA) regulations (California Construction Safety Orders, Title 8) and should be monitored for evidence of incipient instability. Standard construction techniques should be sufficient for temporary site excavations. Project safety is the responsibility of the Contractor and the Owner. Earth Systems will not be responsible for project safety.

B. <u>Structural Design</u>

1. <u>Conventional Spread Foundations</u>

a. Conventional spread foundations (i.e., continuous and isolated pad footings) may be used to support the proposed ADF building.

b. Foundation excavations should be observed by a representative of this firm after excavation, but prior to placing of reinforcing steel or concrete, to verify bearing conditions.

c. Conventional spread foundations supported on compacted engineered fill, prepared as recommended in Section A of this report, may be designed based on an allowable bearing value of 2,000 psf. This value is based on a factor of safety of greater than 3.

d. Conventional continuous footings should have a minimum embedment depth of 24 inches and a minimum width of 15 inches to facilitate hand cleaning of the footing. Isolated pad footings should have a minimum embedment depth of 24 inches and a minimum width of 2 feet.

e. Allowable bearing values are net (weight of footing and soil surcharge may be neglected) and are applicable for dead plus reasonable live loads.

f. Bearing values may be increased by one-third when transient loads such as wind and/or seismicity are included.

g. Resistance to lateral loading may be provided by friction acting on the base of foundations. A coefficient of friction of 0.65 may be applied to dead load forces. This value does not include a factor of safety. An appropriate factor of safety should be used for design calculations (minimum of 1.5 recommended).

h. Passive resistance acting on the sides of foundation stems equal to 425 pcf of equivalent fluid weight may be included for resistance to lateral load. This value does not include a factor of safety. An appropriate factor of safety should be used for design calculations (minimum of 1.5 recommended).

i. The information that follows regarding reinforcement and premoistening for footings is the same as that given in the attached Minimum Foundation Design table for the "medium" expansion range. Actual footing designs should be provided by the Structural Engineer, but the dimensions and reinforcement he recommends should not be less than the criteria set forth in the attached Minimum Foundation Design for the appropriate expansion range.

j. Continuous footings bottomed in soils in the "medium" expansion range should be reinforced, at a minimum, with one No. 4 bar along the bottom and one No. 4 bar along the top. In addition, bent No. 3 bars on 24-inch centers should extend from within the footings to a minimum of 3 feet into adjacent slabs.

k. Bearing soils in the "medium" expansion range should be premoistened to 3 percent over optimum moisture content to a depth of 18 inches below lowest adjacent grade. Premoistening should be confirmed by testing.

l. If the preliminary recommendations for conventional foundation design and construction are followed, settlement of the proposed improvements bearing into compacted fill should not exceed approximately 1 inch The proposed structure should be designed for differential settlements between adjacent load bearing members on the order of half the total settlement over a distance of 30 feet.

2. Mat Foundations

Earth Systems recommends that a relatively rigid foundation system such as a structural mat slab be used for support of the proposed water tanks to minimize the differential settlement due to settlement of the underlying fills of variable depth across the footprint of the tanks. A mat foundation may also be used for support of the percolate tanks at the north end of the proposed ADF provided the grading recommended in Section A of this report is carried out.

a. The mat foundations may be a conventionally reinforced slab system.

b. The mat foundations for the proposed water tanks should be supported by a minimum 3.5-foot thickness of newly compacted engineered fill prepared as recommended in Section A of this report. Due to the possibility of potentially expansive bedrock exposed at the planned foundation depths, the proposed percolate tanks should be supported by a minimum 3.5-foot thickness of newly compacted engineered fill prepared as recommended in Section A of this report.

c. To limit the maximum total settlement at the center of the tanks under static conditions to about 1 inch, an allowable "net" bearing capacity of 1,500 pounds per square foot (psf), for loads distributed over the full footprint of the water tank foundation, may be utilized for dead and sustained live loads for design of the mat foundation. An allowable "net" bearing capacity of

2,000 psf may be used for thickened edges or other concentrated load areas. These values include a safety factor of at least 3.0 may be increased by 1/3 when considering transient loads such as earthquake or wind forces.

d. For mat foundations bearing entirely into formational bedrock, an allowable "net" bearing capacity of 4,500 pounds psf may be utilized for dead and sustained live loads for design of the mat foundation. This value is based on a factor of safety of greater than 3.

e. For design of the water tank foundations, a modulus of subgrade reaction ("k_p" value) of 150 pounds per square inch per inch (psi/in for standard 30-inch square bearing plate) may be used provided the subgrade (i.e., compacted engineered fill) is prepared as recommended in Section A of this report.

f. The actual depth, width, and reinforcement requirements for the mat foundation should be specified by the project Structural Engineer.

g. Resistance to lateral loading may be provided by friction acting along the mat foundation base. A coefficient of friction of 0.53 may be used for concrete foundations on compacted engineered fill and may be used with dead loads. For foundations bearing entirely into formational bedrock, a coefficient of friction of 0.65 may be used with dead loads. These values do not include a safety factor. An appropriate factor of safety should be used for design calculations (minimum of 1.5 recommended).

h. Additional resistance to lateral loading may be provided by passive earth pressure acting against the sides of foundations (i.e., thickened edges). An equivalent fluid weight (EFW) of 325 Z psf may be used for passive pressure, where Z = Depth (in feet) into the compacted engineered fill below the finished ground elevation. For foundations bearing entirely into formational bedrock, an equivalent fluid weight of 400 Z psf may be used. In passive pressure calculations, the upper 1 foot of soil should be subtracted from the depth, Z, unless confined by pavement or slab. The resisting pressures provided are ultimate values. An appropriate factor of safety should be used for design calculations (minimum of 1.5 recommended).

i. The subgrade for the mat foundation should be cleaned of all loose or unsuitable soils and debris prior to placement of reinforcement steel and concrete. Material generated from the foundation excavations should not be placed below the mat slab.

3. <u>Slabs-on-Grade</u>

a. Concrete slabs should be supported by compacted engineered fill as recommended elsewhere in this report.

b. It is recommended that perimeter slabs (walks, patios, etc.) be designed relatively independent of footing stems (i.e. free floating) so foundation adjustment will be less likely to cause cracking.

c. The information that follows regarding design criteria for slabs is the same as that given in the attached Minimum Foundation Design table for the "medium" expansion range. Actual slab designs should be provided by the Structural Engineer, but the reinforcement and thicknesses of sand he recommends should not be less than the criteria set forth in the attached Minimum Foundation Design table for the appropriate expansion range.

d. Slabs bottomed on soils in the "medium" expansion range should be underlaid with a minimum of 4 inches of sand.

e. Slabs bottomed on soils in the "medium" expansion range should at a minimum be reinforced at mid-slab with No. 3 bars on 24-inch centers, each way. No. 3 bars acting as dowels should also extend out of the perimeter footings, and should be bent so that they extend a minimum of 3 feet into adjacent slabs.

f. Soils underlying slabs that are in the "medium" expansion range should be premoistened to 3 percent over optimum moisture content to a depth of 18 inches below lowest adjacent grade. Premoistening of slab areas should be observed and tested by this firm for compliance with these recommendations prior to placing of sand, reinforcing steel, or concrete.

g. Where dampness of floor slabs is to be minimized, the slabs should be constructed on a minimum 4-inch-thick layer of capillary break material covered with a high-quality vapor retarder. The capillary break material should be free-draining, clean gravel or rock such as No. 4 by 3/4-inch pea gravel or permeable aggregate complying with Caltrans Standard Specifications, Section 68, Class 1, Type B. A 2-inch-thick protective cover (blotter) of clean sand should be placed over the vapor retarder. The vapor retarder should have a minimum thickness of 15 mils, a permeance as tested before and after mandatory conditioning (ASTM E 1745, Section 7.1.2 – 7.1.5) of less than 0.01 perms [grains/(ft^2 hr in.Hg)], and comply with the ASTM E 1745 Class A requirements. Vapor retarders having these properties are commonly referred to as "vapor barriers". The designer of record may omit the blotter at their discretion when a concrete with a water-cement ratio of 0.45 or less is specified. The vapor retarder should be constructed in accordance with ASTM E 1643-09 using material which meets ASTM E 1745.

h. Slab surfaces to receive moisture sensitive floor coverings should have considerations for maximum vapor emission levels. Most floor coverings require a 3- or 5-pound emission levels for a warranted installation. Emission levels may be controlled by the use of a sub-slab vapor barrier meeting ASTM E 1745 Class A, ASTM E 154-93 resistance to puncture of not less than 3000 grams and ASTM E 154-93 tensile strength after soaking of not less than 55.5 (MD/TD) average.

i. Slabs should be cast using concrete with a maximum slump of 4 inches or less. Excessive water content is the major cause of concrete cracking. To reduce concrete shrinkage, a water reducing agent or plasticizer may be utilized in the concrete to increase slump while maintaining an appropriate water/cement ratio. Hot reinforcing steel should be cooled prior to concrete placement to help prevent concrete shrinkage at the bar location. Where there is potential for moisture accumulation under the slab, special consideration should be given to allow gravity drainage of any water that could migrate into the subgrade of the slab or rock cushion. Control joints should be provided at appropriate intervals to control the location of shrinkage cracks.

j. Before floor coverings are placed, any bond breaker coating and all other contaminates should be removed from the slab surface. Once the building has been enclosed, and environmental controls (heating and air conditioning) are installed and operational, the slab should then be tested for moisture vapor emission, in accordance with ASTM E 1907. The flooring manufacturer may also require testing for relative humidity and pH of the concrete prior to placing the floor coverings.

k. Adhesives and floor coverings should be compatible, and the manufacturer's requirements should be followed. The tested moisture vapor emission rate should be below the specified rate for the floor covering products used prior to the product being placed. If required, the measured relative humidity and pH should also be below the specified values for the floor covering products used prior to the product being placed.

5. Retaining Walls

a. Active earth pressures may be used for design of unrestrained retaining walls where the top of the wall is free to translate or rotate. To develop active earth pressures, the walls should be capable of deflecting by at least 0.004H (where H is the height of the wall). At-rest earth pressures should be used for design of retaining walls where the wall top is restrained such that the deflections required for development of active soil pressures cannot occur or are undesirable.

b. Due to the expansion potential of the Rincon Formation and materials derived from it, Earth Systems recommends that the proposed retaining walls at the ADF be backfilled with non-expansive import soil. However, if the cantilever retaining walls are backfilled with compacted on-site soils, the walls should be designed for active or at-rest lateral earth pressures for various backfill slopes using the following equivalent fluid unit weights.

Equivalent Fluid Unit Weight (pcf)

Backfill Slope	Active Conditions	At-Rest Conditions
Level	58 pcf	79 pcf
2H:1V	68 pcf	94 pcf

c. Provided the wall is backfilled at a 1:1 projection upward from the heels of the wall footings with crushed rock or non-expansive sand, an active pressure of 35 pcf of equivalent fluid weight for well-drained, level backfill may be used. An at-rest pressure of 55 pcf of equivalent fluid weight for well-drained, level backfill may be used. Similarly, an active pressure of 45 pcf of equivalent fluid weight may be used for well-drained backfill (i.e., crushed rock or non-expansive sand) sloping at 2H:1V (horizontal to vertical). An 18-inch thick cap of compacted native soils should be placed above the rock or sand. Filter fabric should be placed between the rock or sand and native soils and/or backfill over the top.

d. The lateral earth pressures presented in the table above assume the wall backfill is drained (no hydrostatic forces acting on the wall) and no traffic or other surcharge loads are applied within a distance of one-half the wall height. The lateral earth pressures listed above were based on the assumption that backfill soils will be compacted to 90 percent of maximum dry density as determined by the ASTM D 1557 Test Method.

e. Retaining walls may need to be designed for a seismic loading force that is applied in addition to the static forces when seismic shaking occurs. Based on the 2016 CBC, a seismic increment of earth pressure equal to 23 pcf of additional equivalent fluid weight needs to be considered for flexible retaining walls **over 6 feet tall**. For rigid retaining walls, a seismic increment of earth pressure equal to 37 pcf of additional equivalent fluid weight needs to be considered. These pressures have been determined by a procedure presented by Al Atik and Sitar (2010). The seismic increment of pressure can be assumed to be distributed so that the centroid of pressure acts at 0.33H above the base of a retaining wall, where H is the wall height in feet. Because this seismic force is transient, and in accordance with CBC Section 1807.2.3, a minimum factor of safety of 1.1 may be used for sliding and overturning when seismic loads are included. The estimated peak ground acceleration used in our calculations was two-thirds of the site peak ground accelerations (PGA) of 0.923 g.

f. The lateral earth pressure to be resisted by the retaining walls or similar structures should also be increased to allow for any other applicable surcharge loads. The surcharges considered should include forces generated by any structures or temporary loads that would influence the wall design. Earth Systems can provide assistance in evaluating the effects of surcharge loading, if desired, once details are known regarding the magnitude of the surcharge, the size of the surcharge-loaded area, the distance of the surcharge from the wall, and the restraint of the wall.

g. A system of backfill drainage should be incorporated into retaining wall designs. Backfill comprising the drainage system immediately behind retaining structures should be free-draining granular material with a filter fabric between it and the rest of the backfill soils. As an alternative, the backs of walls could be lined with geodrain systems. The backdrains should extend from the bottoms of the walls to about 18 inches from finished backfill grade. Waterproofing may aid in reducing the potential for efflorescence on the faces of retaining walls.

h. Compaction on the uphill sides of walls within a horizontal distance equal to one wall height should be performed by hand-operated or other lightweight compaction equipment. This is intended to reduce potential "locked-in" lateral pressures caused by compaction with heavy grading equipment.

i. Water should not be allowed to pond near the tops of retaining walls. To accomplish this, final backfill site grades should be such that all water is diverted away from retaining walls.

6. Preliminary Asphaltic Pavement Recommendations

a. Assuming that soils derived from the Rincon Formation will be used for fill in the proposed paved areas around the ADF, we anticipate poor traffic support capacity when recompacted and used as pavement subgrade. An R-value of 15 was assumed for the subgrade material.

b. Pavement sections for untreated subgrade soils are presented below based on an R-value of 15; current Caltrans design procedures, and traffic indices ranging from 4 to 10. The traffic index (TI) is a measure of traffic wheel loading frequency and intensity of anticipated traffic. Traffic indices assumed above should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project.

TRAFFIC INDEX	ASPHALT-CONCRETE (INCH)	CLASS 2 AGGREGATE BASE (INCH)
4.0	3.0	4.5
5.0	3.5	7.0
6.0	4.0	9.5
7.0	4.5	12.0
8.0	5.0	15.0
9.0	6.0	16.5
10.0	7.0	18.5

c. The preliminary paving sections provided above have been designed for the type of traffic indicated. If the pavement is placed before construction on the project is complete, construction loads, which could increase the Traffic Indices, assumed above, should be taken into account.

d. To reduce the thickness of aggregate base material in the pavement section for the truck lanes, geogrid (Tensar *TriAx TX5 or* equivalent) may be placed to increase the gravel factor of the aggregate base material, or the subgrade soils may be improved by either lime or cement treatment. Earth Systems can provide pavement sections for either case upon request.

e. The subgrade soils in the upper 12 inches below the finished subgrade elevation should be properly moisture conditioned to above optimum moisture, and compacted to achieve a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density. The subgrade soils should be in a stable, non-pumping condition at the time the aggregate base material is placed and compacted.

f. Aggregate base and aggregate subbase materials should conform to the specifications stated in the 2015 "Greenbook" and be compacted as engineered fill to at least 95 percent relative compaction.

g. Asphalt paving materials and placement methods should meet specifications stated in the 2015 "Greenbook" for asphalt concrete.

h. Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become continuously wet.

i. All concrete curbs separating pavement and landscaped areas should extend at least 2 inches into the subgrade and below the bottom of the adjacent aggregate base to provide a barrier against lateral migration of landscape water or runoff into the pavement section.

j. Periodic maintenance should be performed to repair degraded areas and seal cracks with appropriate filler.

k. Following site grading, we recommend that representative subgrade samples be obtained and R-value testing be performed. If the results of the R-value testing vary significantly from that assumed, the pavement sections presented above will need to be revised.

7. Preliminary Rigid Pavement Recommendations

Rigid pavement sections for untreated subgrade soils are presented below based on an assumed R-value of 15; current Caltrans design procedures, and traffic indices of 4.5 and 10.0. The unreinforced pavement thicknesses are based on concrete 28-day concrete compressive strengths of 3,500 psi and 4,000 psi.

For unreinforced rigid pavements in automobile and pickup truck access areas, the following pavement section criteria may be used for areas with a TI of 4.5 or less:

1. Concrete pavement sections for a TI of 4.5 should be a minimum of 5.75 inches thick for a 28-day concrete compressive strength of 3,500 psi. For a 28-day concrete compressive strength of 4,000 psi, the concrete pavement should be at least 5.25 inches thick.

2. The pavement thickness presented above is based on a 4-inch thick layer of compacted aggregate base (or crushed miscellaneous base) beneath the concrete pavement.

3. Contraction joints should be placed at intervals not exceeding 12 feet.

For reinforced rigid pavements in truck traffic driveways and access lanes, the following pavement section criteria may be used for a TI of 10.0:

1. For a 6-inch thick reinforced rigid pavement, minimum reinforcing should consist of No. 5 bars at a maximum spacing of 6 inches in longitudinal direction.

2. For a 7-inch thick reinforced rigid pavement, minimum reinforcing should consist of No. 4 bars at a maximum spacing of 12 inches in longitudinal direction.

3. For traffic in one direction, the percentage of reinforcing steel used in the traverse direction may be half of that used in the longitudinal direction. If the pavement will be subjected to multi-directional traffic or short radius maneuvering, the percentage of reinforcing steel used in the traverse direction should be the same as in the longitudinal direction.

4. The reinforced pavement thicknesses are based on a concrete 28-day concrete compressive strength of at least 4,000 psi.

5. The concrete pavement sections should be underlain by a 4-inch thick (minimum) layer of compacted aggregate base (or crushed miscellaneous base).

6. Reinforcing bars should be placed at mid-height of the concrete slab and maintained at mid height during placement of concrete.

7. Contraction joints should be placed at intervals not exceeding 15 feet.

ADDITIONAL SERVICES

This addendum report is based on the assumption that an adequate program of monitoring and testing will be performed by Earth Systems during construction to check compliance with the recommendations given in this report. The recommended tests and observations include, but are not necessarily limited to the following:

1. Review of the building and grading plans during the design phase of the project.
2. Observation and testing during site preparation, grading, placing of engineered fill, and foundation construction.
3. Consultation as required during construction.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

The analysis and recommendations submitted in this addendum report are based in part upon the data obtained from the test borings drilled by Earth Systems on the two sites, and from data obtained by others during previous studies at the landfill. The nature and extent of variations between and beyond the test borings may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater or air, on, below, or around this site. Any statements in this report or on the soil boring logs regarding odors noted, unusual or suspicious items or conditions observed are strictly for the information of the Client.

Findings of this report are valid as of this date; however, changes in conditions of a property can occur with passage of time whether they are due to natural processes or works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur whether they result from legislation or broadening of knowledge. Accordingly, findings of this report may be invalidated wholly or partially by changes outside the control of this firm. Therefore, this report is subject to review and should not be relied upon after a period of one year.

In the event that any changes in the nature, design, or location of the structures, above-ground storage tanks, composting management unit, and other improvements are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

This report is issued with the understanding that it is the responsibility of the Owner, or of his representative to insure that the information and recommendations contained herein are called to the attention of the Architect and Engineers for the project and incorporated into the plan and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

As the Geotechnical Engineers for this project, Earth Systems has striven to provide services in accordance with generally accepted geotechnical engineering practices in this community at this time. No warranty or guarantee is expressed or implied. This report was prepared for the exclusive use of the Client for the purposes stated in this document for the referenced project only. No third party may use or rely on this report without express written authorization from Earth Systems for such use or reliance.

It is recommended that Earth Systems be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications. If Earth Systems is not accorded the privilege of making this recommended review, it can assume no responsibility for misinterpretation of the recommendations.

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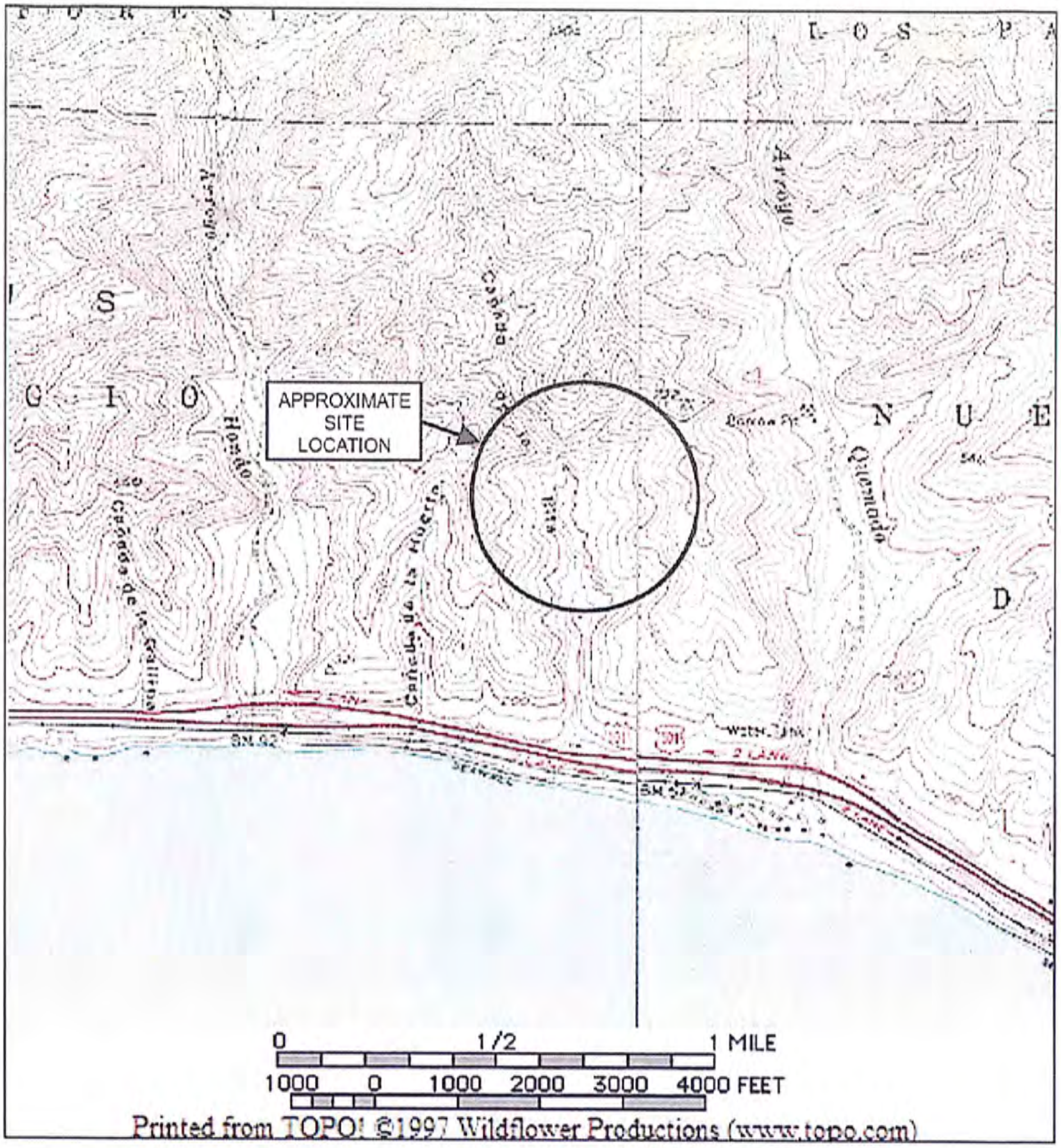
APPENDIX A

Vicinity Map
Regional Geologic Map
Site Plan 1 (Relocated ADF)
Site Plan 2 (Pad 7)
Field Study
Logs of Borings
Symbols Commonly Used on Boring Logs
Unified Soil Classification



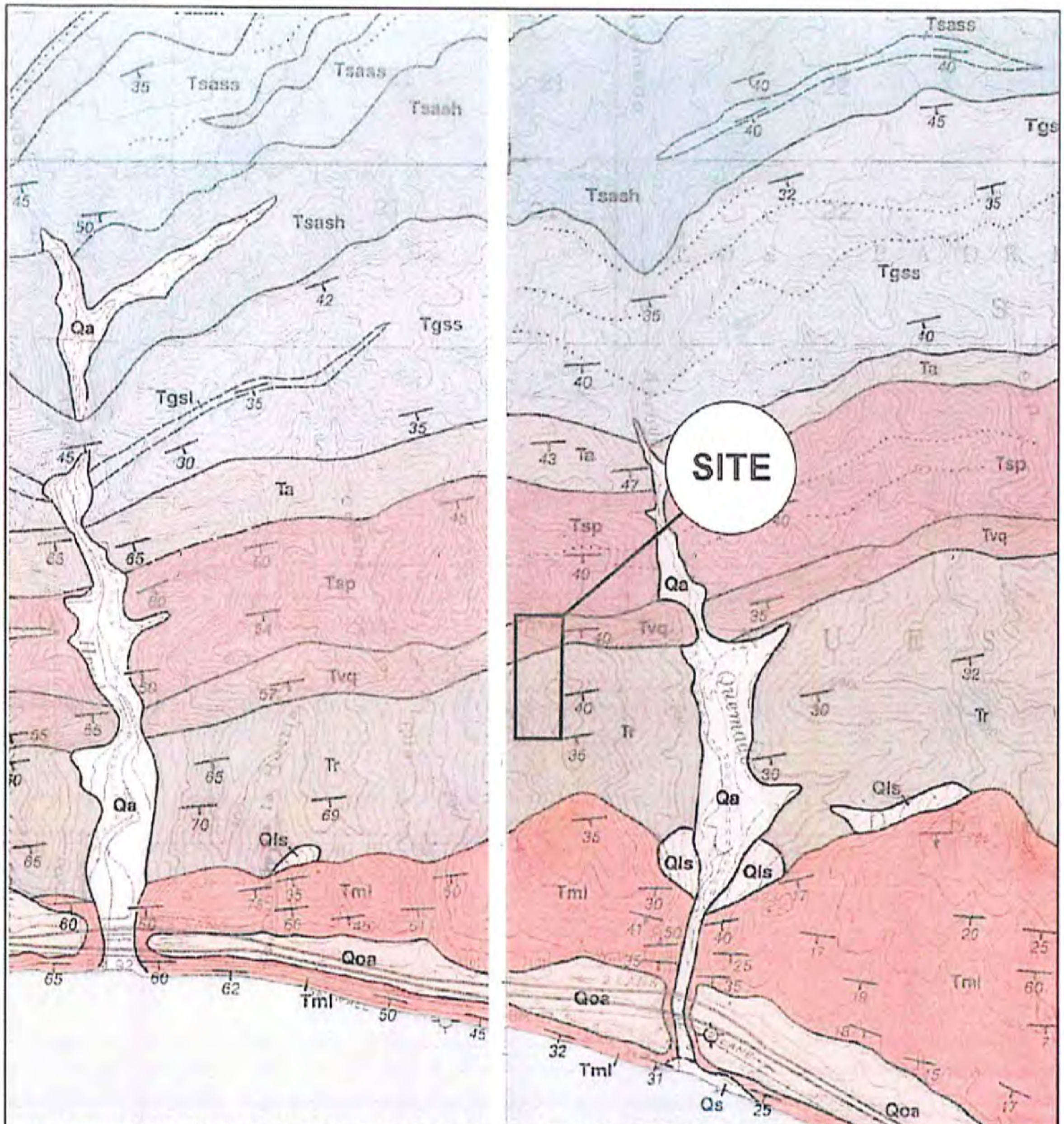
N

VICINITY MAP

Tajiguas Landfill
Santa Barbara County, California

Earth Systems
Southern California

May 2017	VT-24980-04



*Taken from Dibblee, Geologic Map of the Solvang and Gaviota Quadrangles, 1988; Geologic Map of Santa Inez and Tajiguas Quadrangles, 1988.,

0 ft. ~ 1,000 ft. ~ 2,000 ft.

N

LEGEND

Quaternary

Qa Surficial Sediments: valley and floodplain deposits of silt, sand and gravel.

Tertiary

Tr Rincon Shale: poorly bedded gray clay shale or claystone.

Tml Monterey Shale: white weathering, soft, punky, fissile to platy, semi-saliceous shale.

Tvq Vaqueros Sandstone: light gray calcareous sandstone.

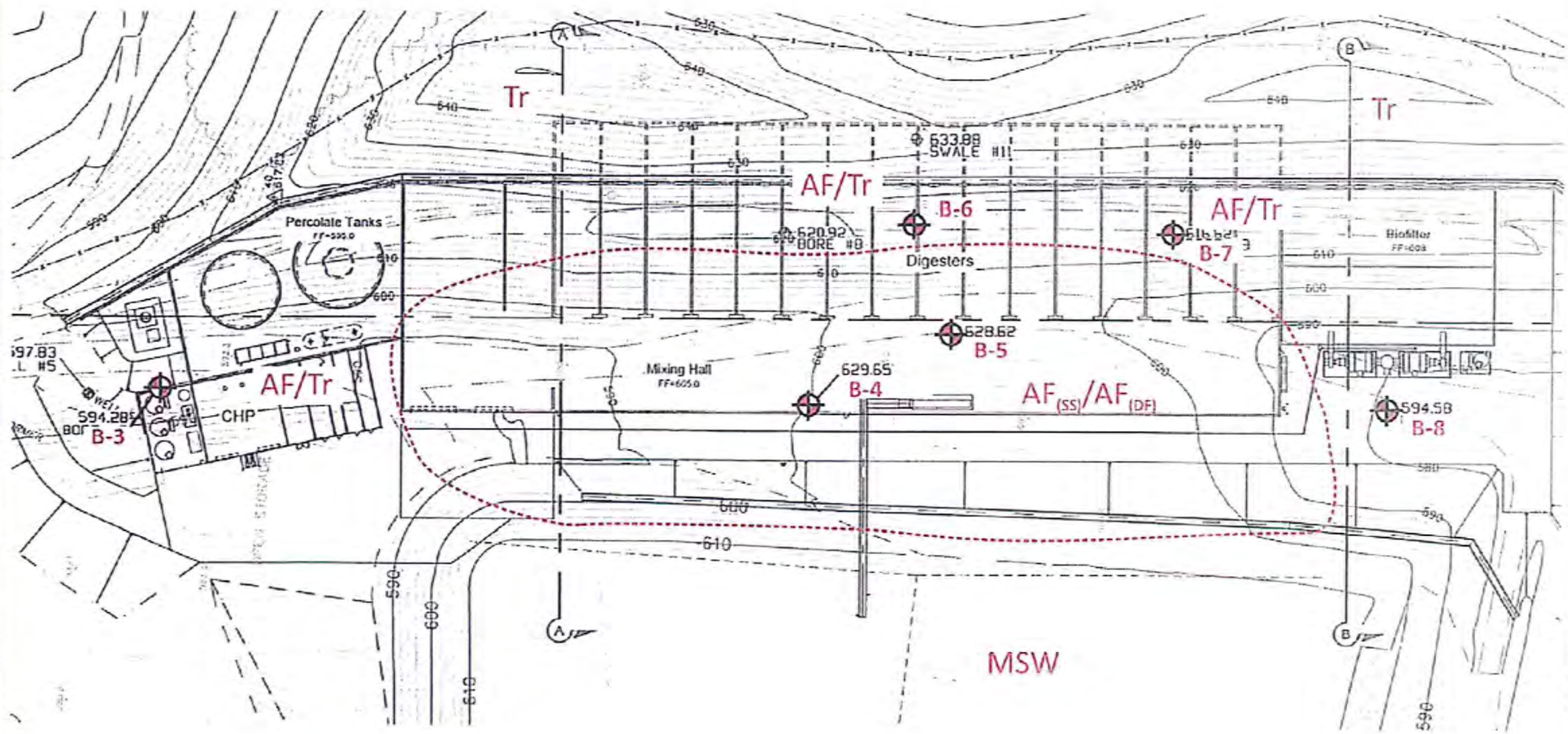
Tsp Sespe Formation: gray to tan sandstone green to red siltstone and claystone.

REGIONAL GEOLOGIC MAP

Tajiguas Landfill
Santa Barbara County, California

Earth Systems
Southern California

May 2017 | VT-24980-04



: Approximate boring location

: Approximate boundary between units

$AF_{(SS)}$: Artificial Fill (Stockpiled Soil)

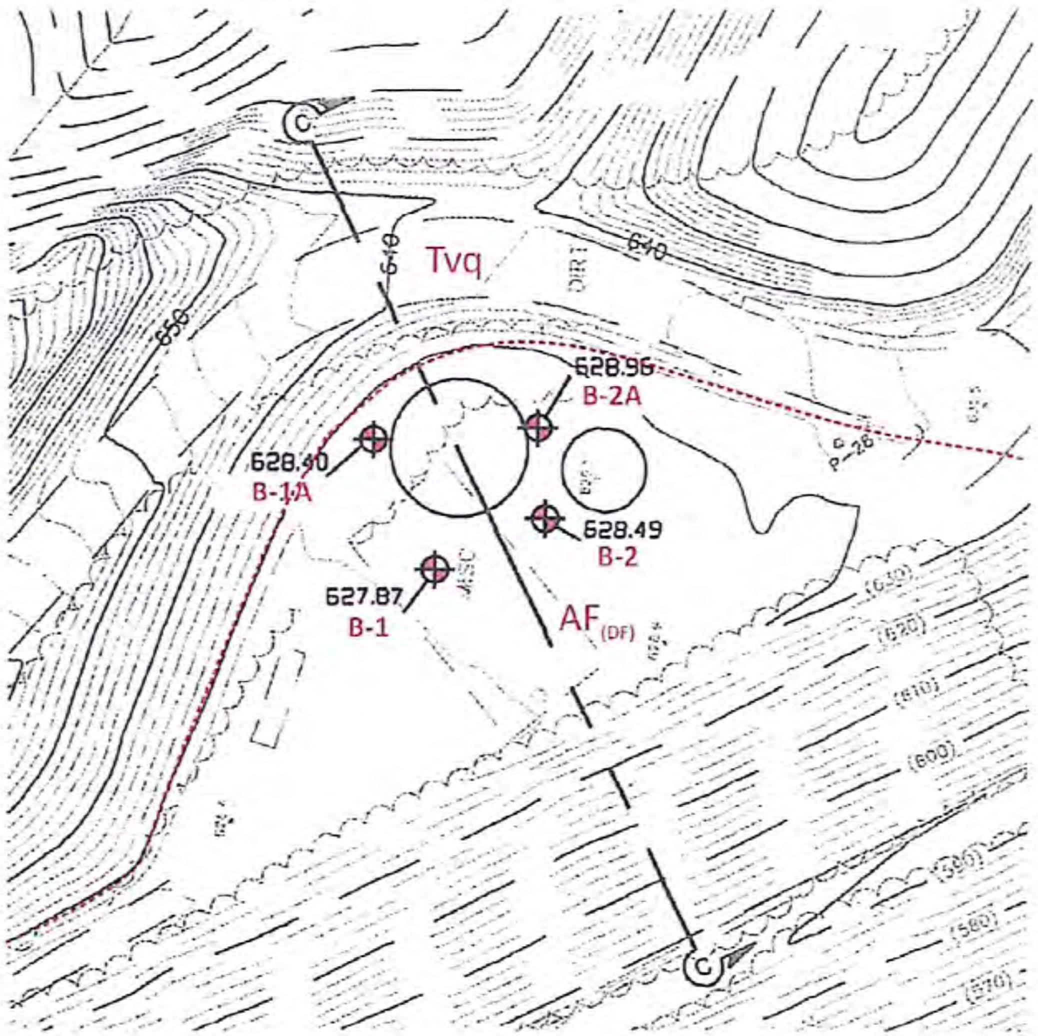
$AF_{(DF)}$: Artificial Fill (Documented Fill)

Tr : Rincon Formation bedrock

MSW : Municipal solid waste

Approximate Scale: 1" = 80'

SITE PLAN 1	
Tijiguas Landfill Resource Recovery Project 14770 Calle Real Santa Barbara County, California	
Earth Systems Southern California	
May 2017	VT-24980-04



: Approximate boring location

: Approximate boundary between units

$AF_{(DF)}$: Artificial Fill (Documented Fill)

Tvq : Vaqueros Sandstone

SITE PLAN 2	
Tijiguas Landfill Resource Recovery Project 14770 Calle Real Santa Barbara County, California	
Earth Systems Southern California	
May 2017	VT-24980-04

FIELD STUDY

A. Between March 29 and April 5, 2017, ten (10) exploratory borings were drilled to observe the soil and bedrock profile, and to obtain samples for laboratory analysis. The borings were drilled to depths ranging from approximately 16.5 to 55.5 feet below the existing ground surface. All borings were drilled using 8-inch diameter hollow stem auger. The borings were logged by an Engineer of Earth Systems. (The coordinates of the test borings drilled for this study were obtained by a GPS phone app, and the locations are shown on the Site Plan in this Appendix.)

B. Relatively undisturbed samples were obtained within the test borings with a Modified California (MC) ring sampler (ASTM D 3550 with shoe similar to ASTM D 1586). The MC sampler has a 3-inch outside diameter and a 2.37-inch inside diameter. A 140-pound hammer falling approximately 30 inches (ASTM D 1586) drove the sampler. The down-hole hammer was operated by an automatic trip mechanism. The number of blows required to drive the sampler 18 inches was recorded in 6-inch increments and recorded on the boring logs. Recovered ring samples were sealed in plastic containers and transported to the Earth Systems laboratory for further classification and testing. Since the stockpiled soil on the western half of the ADF will be removed, samples were not collected for subsequent laboratory testing nor to obtain standard blow counts for evaluating the consistency of the stockpiled soil.

C. Bulk (disturbed) samples of the subsurface soils were obtained from tailings generated in select exploratory borings. These samples were secured for classification and testing purposes and represent a mixture of soils within the depths collected.

D. The final logs of the borings represent interpretations of the contents of the field logs and the results of laboratory testing performed on the samples obtained during the subsurface study. The final boring and test pit logs are included in this Appendix.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-1
PROJECT NAME: Tajiguas Landfill
PROJECT NUMBER: VT-24980-04
BORING LOCATION: Per Plan

DRILLING DATE: March 29, 2017
DRILLING METHOD: 8" Hollow Stem Auger
DRILL RIG: CME-75
LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0	X								
	X		■	7/12/13		SM	110.8	11.3	**DOCUMENTED FILL:** Yellowish brown silty sand; medium dense; damp.
5			■	9/14/18		SM	113.3	11.9	**DOCUMENTED FILL:** Dark yellowish brown silty sand; medium dense; damp.
			■	8/12/13		SM	110.8	15.8	**DOCUMENTED FILL:** Yellowish brown silty sand; medium dense; damp.
10			■	6/10/14		SM	116.5	14.8	**DOCUMENTED FILL:** Yellowish brown silty sand; medium dense; damp.
15			■	10/17/26		SM	114.1	12.2	**DOCUMENTED FILL:** Dark yellowish brown silty sand; medium dense; damp.
20			■	14/18/26		SM	127.0	8.9	**DOCUMENTED FILL:** Dark brown silty sand; medium dense; damp.
25			■	17/30/45		SM	118.7	11.6	**DOCUMENTED FILL:** Dark brown silty sand; dense; dry.
30			■	18/32/47		SM	121.9	12.0	**DOCUMENTED FILL:** Dark olive brown silty sand with minor gravels; dense; dry.
35			■	19/23/38		SM	123.5	6.8	**DOCUMENTED FILL:** Dark olive brown silty sand; dense; dry.
									Bedrock encountered at about 38 feet.
40									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
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PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-1 (Continued)	DRILLING DATE: March 29, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40				50 for 4"					**BEDROCK:** Grey Sandstone; very dense; dry; poor recovery.
45				50 for 5"					**BEDROCK:** Grey Sandstone; very dense; dry; poor recovery.
									Total depth = 45.5 feet. **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

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BORING NO: B-1A	DRILLING DATE: March 29, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
						SM			**DOCUMENTED FILL:** Dark yellowish brown silty sand; moist.
5									
10						SM			**DOCUMENTED FILL:** Dark yellowish brown silty sand; moist.
15									
									Bedrock encountered at about 16 feet.
									Total depth = 17.0 feet. **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-2
PROJECT NAME: Tajiguas Landfill
PROJECT NUMBER: VT-24980-04
BORING LOCATION: Per Plan

DRILLING DATE: March 29, 2017
DRILLING METHOD: 8" Hollow Stem Auger
DRILL RIG: CME-75
LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	10/16/16		SM	121.5	12.3	**DOCUMENTED FILL:** Dark brown silty sand; medium dense; damp.
5			■	12/24/30		SM	–	3.0	**DOCUMENTED FILL:** Dark brown silty sand with minor gravels; very dense; damp.
10			■	9/15/20		SM	95.6	12.8	**DOCUMENTED FILL:** Olive brown silty sand; medium dense; damp.
15			■	8/14/23		SM	114.8	11.1	**DOCUMENTED FILL:** Dark brown silty sand; medium dense; damp.
20			■	11/16/16		SM	118.9	11.7	**DOCUMENTED FILL:** Dark brown silty sand; medium dense; dry.
25			■	14/31/50		SM	121.6	10.0	**DOCUMENTED FILL:** Olive brown silty sand; very dense; damp.
30			■	13/19/27		SM	120.8	11.9	**DOCUMENTED FILL:** Olive brown silty sand; medium dense; damp.
35			■	26/50 for 3"		SM	115.8	4.2	**DOCUMENTED FILL:** Olive brown silty sand; medium dense; damp.
									Bedrock encountered at about 35.5 feet.
40									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-2 (Continued)	DRILLING DATE: March 29, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40		▒		50 for 3"	▒				**BEDROCK:** Grey sandstone; very dense; dry; poor recovery.
									Total depth = 40.5 feet. **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-2A	DRILLING DATE: March 30, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0–5						SM			**DOCUMENTED FILL:** Dark brown silty sand; damp.
5–10						SM			**DOCUMENTED FILL:** Dark brown silty sand; damp.
15						SM			**DOCUMENTED FILL:** Dark brown silty sand; damp.
									BEDROCK: Grey sandstone; very dense; dry.
20									**Total depth = 19.5 feet.** **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-3	DRILLING DATE: March 30, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						SM			**ARTIFICIAL FILL:** Olive brown silty sand; damp.
			X	6/11/16			106.3	18.5	**BEDROCK:** Olive brown claystone with caliche; very stiff; dry.
5			X	8/24/39			103.3	22.5	**BEDROCK:** Olive brown claystone with caliche; hard; dry.
10			X	15/40/50 for 5"			107.3	20.6	**BEDROCK:** Olive brown claystone with caliche; hard; dry.
15			X	50 for 5.5"					**BEDROCK:** Olive brown claystone with caliche; hard; dry.
20			X	50 for 4"					**BEDROCK:** Dark olive brown claystone with caliche; hard; dry; poor recovery.
									Total depth = 20.5 feet. **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-4	DRILLING DATE: March 30, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0–24						SM			**STOCKPILED SOIL:** Yellowish brown, brown, olive brown, and dark brown silty sand; damp.
						SM			**STOCKPILED SOIL:** Yellowish brown, brown, olive brown, and dark brown silty sand; damp.
25	X		■	14/25/38		SM	123.9	9.3	**DOCUMENTED FILL:** Yellowish brown silty sand; dense; damp.
30			■	25/43/50		SM	118.8	9.0	**DOCUMENTED FILL:** Yellowish brown and brown silty sand; dense; damp.
35			■	15/25/41		SM	123.3	10.4	**DOCUMENTED FILL:** Yellowish brown and brown silty sand; Dense; damp.
40									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-4 (Continued)
PROJECT NAME: Tajiguas Landfill
PROJECT NUMBER: VT-24980-04
BORING LOCATION: Per Plan

DRILLING DATE: March 30, 2017
DRILLING METHOD: 8" Hollow Stem Auger
DRILL RIG: CME-75
LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40			X	13/24/37		SM	116.7	8.1	**DOCUMENTED FILL:** Yellowish brown and brown silty sand; dense; damp.
45			X	17/50 for 5"		SM			**DOCUMENTED FILL:** Yellowish brown silty sand and green gravel chips; dense; damp.
50			X	50 for 6"					**Bedrock encountered at about 50.0 feet.** **BEDROCK:** Dark olive brown claystone with caliche; hard; dry.
55			X	50 for 5.5"					
									Total depth = 55.5 feet. **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-5	DRILLING DATE: March 30, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
5						SM			**STOCKPILED SOIL:** Dark yellowish brown, brown, olive brown, and dark brown silty sand; damp.
10									
15						SM			**STOCKPILED SOIL:** Dark yellowish brown, brown, olive brown, and dark brown silty sand; damp.
20									
25									
30			■	20/27/35		SM	121.0	9.1	**DOCUMENTED FILL:** Yellowish brown and brown silty sand, And green gravel chips; dense; damp.
35									
40									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-5 (Continued)	DRILLING DATE: March 30, 2017
PROJECT NAME: Tajiguas Landfill	DRILLING METHOD: 8" Hollow Stem Auger
PROJECT NUMBER: VT-24980-04	DRILL RIG: CME-75
BORING LOCATION: Per Plan	LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40									**Bedrock encountered at about 40.0 feet.** **BEDROCK:** Dark olive brown claystone with caliche; hard; dry.
45									**Total depth = 45.0 feet.** **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-6
PROJECT NAME: Tajiguas Landfill
PROJECT NUMBER: VT-24980-04
BORING LOCATION: Per Plan

DRILLING DATE: March 31, 2017
DRILLING METHOD: 8" Hollow Stem Auger
DRILL RIG: CME-75
LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0	X					SM			**ARTIFICIAL FILL:** Light yellowish brown silty sand; damp.
	X		■	8/22/40			109.0	16.4	**BEDROCK:** Dark brown claystone with caliche; hard; dry.
5			■	25/50 for 4"			103.3	17.5	**BEDROCK:** Dark brown claystone with caliche; hard; dry.
10			■	50 for 4"					**BEDROCK:** Dark brown claystone with caliche; hard; poor recovery.
15			■	19/50 for 3"					**A thin layer of greyish silty sand was encountered at 15 feet to 15.5 feet.**
									BEDROCK: Dark brown claystone with caliche; hard; dry.
20			■	18/50 for 2"			109.4	13.5	
									Total depth = 20.5 feet. **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California
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PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-7
PROJECT NAME: Tajiguas Landfill
PROJECT NUMBER: VT-24980-04
BORING LOCATION: Per Plan

DRILLING DATE: April 5, 2017
DRILLING METHOD: 8" Hollow Stem Auger
DRILL RIG: CME-75
LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0–5	X					SM			**ARTIFICIAL FILL:** Dark brown silty sand; damp.
5			■	24/50 for 5"					**BEDROCK:** Dark olive brown claystone with caliche; hard; dry.
10			■	31/45/48					**BEDROCK:** Dark olive brown claystone with caliche; hard; dry.
15			■	12/18/20					**BEDROCK:** Dark olive brown claystone with caliche; very stiff; damp.
									Total depth = 16.5 feet. **No groundwater encountered.**

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

Earth Systems
Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-8
PROJECT NAME: Tajiguas Landfill
PROJECT NUMBER: VT-24980-04
BORING LOCATION: Per Plan

DRILLING DATE: April 5, 2017
DRILLING METHOD: 8" Hollow Stem Auger
DRILL RIG: CME-75
LOGGED BY: ML

Vertical Depth (ft)	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS PER 6")	SYMBOL	USCS CLASS	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
5			X	15/22/29		SM	120.2	8.9	**ARTIFICIAL FILL:** Olive brown and yellowish brown silty sand; dense; damp.
10			X	10/14/18		SM	119.9	10.8	**ARTIFICIAL FILL:** Dark brown and yellowish brown silty sand; medium dense; damp.
15			X	9/20/50 for 5"		SM	125.2	10.1	**ARTIFICIAL FILL:** Dark brown and yellowish brown silty sand with minor gravels; dense; damp.
20			X	17/50 for 5"		SM	100.1	22.0	**BEDROCK:** Dark brown claystone with caliche; hard; damp.
25			X	50 for 4"					**BEDROCK:** Dark brown claystone with caliche; hard; damp.
30			X	50 for 2"					**BEDROCK:** Dark brown claystone with caliche; hard; damp; poor recovery.

Total depth = 30.0 feet.
No groundwater encountered.

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types, and the transitions may be gradual.

■	Modified California Split Barrel Sampler
⧅	Modified California Split Barrel Sampler - No Recovery
▌	Standard Penetration Test (SPT) Sampler
▯	Standard Penetration Test (SPT) Sampler - No Recovery
▽	Perched Water Level
▼	Water Level First Encountered
▼	Water Level After Drilling
⊙	Pocket Penetrometer (tsf)
⊕	Vane Shear (ksf)

1. The approximate locations of borings were determined by sighting and pacing from nearby prominent topographic or cultural features. Borehole elevations were estimated by interpolating between available plan contour intervals. The location and elevation of each boring should be considered accurate only to the degree implied by this method.

2. Stratification lines represent the approximate boundary between soil and/or rock types. The transition between statigraphic units may be gradual.

3. Water level readings taken in boreholes are approximate and apply only to the time and date of drilling. Fluctuations in the level of groundwater from the time of initial measurement may occur due to variations in rainfall, tides, barometric pressure, temperature, or other factors.

Earth Systems So. Calif.

1731-A Walter Street, Ventura, California 93003
PH: (805) 642-6727 FAX: (805) 642-1325

Symbols Commonly Used on Boring Logs

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		G W	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				G P	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		G M	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				G C	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		S W	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				S P	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH FINES (APPRECIABLE AMOUNT OF FINES)		S M	SILTY SANDS, SAND-SILT MIXTURES
				S C	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		M L	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				C L	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				O L	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		M H	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				C H	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				O H	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				P T	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

Earth Systems So. Calif.

1731-A Walter Street, Ventura, California 93003
PH: (805) 642-6727 FAX: (805) 642-1325

Unified Soil Classification System (USCS)

APPENDIX B

Laboratory Testing
Tabulated Laboratory Test Results
Individual Laboratory Test Results
Minimum Foundation Design Table

LABORATORY TESTING

A. Samples were reviewed along with field logs to determine which would be analyzed further. Those chosen for laboratory analysis were considered representative of soils that would be exposed and/or used during grading, and those deemed to be within the influence of proposed structures. Test results are presented in graphic and tabular form in this Appendix.

B. In-situ Moisture Content and Unit Dry Weight for the ring samples were determined in general accordance with ASTM D 2937.

C. The relative strength characteristics of soils were determined from the results of Direct Shear tests on remolded and in-situ samples. Specimens were placed in contact with water at least 24 hours before testing, and were then sheared under normal loads ranging from 0.5 to 3 ksf in general accordance with ASTM D 3080.

D. Settlement characteristics were developed from the results of one dimensional consolidation tests performed in general accordance with ASTM D 2435. The samples were loaded to approximately the overburden, flooded with water, and then incrementally loaded to maximum pressures ranging from 4 to 16 ksf. The samples were allowed to consolidate under each load increment. Rebound was measured under reverse alternate loading. Compression was measured by dial gauges accurate to 0.0001 inch. Results of the Consolidation tests are presented in this Appendix in the form of percent consolidation versus log of pressure curves.

E. Expansion index tests were performed on bulk soil samples in accordance with ASTM D 4829. The samples were surcharged under 144 pounds per square foot at moisture content of near 50 percent saturation. The samples were then submerged in water for 24 hours, and the amount of expansion was recorded with a dial indicator.

F. Maximum density tests were performed to estimate the moisture-density relationship of typical soil materials. The tests were performed in accordance with ASTM D 1557.

G. A portion of select bulk samples was sent to another laboratory for analyses of soil pH, resistivity, chloride contents, and sulfate contents. Soluble chloride and sulfate contents were determined on a dry weight basis. Resistivity testing was performed in accordance with California Test Method 424, wherein the ratio of soil to water was 1:3.

TABULATED LABORATORY TEST RESULTS

REMOLDED SAMPLES

BORING AND DEPTH	B-1&B-2 @ 0-10'	B-4 @ 25-30'	B-6 @ 0-5'
USCS	SM (Fill)	SM (Fill)	ML
MAXIMUM DENSITY (pcf)	128.5	130.0	107.0
OPTIMUM MOISTURE (%)	10.0	9.0	17.5
PEAK COHESION (psf)	--	240	400
PEAK ANGLE OF INTERNAL FRICTION	--	24	27
ULTIMATE COHESION (psf)	--	200	400
ULTIMATE ANGLE OF INTERNAL FRICTION	--	24	27
EXPANSION INDEX	51	--	--
pH	8.4	--	6.4
SOLUBLE CHLORIDES (mg/Kg)	5.8	--	6.2
RESISTIVITY (OHMs-cm)	3,800	--	330
SOLUBLE SULFATES (mg/Kg)	198	--	5,400

RELATIVELY UNDISTURBED SAMPLES

BORING AND DEPTH	B-1 @ 35'	B-6 @ 15'
USCS	SM (Fill)	ML (Bedrock)
IN-PLACE DRY DENSITY (pcf)	123.6	104.7
IN-PLACE MOISTURE (%)	6.8	16.1
PEAK COHESION (psf)	720	450
PEAK ANGLE OF INTERNAL FRICTION	31	42
ULTIMATE COHESION (psf)	360	0
ULTIMATE ANGLE OF INTERNAL FRICTION	32	42

File No.: VT-24980-04 April 12, 2017

UNIT DENSITIES AND MOISTURE CONTENT

ASTM D2937 & D2216

Job Name: Tajiguas Landfill

Sample Location	Depth (feet)	Unit Dry Density (pcf)	Moisture Content (%)	USCS Group Symbol
B1	2.5	110.8	11.3	SM
B1	5	113.3	11.9	SM
B1	7.5	110.8	15.8	SM
B1	10	116.5	14.8	SM
B1	15	114.1	12.2	SM
B1	20	127.0	8.9	SM
B1	25	118.7	11.6	SM
B1	30	121.9	12.0	SM
B1	35	123.5	6.8	SM
B2	2.5	121.5	12.3	SM
B2	5	---	3.0	SM
B2	10	95.6	12.8	SM
B2	15	114.8	11.1	SM
B2	20	118.9	11.7	SM
B2	25	121.6	10.0	SM
B2	30	120.8	11.9	SM
B2	35	115.8	4.2	SM
B3	2.5	106.3	18.5	SM/SC
B3	5	103.3	22.5	SM/ML
B3	10	107.3	20.6	SM/ML
B4	25	123.9	9.3	SM
B4	30	118.8	9.0	SM
B4	35	123.3	10.4	SM
B4	40	116.7	8.1	SM
B5	30	121.0	9.1	SM
B6	2.5	109	16.4	SM/ML
B6	5	103.3	17.5	SM/ML
B6	20	109.4	13.5	SM/ML
B8	5	120.2	8.9	SM
B8	10	119.9	10.8	SM
B8	15	125.2	10.1	SM
B8	20	100.1	22.0	SM

File Number: VT-24980-04 Lab Number: 097364

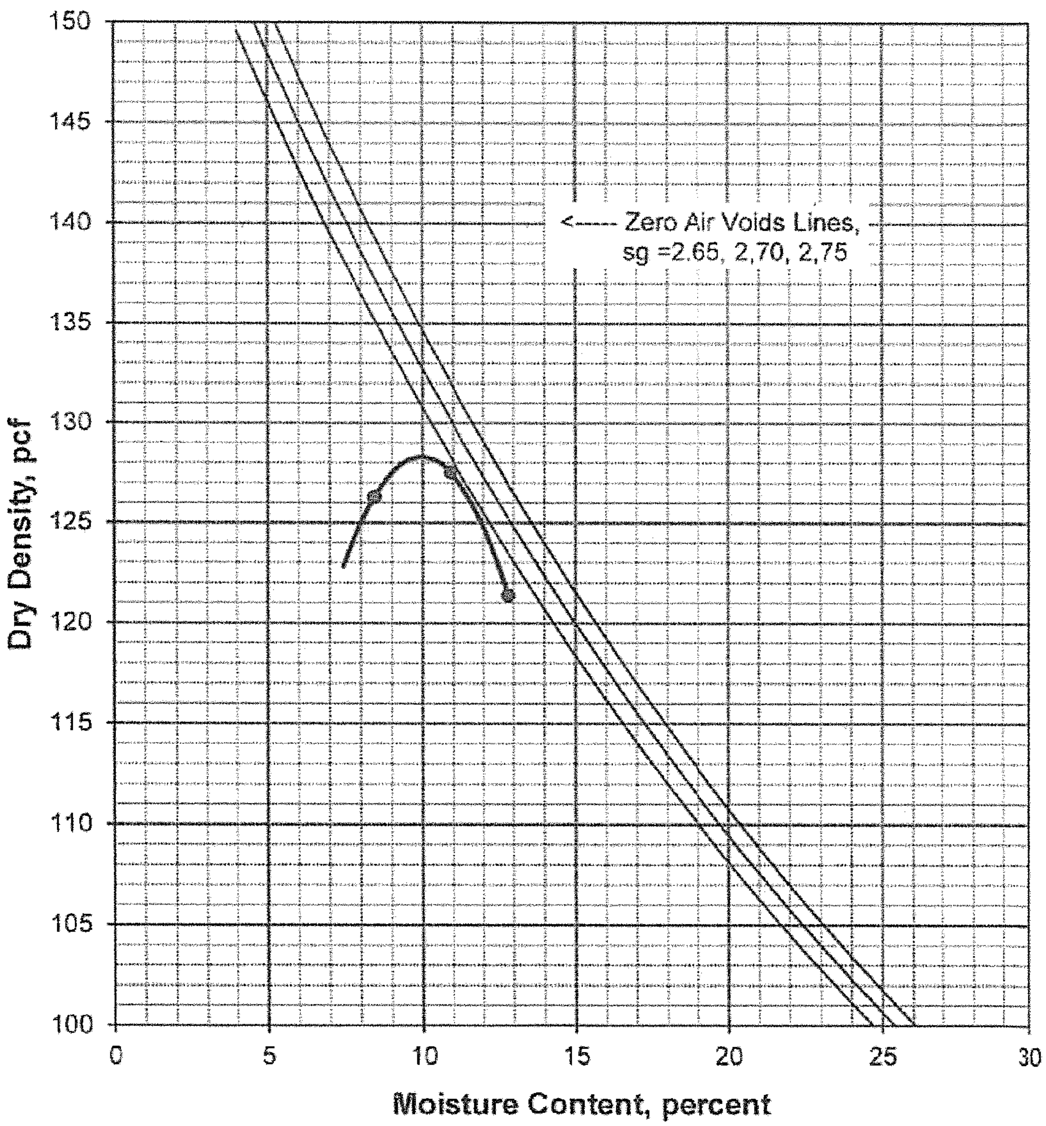
MAXIMUM DENSITY / OPTIMUM MOISTURE ASTM D 1557-07 (Modified)

Job Name: Tajiguas Landfill
Sample ID: B1 @0-5' B2 @ 0-5' MIX
Location:
Description: Dark Yellowish Brown Clayey Silty Sand

Procedure Used: A
Prep. Method: Moist
Rammer Type: Automatic

Maximum Density: **128.5 pcf**
Optimum Moisture: **10%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	1.8



File Number: VT-24980-04 Lab Number: 097364

MAXIMUM DENSITY / OPTIMUM MOISTURE

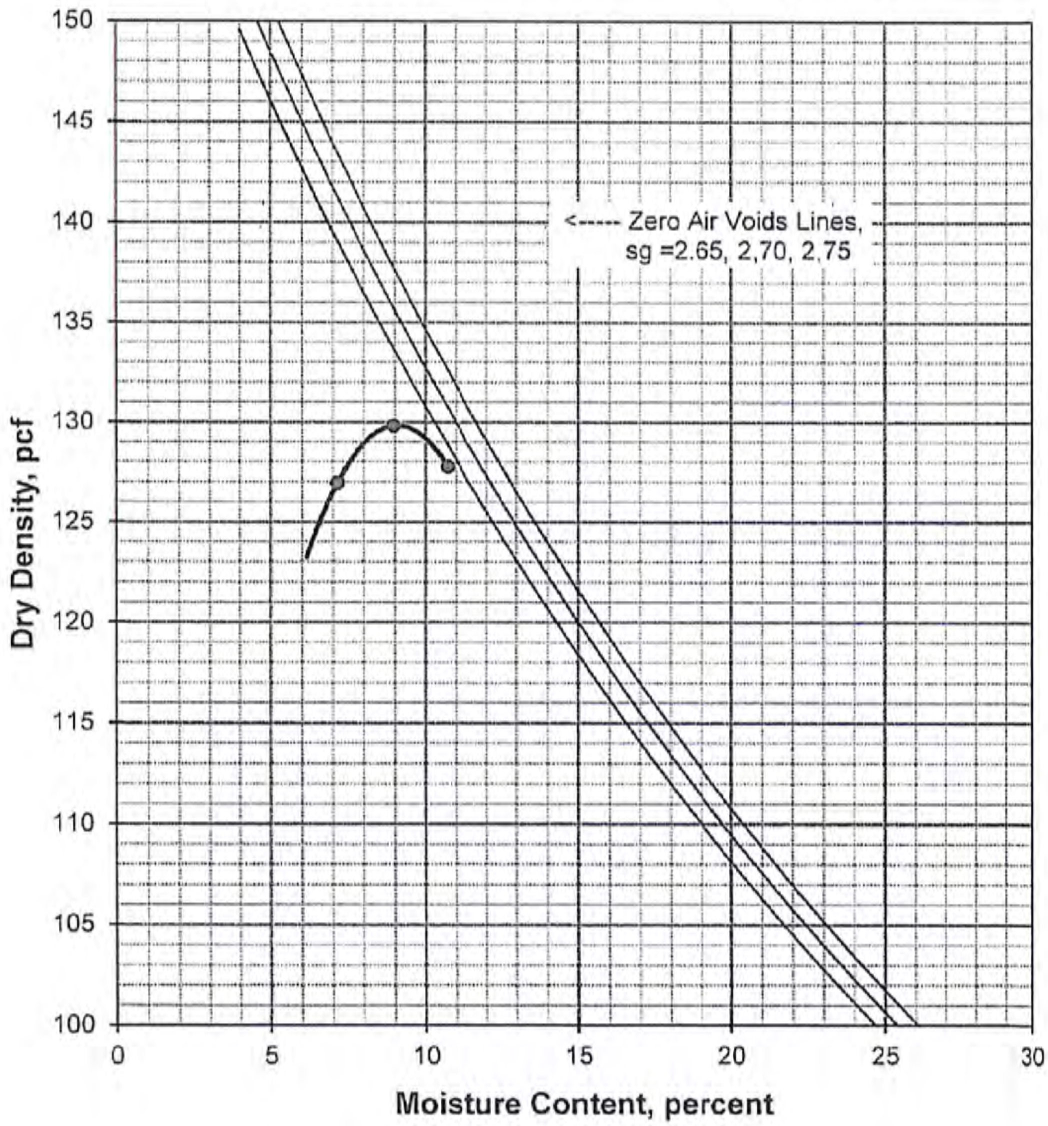
ASTM D 1557-07 (Modified)

Job Name: Tajiguas Landfill
Sample ID: B 4 @ 25'-30'
Location:
Description: Grayish Brown Clayey Silty Sand

Procedure Used: A
Prep. Method: Moist
Rammer Type: Automatic

Maximum Density: **130 pcf**
Optimum Moisture: **9%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	0.3



File Number: VT-24980-04 Lab Number: 097364

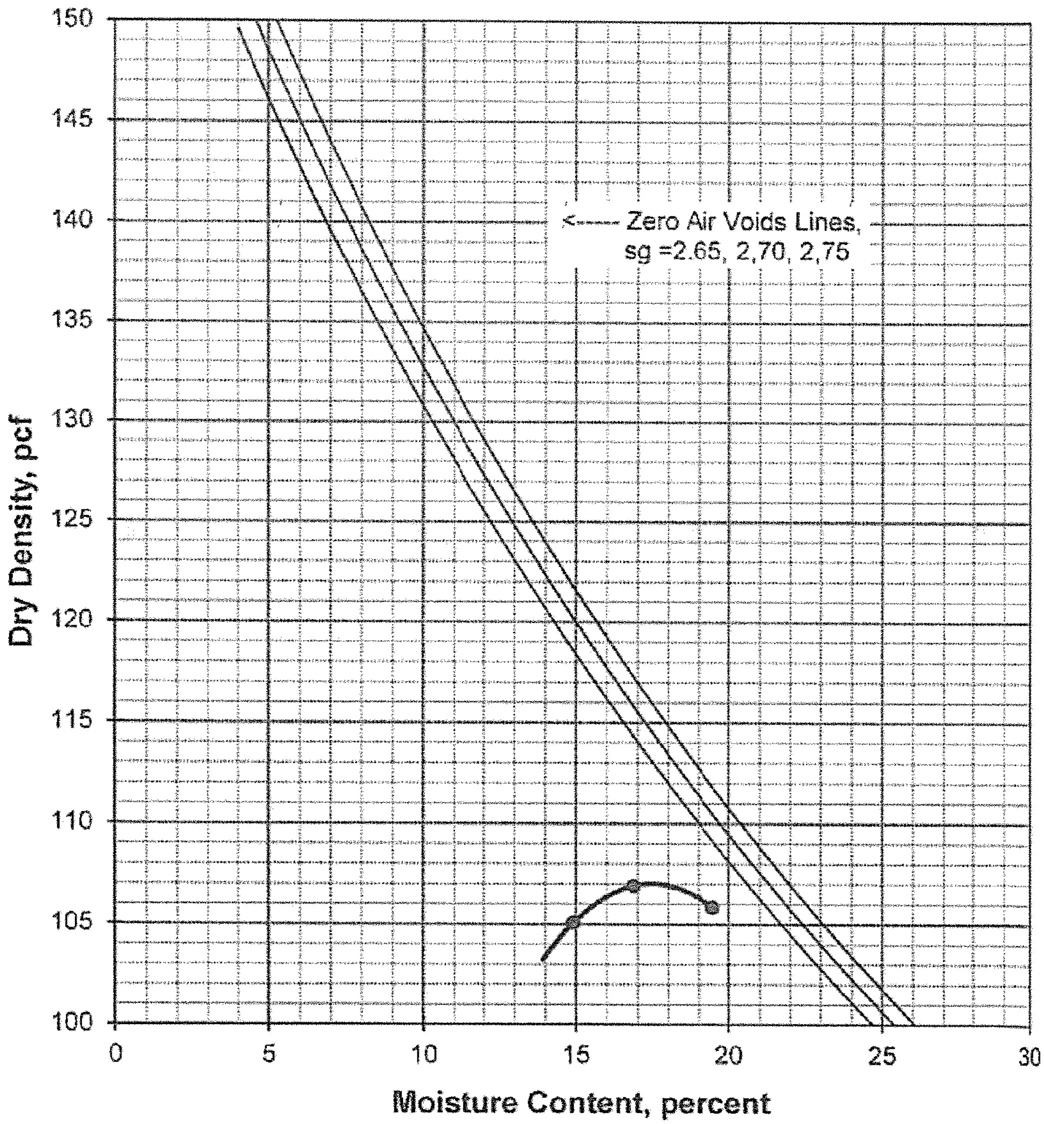
MAXIMUM DENSITY / OPTIMUM MOISTURE ASTM D 1557-07 (Modified)

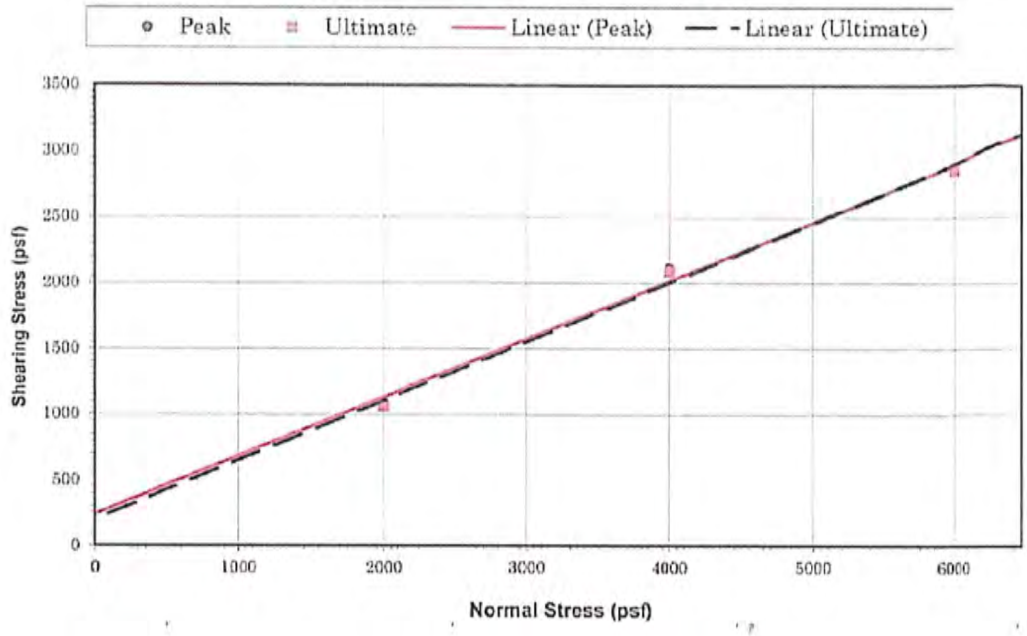
Job Name: Tajiguas Landfill
Sample ID: B 6 @ 0-5'
Location:
Description: Olive Brown Clayey Silt

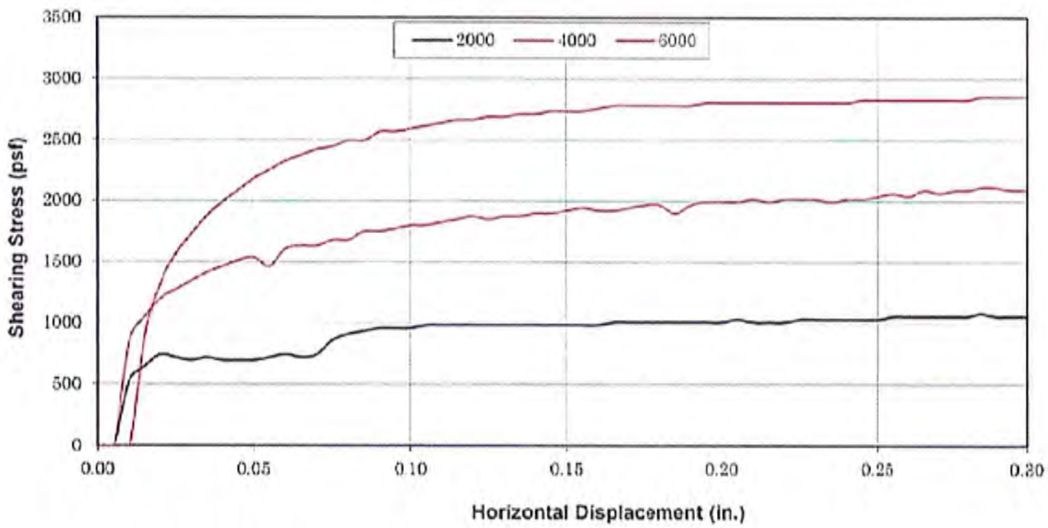
Procedure Used: A
Prep. Method: Moist
Rammer Type: Automatic

Maximum Density: **107 pcf**
Optimum Moisture: **17.5%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	0.2







DIRECT SHEAR DATA*

Sample Location: B 4 @25'-30'
Sample Description: Clayey Silty Sand
Dry Density (pcf): 116.2
Intial % Moisture: 9.2
Average Degree of Saturation: 100.0
Shear Rate (in/min): 0.005 in/min

Normal stress (psf)	2000	4000	6000
Peak stress (psf)	1080	2112	2856
Ultimate stress (psf)	1056	2088	2856

	Peak	Ultimate
ϕ Angle of Friction (degrees):	24	24
c Cohesive Strength (psf):	240	200

Test Type: Peak & Ultimate

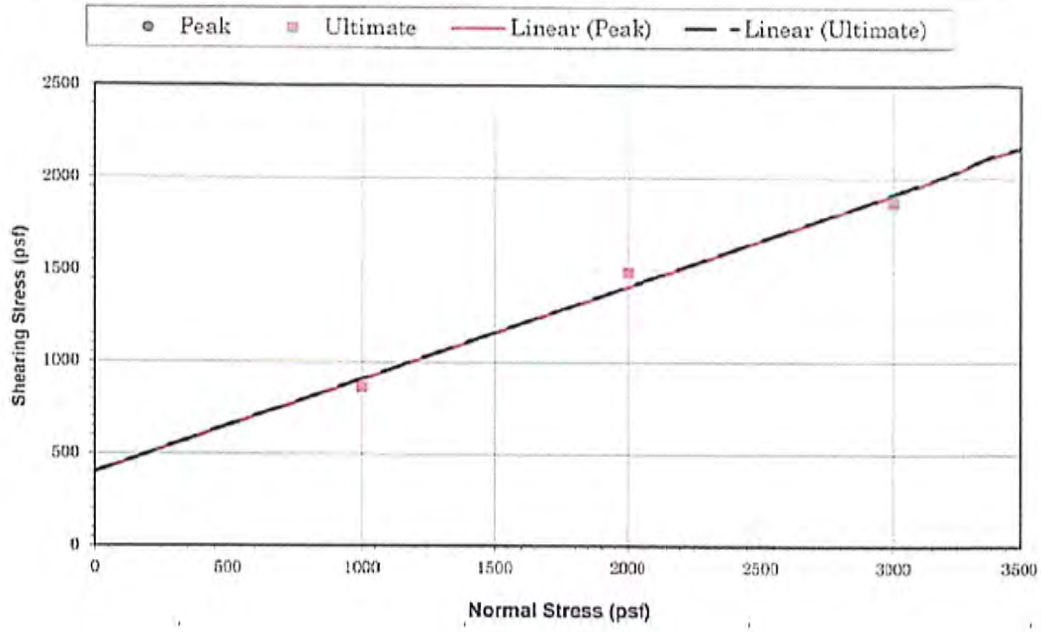
* Test Method: ASTM D-3080

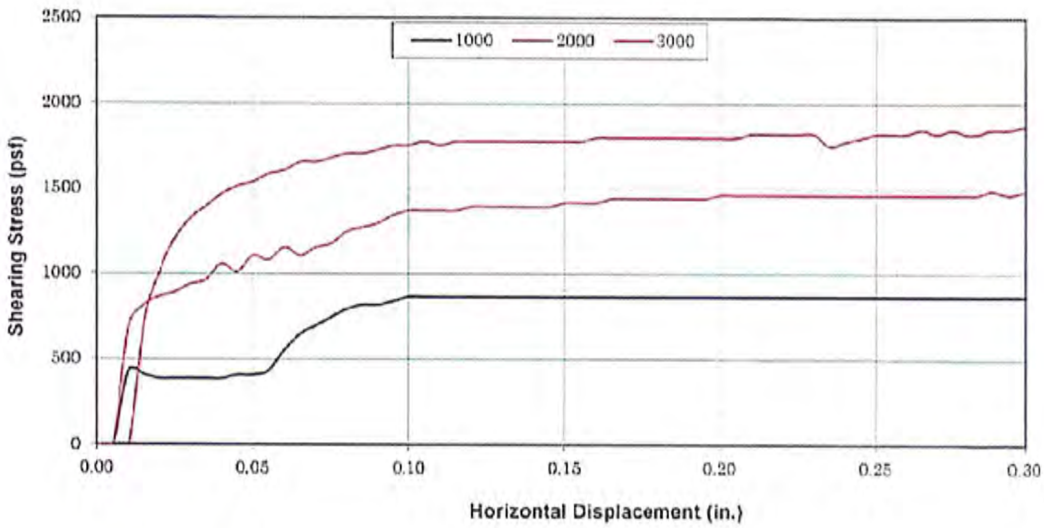
DIRECT SHEAR TEST

Tajiguas Landfill

Earth Systems Southern California

5/1/2017 | VT-24980-04





DIRECT SHEAR DATA*

Sample Location: B 6 @ 0-5'
Sample Description: Clayey Silt
Dry Density (pcf): 95.9
Intial % Moisture: 17.5
Average Degree of Saturation: 100.0
Shear Rate (in/min): 0.0116 in/min

Normal stress (psf)	1000	2000	3000
Peak stress (psf)	864	1488	1872
Ultimate stress (psf)	864	1488	1872

	Peak	Ultimate
ϕ Angle of Friction (degrees):	27	27
c Cohesive Strength (psf):	400	400

Test Type: Peak & Ultimate

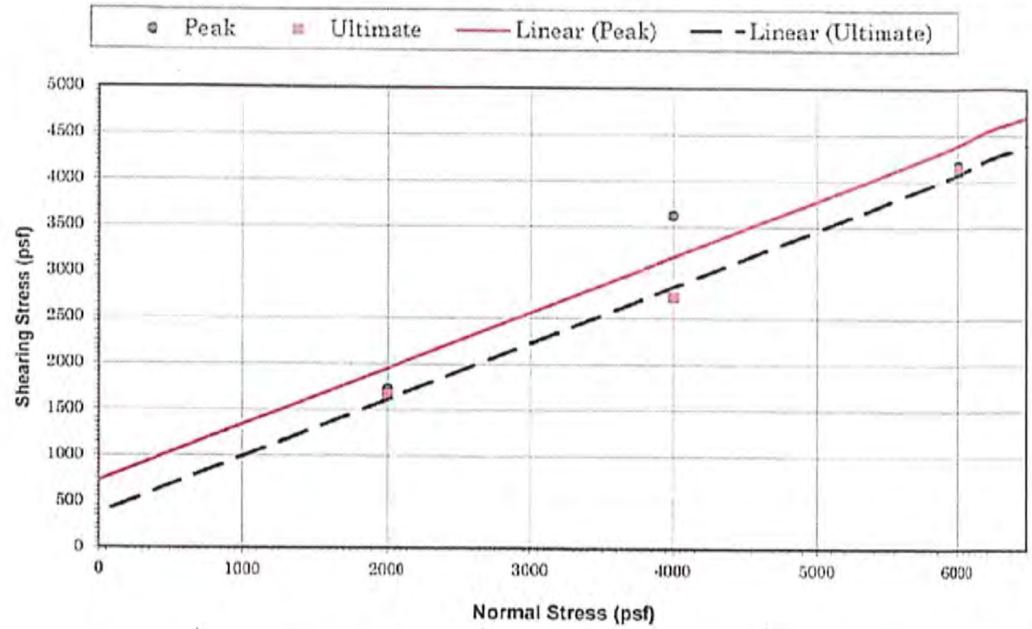
* Test Method: ASTM D-3080

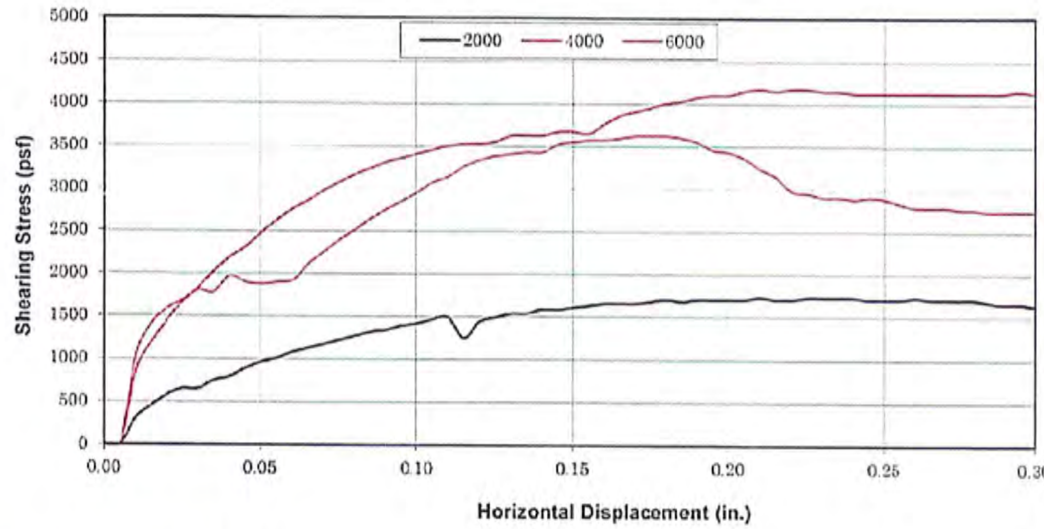
DIRECT SHEAR TEST

Tajiguas Landfill

Earth Systems
Southern California

4/18/2017 VT-24980-04





DIRECT SHEAR DATA*

Sample Location: B 1 @35'
Sample Description: Clayey Silty Sand
Dry Density (pcf): 123.6
Intial % Moisture: 6.8
Average Degree of Saturation: 100.0
Shear Rate (in/min): 0.012 in/min

Normal stress (psf)	2000	4000	6000
Peak stress (psf)	1728	3624	4176
Ultimate stress (psf)	1656	2736	4128

	Peak	Ultimate
ϕ Angle of Friction (degrees):	31	32
c Cohesive Strength (psf):	720	360

Test Type: Peak & Ultimate

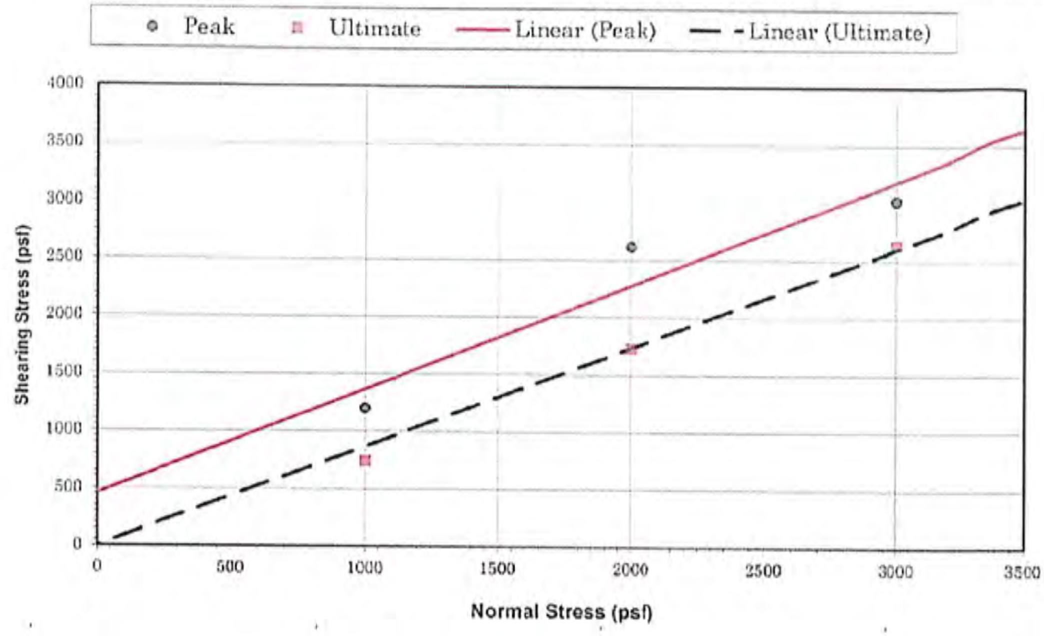
* Test Method: ASTM D-3080

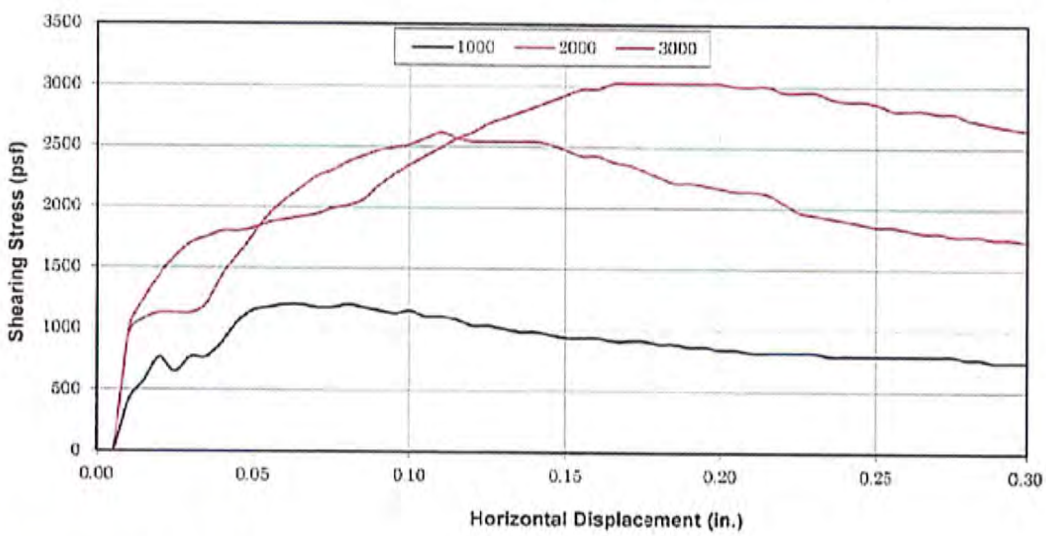
DIRECT SHEAR TEST

Tajiguas Landfill

Earth Systems
Southern California

4/13/2017 VT-24980-04





DIRECT SHEAR DATA*

Sample Location: B 6 @15'
Sample Description: Clayey Siltstone
Dry Density (pcf): 104.7
Intial % Moisture: 16.1
Average Degree of Saturation: 100.0
Shear Rate (in/min): 0.0072 in/min

Normal stress (psf)	1000	2000	3000
Peak stress (psf)	1200	2616	3024
Ultimate stress (psf)	744	1728	2640

	Peak	Ultimate
ϕ Angle of Friction (degrees):	42	42
c Cohesive Strength (psf):	450	0

Test Type: Peak & Ultimate

* Test Method: ASTM D-3080

DIRECT SHEAR TEST

Tajiguas Landfill

Earth Systems
Southern California

4/13/2017 | VT-24980-04

VT-24980-04

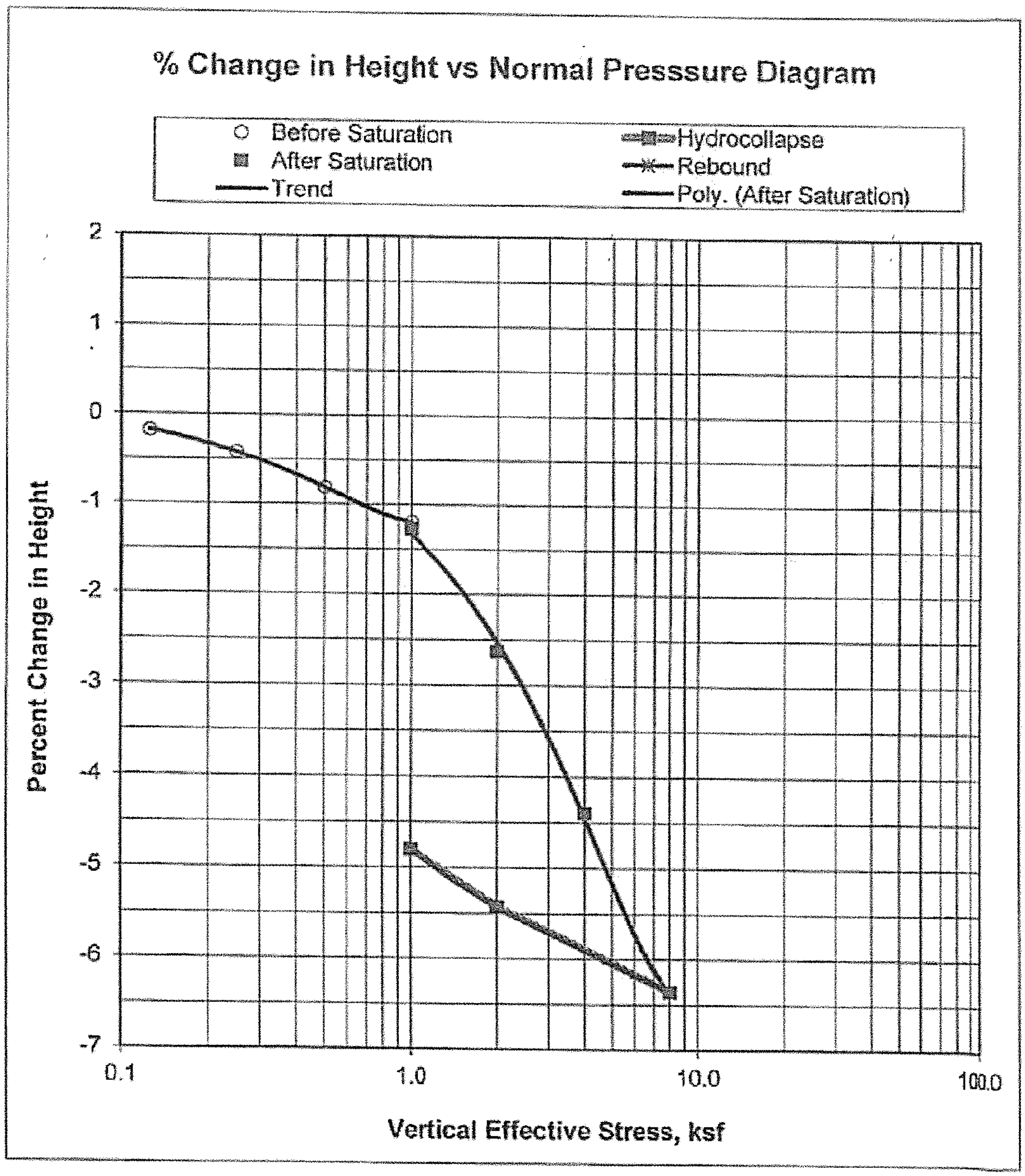
Apr 13, 2017

CONSOLIDATION TEST

ASTM D 2435-90

Tajiguas Landfill
B 2 @ 20'
ML/SM
Ring Sample

Initial Dry Density: 118.9 pcf
Initial Moisture, %: 11.7%
Specific Gravity: 2.67 (assumed
Initial Void Ratio: 0.402



File No.: VT-24980-04 September 8, 2016

EXPANSION INDEX

ASTM D-4829, UBC 18-2

Job Name: Tajiguas Landfill
Sample ID: B1@0-5' & B2@5'-10' MIX
Soil Description: SM

Initial Moisture, %:	8.6
Initial Compacted Dry Density, pcf:	115.8
Initial Saturation, %:	51
Final Moisture, %:	19.9
Volumetric Swell, %:	5.1

Expansion Index: **51** **Medium**

EI	UBC Classification
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
130+	Very High

CERTIFICATE OF ANALYSIS

Client: Earth Systems Southern California
CAS LAB NO: 170726-02
Sample ID: B1@0-5' & B2@5'-10'
Analyst: GP

Date Sampled: 04/06/17
Date Received: 04/06/17
Sample Matrix: Soil

WET CHEMISTRY ANALYSIS SUMMARY

COMPOUND	RESULTS	UNITS	DF	PQL	METHOD	ANALYZED
pH (Corrosivity)	8.4	S.U.	1	---	9045	04/10/17
Resistivity*	3800	Ohms-cm	1	---	SM 120.1M	04/11/17
Chloride	5.8	mg/Kg	1	0.6	300.0M	04/11/17
Sulfate	198	mg/Kg	1	0.6	300.0M	04/11/17

*Sample was extracted using a 1:3 ratio of soil and DI water.

DF: Dilution Factor
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
mg/Kg: Milligrams/Kilograms(ppm)

CERTIFICATE OF ANALYSIS

Client: Earth Systems Southern California
CAS LAB NO: 170726-01
Sample ID: B6@0-5'
Analyst: GP

Date Sampled: 04/06/17
Date Received: 04/06/17
Sample Matrix: Soil

WET CHEMISTRY ANALYSIS SUMMARY

COMPOUND	RESULTS	UNITS	DF	PQL	METHOD	ANALYZED
pH (Corrosivity)	6.4	S.U.	1	---	9045	04/10/17
Resistivity*	330	Ohms-cm	1	---	SM 120.1M	04/11/17
Chloride	6.2	mg/Kg	4	2.4	300.0M	04/11/17
Sulfate	5400	mg/Kg	10	6.0	300.0M	04/12/17

*Sample was extracted using a 1:3 ratio of soil and DI water.

DF: Dilution Factor
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
mg/Kg: Milligrams/Kilograms (ppm)

APPENDIX C

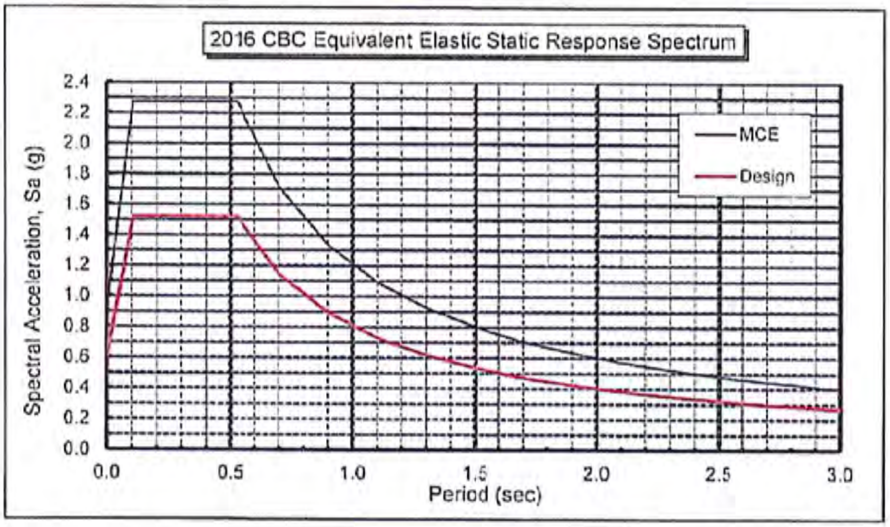
2016 CBC & ASCE 7-10 Seismic Parameters

USGS Design Maps Report

Fault Parameters Table

2016 California Building Code (CBC) (ASCE 7-10) Seismic Design Parameters

			CBC Reference	ASCE 7-10 Reference
Seismic Design Category		E	Table 1613.5.6	Table 11.6-2
Site Class		D	Table 1613.5.2	Table 20.3-1
Latitude:		34.485 N		
Longitude:		-120.125 W		
Maximum Considered Earthquake (MCE) Ground Motion				
Short Period Spectral Reponse	S_S	**2.277 g**	Figure 1613.5	Figure 22-3
1 second Spectral Response	S_1	**0.802 g**	Figure 1613.5	Figure 22.4
Site Coefficient	F_a	1.00	Table 1613.5.3(1)	Table 11.4-1
Site Coefficient	F_v	1.50	Table 1613.5.3(2)	Table 11-4.2
	S_{MS}	2.277 g	$= F_a{*}S_S$	
	S_{M1}	1.203 g	$= F_v{*}S_1$	
Design Earthquake Ground Motion				
Short Period Spectral Reponse	S_{DS}	**1.518 g**	$= 2/3{*}S_{MS}$	
1 second Spectral Response	S_{D1}	**0.802 g**	$= 2/3{*}S_{M1}$	
	To	0.11 sec	$= 0.2{*}S_{D1}/S_{DS}$	
	Ts	0.53 sec	$= S_{D1}/S_{DS}$	
Seismic Importance Factor	I	1.00	Table 1604.5	Table 11.5-1
	F_{PGA}	1.00		



Period T (sec)	Design Sa (g)
0.00	0.607
0.05	1.038
0.11	1.518
0.53	1.518
0.70	1.146
0.90	0.891
1.10	0.729
1.30	0.617
1.50	0.535
1.70	0.472
1.90	0.422
2.10	0.382
2.30	0.349
2.50	0.321
2.70	0.297
2.90	0.277

USGS Design Maps Summary Report

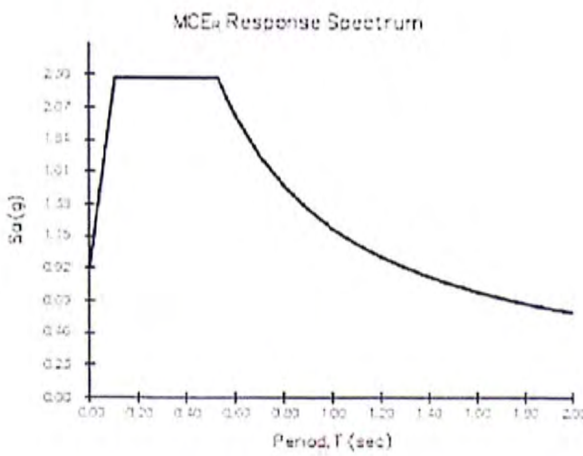
User–Specified Input

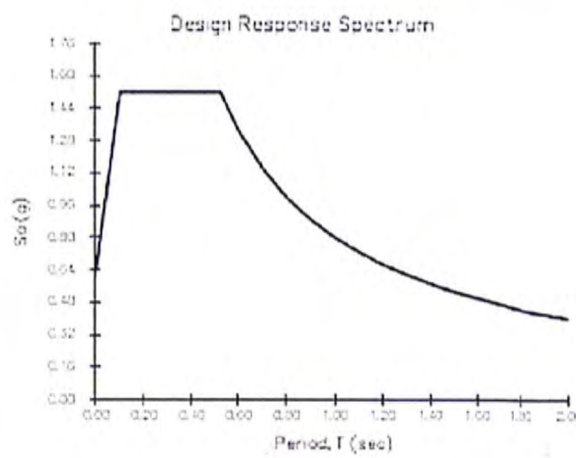
Report Title	Tajiguas Landfill - Water Tanks Tue April 25, 2017 16:39:55 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	34.4852°N, 120.1251°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS–Provided Output

S_S = 2.277 g	S_{MS} = 2.277 g	S_{DS} = 1.518 g
S_1 = 0.802 g	S_{M1} = 1.202 g	S_{D1} = 0.802 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (34.4852°N, 120.1251°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] S_S = 2.277 g

From Figure 22-2 [2] S_1 = 0.802 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3-1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = D and S_S = 2.277 g, F_a = 1.000

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.802 g, F_v = 1.500

Equation (11.4-1):	$S_{MS} = F_aS_S = 1.000 \times 2.277 = 2.277$ g
Equation (11.4-2):	$S_{M1} = F_vS_1 = 1.500 \times 0.802 = 1.202$ g

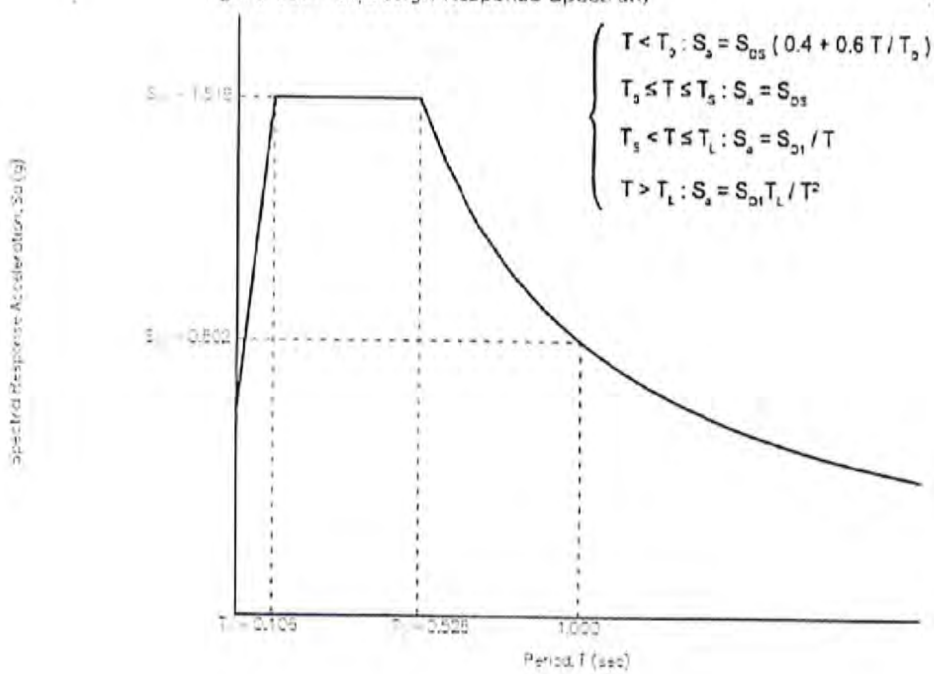
Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-3):	$S_{DS} = ⅔\ S_{MS} = ⅔ \times 2.277 = 1.518$ g
Equation (11.4-4):	$S_{D1} = ⅔\ S_{M1} = ⅔ \times 1.202 = 0.802$ g

Section 11.4.5 — Design Response Spectrum

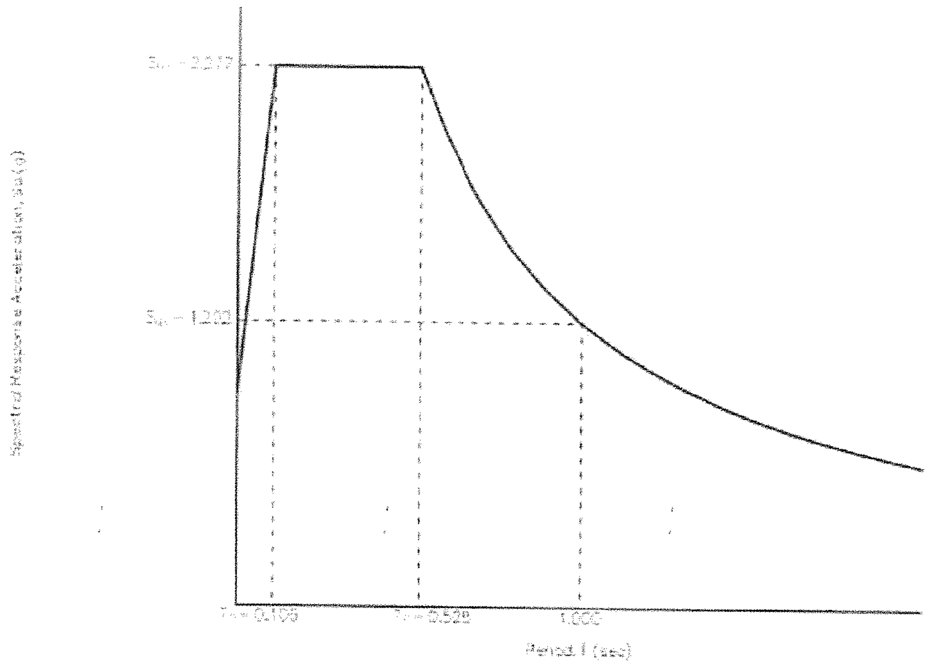
From Figure 22-12 [3]	T_L = 8 seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] $PGA = 0.923$

Equation (11.8-1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.923 = 0.923$ g

Table 11.8-1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.923 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] $C_{RS} = 0.866$

From Figure 22-18 [6] $C_{R1} = 0.863$

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.518 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.802 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = E

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

Table 1
Fault Parameters

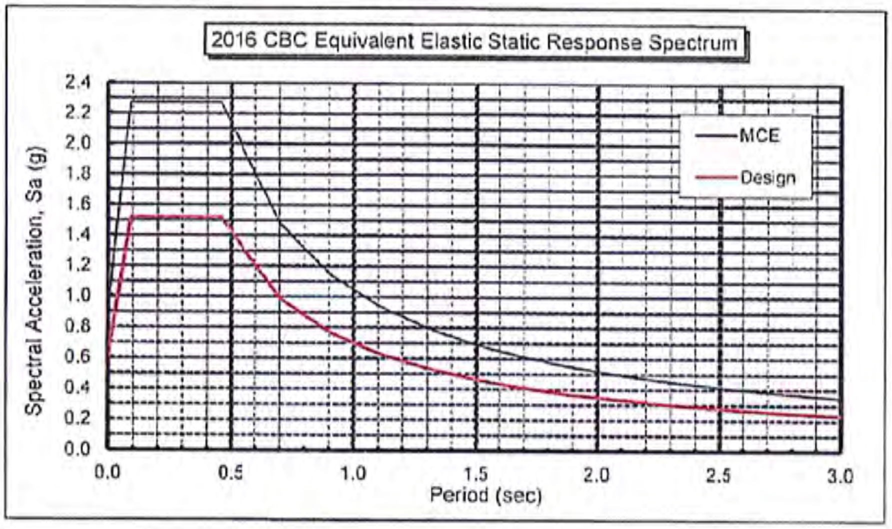
Fault Section Name	Distance (miles)	Distance (km)	Avg Dip Angle (deg.)	Avg Dip Direction (deg.)	Avg Rake (deg.)	Trace Length (km)	Fault Type	Mean Mag	Mean Return Interval (years)	Slip Rate (mm/yr)
Santa Ynez (West)	3.9	6.2	70	182	0	63	B	6.9		2
Red Mountain	7.1	11.4	56	2	90	101	B	7.4		2
Los Alamos-West Baseline	10.7	17.2	30	211	90	28	B	6.8		0.7
Pitas Point (Upper)	12.6	20.2	42	15	90	35	B	6.8		1
North Channel	12.6	20.3	26	10	90	51	B	6.7		1
Mission Ridge-Arroyo Parida-Santa Ana	13.5	21.7	70	176	90	69	B	6.8		0.4
Oak Ridge (Offshore), west extension	14.8	23.9	67	195	na	28	B'	6.1		
Pitas Point (Lower, West)	14.9	23.9	13	3	90	35	B	7.2		2.5
Channel Islands Western Deep Ramp	15.2	24.4	21	204	90	62	B'	7.3		
Lions Head	15.9	25.7	75	29	90	41	B	6.7		0.02
San Luis Range (So Margin)	26.0	41.8	45	37	90	64	B	7.1		0.2
Casmalia (Orcutt Frontal)	27.1	43.6	75	206	90	29	B	6.6		0.25
Nacimiento	27.8	44.8	66	40	na	113	B'	7.1		
Santa Ynez (East)	27.9	44.8	70	172	0	68	B	7.2		2
Pitas Point (Lower)-Montalvo	28.6	46.0	16	359	90	30	B	7.3		2.5
Santa Cruz Island	29.4	47.4	90	188	30	69	B	7.1		1
Oak Ridge (Offshore)	30.1	48.5	32	180	90	38	B	6.9		3
Big Pine (West)	31.2	50.2	50	2	na	18	B'	6.5		
Hosgri (Extension)	33.0	53.1	80	79	na	29	B'	6.4		
Ventura-Pitas Point	33.0	53.1	64	353	60	44	B	6.9		1
South Cuyama	34.6	55.6	33	210	na	48	B'	6.8		
Santa Rosa Island	35.1	56.6	90	1	30	58	B	6.8		1
Channel Islands Thrust	37.9	61.0	20	354	90	59	B	7.3		1.5
Morales (West)	40.7	65.5	32	49	na	28	B'	6.8		
Pine Mtn	41.6	66.9	45	5	na	62	B'	7.3		
Morales (East)	42.8	68.9	32	14	na	18	B'	6.6		
Hosgri	43.5	70.0	80	59	180	171	B	7.3		2.5
Big Pine (Central)	45.5	73.2	76	167	na	23	B'	6.3		
San Juan	46.7	75.1	90	243	180	68	B	7.1		1
Los Osos	47.8	77.0	45	208	90	44	B	6.9		0.5
Sisar	48.0	77.3	29	168	na	20	B'	7.0		
Santa Cruz Catalina Ridge	50.2	80.7	90	38	na	137	B'	7.3		
San Andreas (Carrizo) rev	50.4	81.1	90	224	180	59	A	7.8	106	34
San Andreas (Big Bend)	51.8	83.4	90	198	180	50	A	7.8	108	34
Big Pine (East)	53.8	86.6	73	338	na	23	B'	6.6		
Malibu Coast (Extension), alt 1	54.8	88.3	74	4	30	35	B'	6.5		
Malibu Coast (Extension), alt 2	54.8	88.3	74	4	30	35	B'	6.9		
Oak Ridge (Onshore)	54.9	88.4	65	159	90	49	B	7.2		4
San Cayetano	55.0	88.6	42	3	90	42	B	7.2		6
Pleito	56.6	91.1	46	181	90	44	B	7.1		2

Reference: USGS OFR 2007-1437 (CGS SP 203) Based on Site Coordinates of 34.4852 Latitude, -120.1251 Longitude

Mean Magnitude for Type A Faults based on 0.1 weight for unsegmented section, 0.9 weight for segmented model (weighted by probability of each scenario with section listed as given on Table 3 of Appendix G in OFR 2007-1437). Mean magntude is average of Ellworths-B and Hanks & Bakun moment area relationship.

2016 California Building Code (CBC) (ASCE 7-10) Seismic Design Parameters

			CBC Reference	ASCE 7-10 Reference
Seismic Design Category		E	Table 1613.5.6	Table 11.6-2
Site Class		C	Table 1613.5.2	Table 20.3-1
Latitude:		34.482 N		
Longitude:		-120.124 W		
Maximum Considered Earthquake (MCE) Ground Motion				
Short Period Spectral Reponse	S_S	**2.274 g**	Figure 1613.5	Figure 22-3
1 second Spectral Response	S_1	**0.799 g**	Figure 1613.5	Figure 22.4
Site Coefficient	F_a	1.00	Table 1613.5.3(1)	Table 11.4-1
Site Coefficient	F_v	1.30	Table 1613.5.3(2)	Table 11-4.2
	S_{MS}	2.274 g	$= F_a * S_S$	
	S_{M1}	1.039 g	$= F_v * S_1$	
Design Earthquake Ground Motion				
Short Period Spectral Reponse	S_{DS}	**1.516 g**	$= 2/3 * S_{MS}$	
1 second Spectral Response	S_{D1}	**0.692 g**	$= 2/3 * S_{M1}$	
	To	0.09 sec	$= 0.2 * S_{D1}/S_{DS}$	
	Ts	0.46 sec	$= S_{D1}/S_{DS}$	
Seismic Importance Factor	I	1.00	Table 1604.5	Table 11.5-1
	F_{PGA}	1.00		



Period T (sec)	Design Sa (g)
0.00	0.606
0.05	1.104
0.09	1.516
0.46	1.516
0.70	0.989
0.90	0.769
1.10	0.630
1.30	0.533
1.50	0.462
1.70	0.407
1.90	0.364
2.10	0.330
2.30	0.301
2.50	0.277
2.70	0.256
2.90	0.239

USGS Design Maps Summary Report

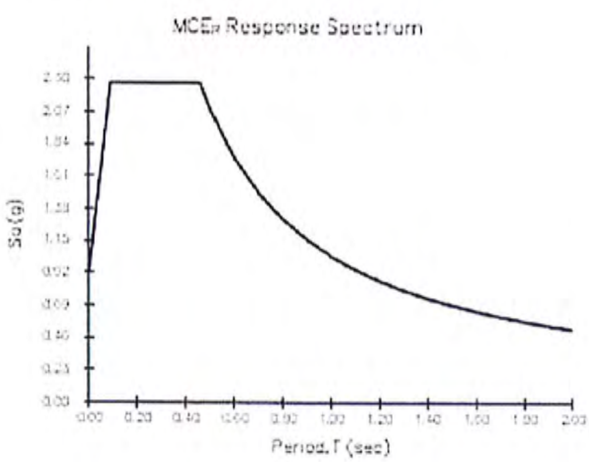
User–Specified Input

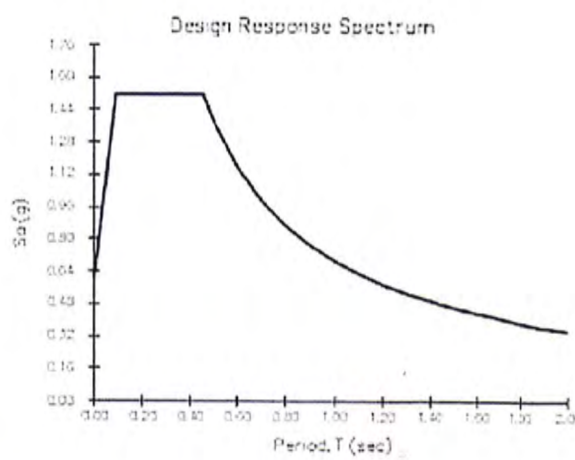
Report Title	Tajiguas Landfill - ADF Tue April 25, 2017 16:38:29 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	34.4823°N, 120.124°W
Site Soil Classification	Site Class C – "Very Dense Soil and Soft Rock"
Risk Category	I/II/III

USGS–Provided Output

S_S =	2.274 g	S_{MS} =	2.274 g	S_{DS} =	1.516 g
S_1 =	0.799 g	S_{M1} =	1.039 g	S_{D1} =	0.693 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (34.4823°N, 120.124°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_s) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] $S_S = 2.274$ g

From Figure 22-2 [2] $S_1 = 0.799$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\overline{v}_s$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index $PI > 20$, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\overline{s}_u < 500$ psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = C and S_S = 2.274 g, F_a = 1.000

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.799 g, F_v = 1.300

Equation (11.4-1):	$S_{MS} = F_a S_S = 1.000 \times 2.274 = 2.274$ g
Equation (11.4-2):	$S_{M1} = F_v S_1 = 1.300 \times 0.799 = 1.039$ g

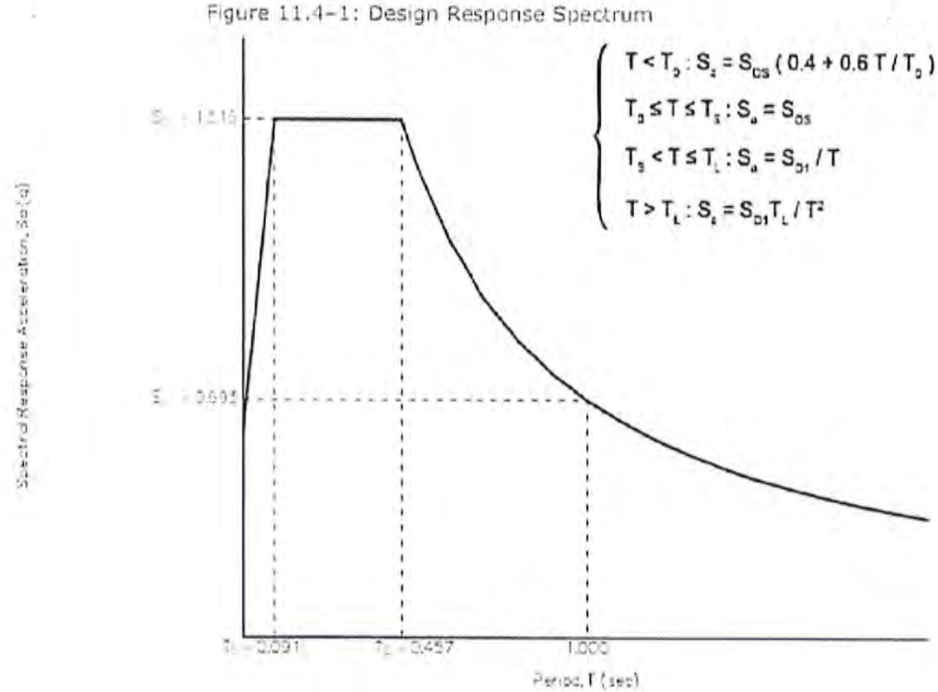
Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-3):	$S_{DS} = ⅔ S_{MS} = ⅔ \times 2.274 = 1.516$ g
Equation (11.4-4):	$S_{D1} = ⅔ S_{M1} = ⅔ \times 1.039 = 0.693$ g

Section 11.4.5 — Design Response Spectrum

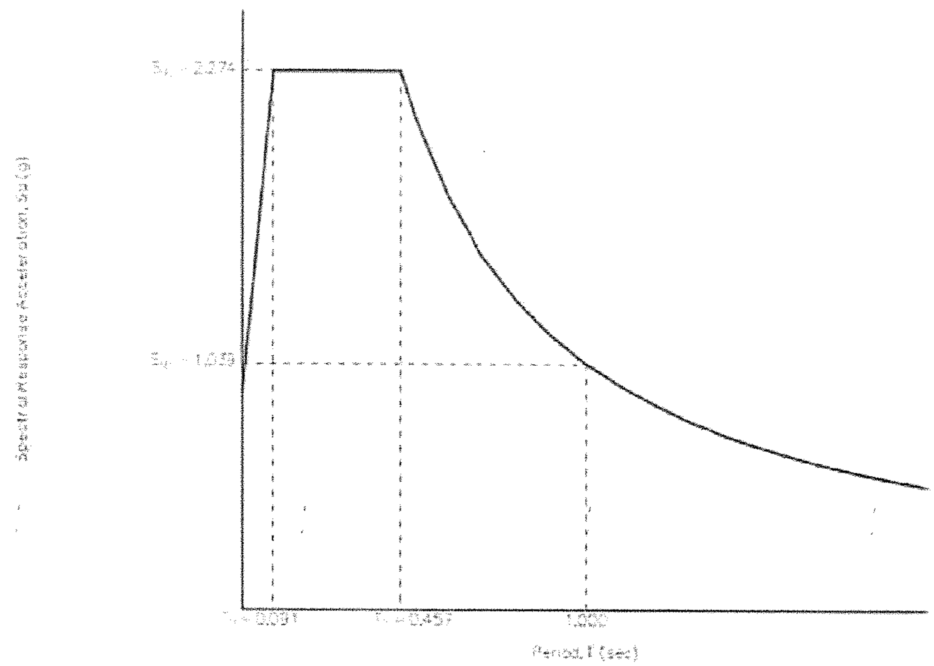
From Figure 22-12 [3]	$T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7[4] PGA = 0.923

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.923 = 0.923$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = C and PGA = 0.923 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17[5] C_{RS} = 0.866

From Figure 22-18[6] C_{R1} = 0.863

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.516 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.693 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = E

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
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Table 1
Fault Parameters

Fault Section Name	Distance (miles)	(km)	Avg Dip Angle (deg.)	Avg Dip Direction (deg.)	Avg Rake (deg.)	Trace Length (km)	Fault Type	Mean Mag	Mean Return Interval (years)	Slip Rate (mm/yr)
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Red Mountain	6.9	11.1	56	2	90	101	B	7.4		2
Los Alamos-West Baseline	10.8	17.4	30	211	90	28	B	6.8		0.7
Pitas Point (Upper)	12.4	19.9	42	15	90	35	B	6.8		1
North Channel	12.5	20.1	26	10	90	51	B	6.7		1
Mission Ridge-Arroyo Parida-Santa Ana	13.4	21.5	70	176	90	69	B	6.8		0.4
Oak Ridge (Offshore), west extension	14.6	23.6	67	195	na	28	B'	6.1		
Pitas Point (Lower, West)	14.7	23.6	13	3	90	35	B	7.2		2.5
Channel Islands Western Deep Ramp	15.0	24.1	21	204	90	62	B'	7.3		
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San Luis Range (So Margin)	26.2	42.1	45	37	90	64	B	7.1		0.2
Casmalia (Orcutt Frontal)	27.3	43.9	75	206	90	29	B	6.6		0.25
Santa Ynez (East)	27.8	44.7	70	172	0	68	B	7.2		2
Nacimiento	28.0	45.0	66	40	na	113	B'	7.1		
Pitas Point (Lower)-Montalvo	28.4	45.7	16	359	90	30	B	7.3		2.5
Santa Cruz Island	29.2	47.1	90	188	30	69	B	7.1		1
Oak Ridge (Offshore)	30.0	48.2	32	180	90	38	B	6.9		3
Big Pine (West)	31.2	50.3	50	2	na	18	B'	6.5		
Ventura-Pitas Point	32.8	52.8	64	353	60	44	B	6.9		1
Hosgri (Extension)	33.1	53.2	80	79	na	29	B'	6.4		
South Cuyama	34.7	55.9	33	210	na	48	B'	6.8		
Santa Rosa Island	34.9	56.2	90	1	30	58	B	6.8		1
Channel Islands Thrust	37.7	60.6	20	354	90	59	B	7.3		1.5
Morales (West)	40.8	65.7	32	49	na	28	B'	6.8		
Pine Mtn	41.6	66.9	45	5	na	62	B'	7.3		
Morales (East)	42.9	69.1	32	14	na	18	B'	6.6		
Hosgri	43.7	70.3	80	59	180	171	B	7.3		2.5
Big Pine (Central)	45.5	73.2	76	167	na	23	B'	6.3		
San Juan	46.9	75.4	90	243	180	68	B	7.1		1
Sisar	47.9	77.1	29	168	na	20	B'	7.0		
Los Osos	48.0	77.3	45	208	90	44	B	6.9		0.5
Santa Cruz Catalina Ridge	50.0	80.4	90	38	na	137	B'	7.3		
San Andreas (Carrizo) rev	50.5	81.3	90	224	180	59	A	7.8	106	34
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Oak Ridge (Onshore)	54.8	88.2	65	159	90	49	B	7.2		4
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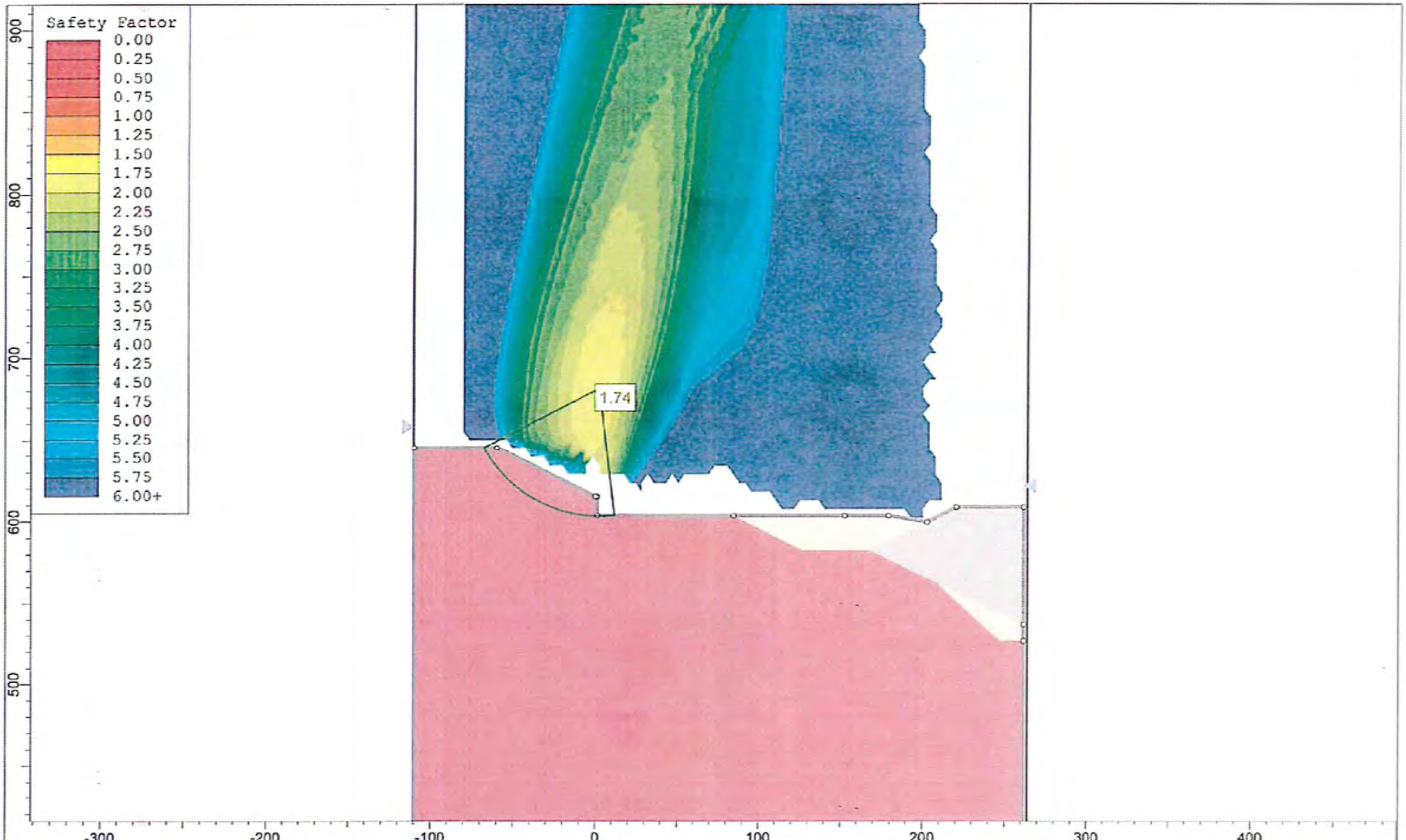
Pleito	56.7	91.2	46	181	90	44	B	7.1		2

Reference: USGS OFR 2007-1437 (CGS SP 203) Based on Site Coordinates of 34.4823 Latitude, -120.124 Longitude

Mean Magnitude for Type A Faults based on 0.1 weight for unsegmented section, 0.9 weight for segmented model (weighted by probability of each scenario with section listed as given on Table 3 of Appendix G in OFR 2007-1437). Mean magntude is average of Ellworths-B and Hanks & Bakun moment area relationship.

APPENDIX D

Results of Slope Stability Analyses



Project	VT-24980-04 Tajiguas Landfill			
Analysis Description	2H:1V Cut Slope Above ADF - Static, Circular			
Drawn By	Meng Wei Lu	Scale 1:967	Company	Earth Systems Southern California
Date	4/27/2017, 12:39:07 PM		File Name	VT-24980-04 Tajiguas Landfill - Static, Circular.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

VT-24980-04 Tajiguas Landfill

Project Summary

- File Name: VT-24980-04 Tajiguas Landfill - Static, Circular
- Slide Modeler Version: 6.039
- Project Title: VT-24980-04 Tajiguas Landfill
- Analysis: 2H:1V Cut Slope Above ADF - Static, Circular
- Author: Meng Wei Lu
- Company: Earth Systems Southern California
- Date Created: 4/27/2017, 12:39:07 PM

General Settings

- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

Material Properties

Property	Documented Fill	MSW	Retaining Wall	Tsp
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Infinite strength	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	70	150	130
Cohesion [psf]	360	250		400
Friction Angle [deg]	32	22		27
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

- FS: 1.739930
- Center: 2.019, 681.541
- Radius: 78.790
- Left Slip Surface Endpoint: -67.785, 645.000
- Right Slip Surface Endpoint: 11.551, 603.330
- Resisting Moment=8.54468e+006 lb-ft
- Driving Moment=4.91094e+006 lb-ft
- Resisting Horizontal Force=93975.9 lb
- Driving Horizontal Force=54011.4 lb
- Total Slice Area=1132.91 ft2

Slice Data

- Global Minimum Query (spencer) - Safety Factor: 1.73993

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	3.17343	1136.37	Tsp	400	27	233.864	406.907	13.5555	0	13.5555
2	3.17343	3232.21	Tsp	400	27	349.124	607.451	407.144	0	407.144
3	3.17343	4925.18	Tsp	400	27	454.593	790.96	767.303	0	767.303
4	3.17343	5900.94	Tsp	400	27	528.501	919.554	1019.68	0	1019.68
5	3.17343	6628.81	Tsp	400	27	591.959	1029.97	1236.38	0	1236.38
6	3.17343	7207.24	Tsp	400	27	649.046	1129.3	1431.32	0	1431.32
7	3.17343	7658.2	Tsp	400	27	700.117	1218.15	1605.72	0	1605.72
8	3.17343	7997.81	Tsp	400	27	745.412	1296.97	1760.39	0	1760.39
9	3.17343	8238.33	Tsp	400	27	785.094	1366.01	1895.9	0	1895.9
10	3.17343	8389.27	Tsp	400	27	819.257	1425.45	2012.57	0	2012.57
11	3.17343	8458.18	Tsp	400	27	847.959	1475.39	2110.57	0	2110.57
12	3.17343	8451.14	Tsp	400	27	871.196	1515.82	2189.92	0	2189.92
13	3.17343	8373.06	Tsp	400	27	888.938	1546.69	2250.5	0	2250.5
14	3.17343	8227.98	Tsp	400	27	901.105	1567.86	2292.06	0	2292.06
15	3.17343	8019.22	Tsp	400	27	907.588	1579.14	2314.19	0	2314.19
16	3.17343	7749.49	Tsp	400	27	908.226	1580.25	2316.36	0	2316.36
17	3.17343	7421.03	Tsp	400	27	902.818	1570.84	2297.91	0	2297.91
18	3.17343	7035.64	Tsp	400	27	891.128	1550.5	2257.97	0	2257.97
19	3.17343	6594.74	Tsp	400	27	872.84	1518.68	2195.53	0	2195.53
20	3.17343	6099.44	Tsp	400	27	847.592	1474.75	2109.31	0	2109.31
21	3.17343	5550.54	Tsp	400	27	814.947	1417.95	1997.84	0	1997.84
22	3.17343	3753.28	Tsp	400	27	650.322	1131.51	1435.68	0	1435.68
23	3.17343	225.456	Tsp	400	27	289.017	502.869	201.891	0	201.891
24	3.17343	172.447	Tsp	400	27	288.296	501.614	199.429	0	199.429
25	3.17343	66.3609	Tsp	400	27	280.888	488.725	174.133	0	174.133

Interslice Data

- Global Minimum Query (spencer) - Safety Factor: 1.73993

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-67.7853	645	0	0	0
2	-64.6119	639.491	-666.304	-287.175	23.3159

3	-61.4384	634.84	121.329	52.2925	23.3159
4	-58.265	630.809	1773.41	764.334	23.3159
5	-55.0916	627.262	3716.34	1601.73	23.3159
6	-51.9181	624.107	5740.91	2474.32	23.3159
7	-48.7447	621.284	7725.27	3329.57	23.3159
8	-45.5713	618.748	9579.89	4128.9	23.3159
9	-42.3978	616.464	11237.7	4843.43	23.316
10	-39.2244	614.408	12648.3	5451.39	23.3159
11	-36.0509	612.559	13774	5936.57	23.316
12	-32.8775	610.901	14587.5	6287.18	23.3159
13	-29.7041	609.42	15070.2	6495.2	23.3159
14	-26.5306	608.106	15210.9	6555.85	23.3159
15	-23.3572	606.95	15005.5	6467.35	23.316
16	-20.1838	605.944	14456.4	6230.67	23.3159
17	-17.0103	605.084	13572	5849.51	23.316
18	-13.8369	604.363	12367.3	5330.27	23.3159
19	-10.6635	603.779	10863.6	4682.18	23.3159
20	-7.49004	603.327	9089.33	3917.48	23.3159
21	-4.31661	603.006	7080.39	3051.63	23.3159
22	-1.14317	602.815	4881.16	2103.77	23.3159
23	2.03026	602.751	2911.78	1254.97	23.3159
24	5.2037	602.816	1983.05	854.69	23.3159
25	8.37713	603.008	1031.2	444.444	23.3159
26	11.5506	603.33	0	0	0

List of Coordinates

External Boundary

X	Y
-110	400
261.52	400
261.52	526.328
261.52	536.446
261.52	608.52
220.42	608.52
202.62	599.44
179.06	603.33
152.62	603.33
84.55	603.33
1	603.33

1	615
0	615
-60	645
-110	645

Material Boundary

X	Y
84.55	603.33
126.435	582.589

Material Boundary

X	Y
126.435	582.589
167.273	582.589

Material Boundary

X	Y
167.273	582.589
202.62	599.44

Material Boundary

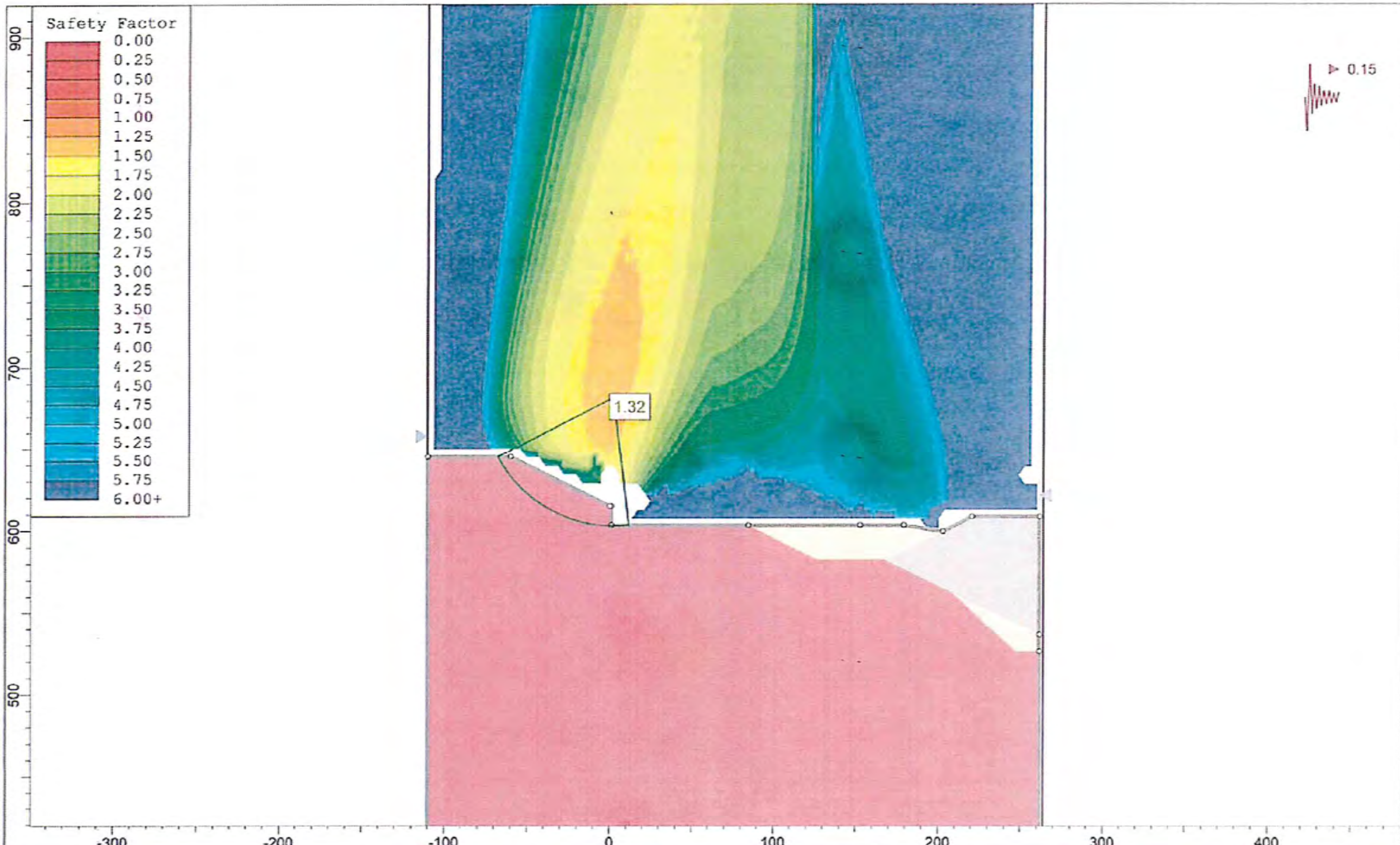
X	Y
167.273	582.589
208.62	562.345
261.52	536.446

Material Boundary

X	Y
208.62	562.345
247.122	526.328
261.52	526.328

Material Boundary

X	Y
0	615
0	603.295
1	603.33



Project	VT-24980-04 Tajiguas Landfill		
Analysis Description	2H:1V Cut Slope Above ADF - Seismic, Circular		
Drawn By: Meng Wei Lu	Scale: 1:967	Company	Earth Systems Southern California
Date: 4/27/2017, 12:39:07 PM		File Name	VT-24980-04 Tajiguas Landfill - Seismic, Circular.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

VT-24980-04 Tajiguas Landfill

Project Summary

- File Name: VT-24980-04 Tajiguas Landfill - Seismic, Circular
- Slide Modeler Version: 6.039
- Project Title: VT-24980-04 Tajiguas Landfill
- Analysis: 2H:1V Cut Slope Above ADF - Seismic, Circular
- Author: Meng Wei Lu
- Company: Earth Systems Southern California
- Date Created: 4/27/2017, 12:39:07 PM

General Settings

- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

Loading

- Seismic Load Coefficient (Horizontal): 0.15

Material Properties

Property	Documented Fill	MSW	Retaining Wall	Tsp
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Infinite strength	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	70	150	130
Cohesion [psf]	720	250		400
Friction Angle [deg]	31	22		27
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

- FS: 1.319910
- Center: 2.019, 681.541
- Radius: 78.790
- Left Slip Surface Endpoint: -67.785, 645.000
- Right Slip Surface Endpoint: 11.551, 603.330
- Resisting Moment=8.22766e+006 lb-ft
- Driving Moment=6.23352e+006 lb-ft

- Resisting Horizontal Force=91212.6 lb
- Driving Horizontal Force=69105.4 lb
- Total Slice Area=1132.91 ft2

Slice Data

- **Global Minimum Query (spencer) - Safety Factor: 1.31991**

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	3.17343	1136.37	Tsp	400	27	311.566	411.239	22.0572	0	22.0572
2	3.17343	3232.21	Tsp	400	27	416.2	549.347	293.11	0	293.11
3	3.17343	4925.18	Tsp	400	27	524.726	692.591	574.242	0	574.242
4	3.17343	5900.94	Tsp	400	27	608.514	803.184	791.294	0	791.294
5	3.17343	6628.81	Tsp	400	27	684.257	903.157	987.502	0	987.502
6	3.17343	7207.24	Tsp	400	27	754.964	996.484	1170.67	0	1170.67
7	3.17343	7658.2	Tsp	400	27	820.523	1083.02	1340.49	0	1340.49
8	3.17343	7997.81	Tsp	400	27	880.924	1162.74	1496.96	0	1496.96
9	3.17343	8238.33	Tsp	400	27	936.186	1235.68	1640.12	0	1640.12
10	3.17343	8389.27	Tsp	400	27	986.309	1301.84	1769.96	0	1769.96
11	3.17343	8458.18	Tsp	400	27	1031.27	1361.18	1886.42	0	1886.42
12	3.17343	8451.14	Tsp	400	27	1070.98	1413.6	1989.31	0	1989.31
13	3.17343	8373.06	Tsp	400	27	1105.34	1458.95	2078.31	0	2078.31
14	3.17343	8227.98	Tsp	400	27	1134.15	1496.98	2152.95	0	2152.95
15	3.17343	8019.22	Tsp	400	27	1157.18	1527.37	2212.59	0	2212.59
16	3.17343	7749.49	Tsp	400	27	1174.08	1549.68	2256.37	0	2256.37
17	3.17343	7421.03	Tsp	400	27	1184.43	1563.34	2283.18	0	2283.18
18	3.17343	7035.64	Tsp	400	27	1187.7	1567.66	2291.66	0	2291.66
19	3.17343	6594.74	Tsp	400	27	1183.22	1561.75	2280.07	0	2280.07
20	3.17343	6099.44	Tsp	400	27	1170.16	1544.51	2246.23	0	2246.23
21	3.17343	5550.54	Tsp	400	27	1147.46	1514.55	2187.42	0	2187.42
22	3.17343	3753.28	Tsp	400	27	942.116	1243.51	1655.48	0	1655.48
23	3.17343	225.456	Tsp	400	27	449.184	592.883	378.553	0	378.553
24	3.17343	172.447	Tsp	400	27	455.952	601.816	396.087	0	396.087
25	3.17343	66.3609	Tsp	400	27	458.737	605.492	403.301	0	403.301

Interslice Data

- Global Minimum Query (spencer) - Safety Factor: 1.31991

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-67.7853	645	0	0	0
2	-64.6119	639.491	-697.291	-471.401	34.0605
3	-61.4384	634.84	-170.568	-115.312	34.0605
4	-58.265	630.809	1216.48	822.398	34.0606
5	-55.0916	627.262	2976.72	2012.4	34.0605
6	-51.9181	624.107	4913.51	3321.76	34.0605
7	-48.7447	621.284	6902.45	4666.37	34.0605
8	-45.5713	618.748	8846.06	5980.35	34.0605
9	-42.3978	616.464	10666.8	7211.25	34.0605
10	-39.2244	614.408	12302.3	8316.89	34.0604
11	-36.0509	612.559	13701.9	9263.09	34.0604
12	-32.8775	610.901	14824.6	10022.1	34.0605
13	-29.7041	609.42	15637.7	10571.8	34.0605
14	-26.5306	608.106	16115	10894.5	34.0605
15	-23.3572	606.95	16237.1	10977	34.0604
16	-20.1838	605.944	15990.1	10810.1	34.0606
17	-17.0103	605.084	15366.4	10388.4	34.0605
18	-13.8369	604.363	14364	9710.71	34.0605
19	-10.6635	603.779	12987.7	8780.28	34.0605
20	-7.49004	603.327	11249.4	7605.13	34.0606
21	-4.31661	603.006	9169.44	6198.97	34.0605
22	-1.14317	602.815	6777.9	4582.17	34.0605
23	2.03026	602.751	4454.62	3011.53	34.0605
24	5.2037	602.816	3037.85	2053.72	34.0604
25	8.37713	603.008	1539.73	1040.93	34.0605
26	11.5506	603.33	0	0	0

List of Coordinates

External Boundary

X	Y
-110	400
261.52	400
261.52	526.328

261.52	536.446
261.52	608.52
220.42	608.52
202.62	599.44
179.06	603.33
152.62	603.33
84.55	603.33
1	603.33
1	615
0	615
-60	645
-110	645

Material Boundary

X	Y
84.55	603.33
126.435	582.589

Material Boundary

X	Y
126.435	582.589
167.273	582.589

Material Boundary

X	Y
167.273	582.589
202.62	599.44

Material Boundary

X	Y
167.273	582.589
208.62	562.345
261.52	536.446

Material Boundary

X	Y
208.62	562.345
247.122	526.328
261.52	526.328

Material Boundary

X	Y
0	615
0	603.295
1	603.33

Project	VT-24980-04 Tajiguas Landfill		
Analysis Description	West Slope of Pad 7 - Static, Circular		
Drawn By: Meng Wei Lu	Scale: 1:3256	Company	Earth Systems Southern California
Date	4/27/2017, 12:39:07 PM	File Name	VT-24980-04 Tajiguas Landfill - Static, Circular.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

VT-24980-04 Tajiguas Landfill

Project Summary

- File Name: VT-24980-04 Tajiguas Landfill - Static, Circular
- Slide Modeler Version: 6.039
- Project Title: VT-24980-04 Tajiguas Landfill
- Analysis: West Slope of Pad 7 - Static, Circular
- Author: Meng Wei Lu
- Company: Earth Systems Southern California
- Date Created: 4/27/2017, 12:39:07 PM

General Settings

- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [psf]: 1500
- Orientation: Normal to boundary

Material Properties

Property	Documented Fill	Tsp
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	130
Cohesion [psf]	360	400
Friction Angle [deg]	32	27
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

- FS: 1.624080
- Center: 149.835, 1229.118
- Radius: 839.003
- Left Slip Surface Endpoint: 120.156, 390.640
- Right Slip Surface Endpoint: 750.210, 643.050
- Resisting Moment=2.18775e+009 lb-ft
- Driving Moment=1.34707e+009 lb-ft
- Resisting Horizontal Force=2.39196e+006 lb
- Driving Horizontal Force=1.47281e+006 lb
- Total Slice Area=35930 ft2

Slice Data

- **Global Minimum Query (spencer) - Safety Factor: 1.62408**

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	25.4001	17896.1	Tsp	400	27	530.129	860.972	904.71	0	904.71
2	25.4001	61980.5	Tsp	400	27	1127.67	1831.42	2809.32	0	2809.32
3	25.4001	103838	Tsp	400	27	1669.38	2711.2	4535.98	0	4535.98
4	25.4001	130136	Tsp	400	27	1982.98	3220.52	5535.59	0	5535.59
5	25.4001	151996	Tsp	400	27	2225.88	3615	6309.8	0	6309.8
6	25.4001	187243	Tsp	400	27	2627.21	4266.8	7589.01	0	7589.01
7	25.4001	219632	Tsp	400	27	2975.99	4833.25	8700.76	0	8700.76
8	25.4001	224871	Tsp	400	27	2980.79	4841.04	8716.05	0	8716.05
9	25.4001	232409	Tsp	400	27	3011.53	4890.97	8814.01	0	8814.01
10	25.4001	251449	Tsp	400	27	3173.31	5153.71	9329.69	0	9329.69
11	25.4001	273707	Tsp	400	27	3363.51	5462.61	9935.93	0	9935.93
12	25.4001	265278	Tsp	400	27	3202.23	5200.68	9421.85	0	9421.85
13	25.4001	245072	Tsp	400	27	2917.21	4737.79	8513.39	0	8513.39
14	25.4001	251044	Tsp	400	27	2921.44	4744.66	8526.88	0	8526.88
15	25.4001	256627	Tsp	400	27	2919.13	4740.9	8519.48	0	8519.48
16	25.4001	253657	Tsp	400	27	2827.03	4591.33	8225.94	0	8225.94
17	25.4001	233385	Tsp	400	27	2563.59	4163.47	7386.23	0	7386.23
18	24.7815	223170	Documented Fill	360	32	2907.31	4721.71	6980.2	0	6980.2
19	24.7815	216148	Documented Fill	360	32	2752.33	4470.01	6577.37	0	6577.37

20	24.7815	198614	Documented Fill	360	32	2480.49	4028.51	5870.85	0	5870.85
21	24.7815	167269	Documented Fill	360	32	2064.82	3353.44	4790.5	0	4790.5
22	24.7815	150534	Documented Fill	360	32	1826.54	2966.45	4171.2	0	4171.2
23	24.7815	129234	Documented Fill	360	32	1550.11	2517.5	3452.72	0	3452.72
24	24.7815	98694.4	Documented Fill	360	32	1192.79	1937.18	2524.01	0	2524.01
25	24.7815	37581.2	Documented Fill	360	32	564.704	917.125	891.586	0	891.586

Interslice Data

- **Global Minimum Query (spencer) - Safety Factor: 1.62408**

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	120.156	390.64	0	0	0
2	145.557	390.126	13929.2	4864.39	19.2504
3	170.957	390.381	41852.9	14616	19.2504
4	196.357	391.406	79602.3	27798.9	19.2503
5	221.757	393.203	120015	41911.8	19.2503
6	247.157	395.779	160297	55979.4	19.2504
7	272.557	399.139	201521	70375.8	19.2504
8	297.957	403.294	240955	84146.9	19.2503
9	323.357	408.255	273417	95483.3	19.2503
10	348.757	414.038	298934	104395	19.2504
11	374.157	420.659	317751	110966	19.2504
12	399.557	428.141	328842	114839	19.2503
13	424.957	436.506	331353	115716	19.2504
14	450.357	445.784	326457	114006	19.2503
15	475.757	456.007	313484	109476	19.2504
16	501.158	467.214	292149	102025	19.2503
17	526.558	479.447	263314	91955.2	19.2504
18	551.958	492.76	230094	80354.1	19.2504
19	576.739	506.845	203820	71178.6	19.2504
20	601.521	522.078	171827	60005.9	19.2504
21	626.302	538.535	136673	47729.4	19.2504
22	651.084	556.306	102704	35866.7	19.2504
23	675.865	575.499	67909	23715.3	19.2503
24	700.647	596.242	34699.5	12117.8	19.2503

25	725.428	618.694	7587.73	2649.8	19.2503
26	750.21	643.05	0	0	0

List of Coordinates

Distributed Load

X	Y
830.865	643.05
786.591	643.05

External Boundary

X	Y
881.38	652.58
846.46	652.58
833.76	643.05
728.98	643.05
711.52	639.88
627.38	595.43
611.51	595.43
528.96	554.15
513.72	554.15
434.34	513.83
396.24	513.83
346.08	485.26
313.69	473.19
295.28	473.19
218.44	431.92
201.93	431.92
123.19	390.64
88.27	390.64
69.22	378.58
0	378.58
0	0
881.38	0

Material Boundary

X	Y
346.08	485.26
346.08	480.509
416.706	480.509
416.706	489.589
528.96	489.589
528.96	492.76
578.187	492.76
578.187	503.855
622.854	503.855
622.854	512.551
661.197	512.551
661.197	525.991
692.82	525.991
692.82	533.897
716.933	533.897
716.933	542.593
738.26	542.593
738.26	556.921
758.284	556.921
758.284	575.075
779.81	575.075
779.81	588.82
797.445	588.82
797.445	602.047
813.784	602.047
813.784	616.311
825.974	616.311
825.974	628.76
833.76	628.76
833.76	643.05

Project	VT-24980-04 Tajiguas Landfill			
Analysis Description	West Slope of Pad 7 - Seismic, Circular			
Drawn By: Meng Wei Lu	Scale: 1:3256		Company: Earth Systems Southern California	
Date: 4/27/2017, 12:39:07 PM			File Name: VT-24980-04 Tajiguas Landfill - Seismic, Circular.slim	

SLIDEINTERPRET 6.039

Global Minimums

Method: spencer

- FS: 1.133080
- Center: 167.462, 1380.653
- Radius: 1007.198
- Left Slip Surface Endpoint: 65.989, 378.580
- Right Slip Surface Endpoint: 863.420, 652.580
- Resisting Moment=4.29358e+009 lb-ft
- Driving Moment=3.78931e+009 lb-ft
- Resisting Horizontal Force=3.97416e+006 lb
- Driving Horizontal Force=3.50741e+006 lb
- Total Slice Area=64040.3 ft2

Slice Data

- **Global Minimum Query (spencer) - Safety Factor: 1.13308**

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	58.8058	88417	Tsp	400	27	1342.75	1521.44	2200.96	0	2200.96
2	58.8058	251696	Tsp	400	27	2765.24	3133.24	5364.27	0	5364.27
3	58.8058	444385	Tsp	400	27	4257.91	4824.55	8683.66	0	8683.66
4	58.8058	620082	Tsp	400	27	5426.63	6148.81	11282.7	0	11282.7
5	58.8058	711207	Tsp	400	27	5806.81	6579.58	12128.1	0	12128.1
6	58.8058	823893	Tsp	400	27	6284.98	7121.38	13191.4	0	13191.4
7	58.8058	816580	Tsp	400	27	5884.32	6667.41	12300.5	0	12300.5
8	58.8058	868169	Tsp	400	27	5883.89	6666.92	12299.5	0	12299.5
9	58.8058	867692	Tsp	400	27	5550.01	6288.61	11557	0	11557
10	58.8058	843011	Tsp	400	27	5092.98	5770.75	10540.7	0	10540.7
11	58.8058	802189	Tsp	400	27	4576.41	5185.44	9391.96	0	9391.96
12	4.07979	53687.3	Documented Fill	720	31	5208.85	5902.04	8624.35	0	8624.35
13	9.19056	117469	Tsp	400	27	4138.79	4689.58	8418.78	0	8418.78
14	12.1364	146072	Documented Fill	720	31	4719.5	5347.57	7701.55	0	7701.55
15	8.78193	98034.8	Tsp	400	27	3573.55	4049.12	7161.79	0	7161.79
16	11.2421	115394	Documented Fill	720	31	4014.65	4548.92	6372.39	0	6372.39
17	13.7368	125764	Tsp	400	27	2916.4	3304.51	5700.42	0	5700.42
18	7.78916	63308.9	Documented Fill	720	31	3211.28	3638.64	4857.44	0	4857.44

19	10.1051	73649.3	Tsp	400	27	2483.02	2813.46	4736.68	0	4736.68
20	7.52994	48230.4	Documented Fill	720	31	3110.09	3523.98	4666.61	0	4666.61
21	8.93797	50022.1	Tsp	400	27	2270.54	2572.7	4264.17	0	4264.17
22	7.40103	35096.3	Documented Fill	720	31	2532.41	2869.42	3577.24	0	3577.24
23	9.59615	37145.9	Tsp	400	27	1769.26	2004.71	3149.41	0	3149.41
24	2.59385	8307.51	Documented Fill	720	31	2019.76	2288.55	2610.5	0	2610.5
25	37.4456	64771.7	Tsp	400	27	809.119	916.796	1014.27	0	1014.27

Interslice Data

- **Global Minimum Query (spencer) - Safety Factor: 1.13308**

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	65.9889	378.58	0	0	0
2	124.795	374.359	75233.2	37009.5	26.194
3	183.601	373.585	204753	100724	26.1939
4	242.406	376.247	366139	180115	26.194
5	301.212	382.375	524096	257818	26.1939
6	360.018	392.033	642821	316223	26.194
7	418.824	405.325	714636	351551	26.194
8	477.63	422.403	729192	358711	26.1939
9	536.436	443.473	686892	337903	26.194
10	595.242	468.813	591273	290865	26.194
11	654.047	498.79	449269	221009	26.194
12	712.853	533.897	269175	132415	26.1939
13	716.933	536.539	259655	127732	26.1939
14	726.124	542.593	229221	112761	26.194
15	738.26	550.811	201471	99109.6	26.194
16	747.042	556.921	174491	85837.3	26.1939
17	758.284	564.947	151312	74434.7	26.1939
18	772.021	575.075	114898	56521.9	26.194
19	779.81	580.98	101811	50083.7	26.1939
20	789.915	588.82	78795.7	38762	26.194
21	797.445	594.798	67157.7	33036.9	26.194
22	806.383	602.047	49098.7	24153.1	26.1939
23	813.784	608.18	40697.2	20020.2	26.194
24	823.38	616.311	26546.8	13059.2	26.194
25	825.974	618.545	24725.2	12163.1	26.194

26	863.42	652.58	0	0	0

List of Coordinates

Distributed Load

X	Y
830.865	643.05
786.591	643.05

External Boundary

X	Y
881.38	652.58
846.46	652.58
833.76	643.05
728.98	643.05
711.52	639.88
627.38	595.43
611.51	595.43
528.96	554.15
513.72	554.15
434.34	513.83
396.24	513.83
346.08	485.26
313.69	473.19
295.28	473.19
218.44	431.92
201.93	431.92
123.19	390.64
88.27	390.64
69.22	378.58
0	378.58
0	0
881.38	0

Material Boundary

X	Y
346.08	485.26
346.08	480.509
416.706	480.509
416.706	489.589
528.96	489.589
528.96	492.76
578.187	492.76
578.187	503.855
622.854	503.855
622.854	512.551
661.197	512.551
661.197	525.991
692.82	525.991
692.82	533.897
716.933	533.897
716.933	542.593
738.26	542.593
738.26	556.921
758.284	556.921
758.284	575.075
779.81	575.075
779.81	588.82
797.445	588.82
797.445	602.047
813.784	602.047
813.784	616.311
825.974	616.311
825.974	628.76
833.76	628.76
833.76	643.05

Slide Analysis Information

VT-24980-04 Tajiguas Landfill

Project Summary

- File Name: VT-24980-04 Tajiguas Landfill - Seismic, Circular
- Slide Modeler Version: 6.039
- Project Title: VT-24980-04 Tajiguas Landfill
- Analysis: West Slope of Pad 7 - Seismic, Circular
- Author: Meng Wei Lu
- Company: Earth Systems Southern California
- Date Created: 4/27/2017, 12:39:07 PM

General Settings

- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

Loading

- Seismic Load Coefficient (Horizontal): 0.15
- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [psf]: 1500
- Orientation: Normal to boundary

Material Properties

Property	Documented Fill	Tsp
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	130
Cohesion [psf]	720	400
Friction Angle [deg]	31	27
Water Surface	None	None
Ru Value	0	0