Appendix D Geotechnical Investigation

Appendices

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Construction Testing & Engineering, Inc.
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GEOTECHNICAL INVESTIGATION
PROPOSED MODERNIZATION
SOLANA VISTA SCHOOL
780 SANTA VICTORIA
SOLANA BEACH, CALIFORNIA

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1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

This report presents the results of the geotechnical investigation, performed by Construction Testing and Engineering, Inc. (CTE), and provides preliminary conclusions and recommendations for the proposed modernization at the existing Solana Vista School campus in Solana Beach, California. This geotechnical investigation was performed in general accordance with the terms of CTE proposal G-4377, dated April 23, 2018 and update for additional coverage.

Based on a review of the project plans, CTE understands the proposed modernization consists of demolition of existing improvements and construction of a new campus in the general area of the existing campus. The proposed campus is anticipated to consist of one- to two-story classroom and faculty structures with associated parking and drive areas, playgrounds, ball fields, flatwork, landscaping, stormwater BMP's, and ancillary improvements. CTE should review any modifications to project plans as they become available in order to make changes to the recommendations herein, as necessary. Preliminary geotechnical recommendations for excavations, site preparation, fill placement, and foundation design for the proposed improvements are presented herein. References reviewed for this report are provided in Appendix A. Site location is shown on the attached Figure 1 (Site Index Map).

1.2 Scope of Services

The scope of services provided included:

- Review of referenced geologic and soils reports.
- Coordination of utility mark-out and location through USA DigAlert services and an independent utility locater.
- Excavation of exploratory borings and soil sampling with two truck-mounted drill rigs.
- Percolation testing in accordance with County of San Diego Department of Environmental Health (DEH) procedures.
- Establishing infiltration rates in general accordance with County of San Diego Storm Water Standards.
- Laboratory testing of selected soil samples.
- Description of the geology and evaluation of potential geologic hazards.
- Engineering and geologic analysis.
- Preparation of this summary report.

2.0 SITE DESCRIPTION

Solana Vista School is located at 780 Santa Victoria in Solana Beach, California (Figure 1). The school campus is bounded by Santa Victoria to the north and west, San Patricio Drive to the south and a residential development to the east. The general layout of the subject site is shown on Figure 2.

The improvement area of the campus is relatively flat and gently slopes down to the southwest with elevations ranging from approximately 243 feet above mean sea level (msl) in the northeast to 239 feet msl to the southwest.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Field Investigation

CTE conducted a field investigation on June 29 and 30, 2018 for the original proposed school campus layout. The plans were subsequently reconfigured and additional borings and percolation tests were performed on April 9 and 10, 2019. In total, the investigation consisted of a visual reconnaissance and the excavation of 33 exploratory borings and three percolation test holes. The borings were placed in representative areas where improvements are proposed and to satisfy California Geological Survey (CGS) minimum boring requirements for school sites. Boring locations were adjusted as necessary based on the presence of existing improvements, underground utilities as surveyed by others, and reconfiguration of the proposed improvements. The borings were excavated with CME-45 and CME-75 truck-mounted drill rigs equipped with eight-inch-diameter, hollow-stem augers that extended to a maximum depth of approximately 20 feet below the ground surface (bgs). Approximate locations of the soil borings and percolation test holes are shown on the attached Figure 2.

The soils were logged in the field by a CTE Engineering Geologist, and were visually classified in general accordance with the Unified Soil Classification System. The field descriptions have been modified, where appropriate, to reflect laboratory test results. Boring logs, including descriptions of the soils encountered, are included in Appendix B.

3.2 Laboratory Testing

Laboratory tests were conducted on selected soil samples for classification purposes, and to evaluate physical properties and engineering characteristics. Laboratory tests conducted include: Expansion Index (EI), R-Value, Gradation, Atterberg Limits, Direct Shear, Consolidation, and Chemical

Characteristics. Test descriptions and laboratory test results for the selected soils are included in Appendix C.

4.0 PERCOLATION TESTING

Specific stormwater BMP locations were not known at the time of the field investigation; therefore, testing was performed within representative and accessible locations throughout the site. The percolation test holes were excavated to depths ranging from approximately 3.7 to 5.6 feet below the ground surface (bgs). The attached Figure 2 shows the approximate percolation test locations. The evaluation was performed in general accordance with Appendix C of the Model BMP Design Manual for the San Diego Region "Geotechnical and Groundwater Investigation Requirements", dated January 2016.

4.1 Percolation Test Methods

The percolation tests were performed in general accordance with methods approved by the San Diego Region BMP Design Manual with a presoak period of approximately 20 to 21 hours. Percolation test results and calculated infiltration rates are presented below in Table 4.2. Field Data and percolation to infiltration calculations are included in Appendix E.

4.2 Calculated Infiltrated Rate

As per the San Diego Region BMP design documents (2016) infiltration rates are to be evaluated using the Porchet Method. San Diego BMP design documents utilized the Porchet Method through guidance of the County of Riverside (2011). The intent of calculating the infiltration rate is to take into account bias inherent in percolation test borehole sidewall infiltration that would not occur at a basin bottom where such sidewalls are not present.

The infiltration rate (I_t) is derived by the equation:

$$I_t = \frac{\Delta H \, \pi r2 \, 60}{\Delta t(\pi r2 + 2\pi r H_{avg})} = \frac{\Delta H \, 60 \, r}{\Delta t(r + 2H_{avg})}$$

Where:

I_t = tested infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
* r = effective radius of test hole
H_{avg} = average head over the time interval, inches

Given the measured percolation rates, the calculated infiltration rates are presented with and without a Factor of Safety applied in Table 4.2 below. The civil engineer of record should determine an appropriate factor of safety to be applied via completion of Worksheet I-8 of County of San Diego "Best Management Practice Design Manual", Appendix D or other approved methods. CTE does not recommend using a factor of safety of less than 2.0.

TABLE 4.2
SUMMARY OF PERCOLATION AND INFILTRATION TEST RESULTS

Test Location	Soil Type	San Diego County Percolation Procedure	Depth (inches)	Percolation Rate (inches/hour)	Infiltration Rate (inches/hour)	Recommended Rate for Design* (inches/hour)
P-1	Tt	Case I	36	0.004	0.034	0.017
P-2	Tt	Case I	50	0.006	0.035	0.017
P-3	Tt	Case I	38	0.006	0.039	0.019

NOTES
Water level was measured from a fixed point at the top of the hole.
Weather was sunny and warm during percolation testing.
Tt = Tertiary Torrey Sandstone
The test holes were eight inches in diameter.

5.0 GEOLOGY

5.1 General Setting

Solana Beach is located within the Peninsular Ranges physiographic province that is characterized by northwest-trending mountain ranges, intervening valleys, and predominantly northwest trending regional faults. The San Diego region can be further subdivided into the coastal plain area, a central mountain–valley area, and the eastern mountain valley area. The project site is located within the coastal plain area, which is generally underlain by Cretaceous and Tertiary sedimentary deposits that onlap an eroded basement surface consisting of Jurassic and Cretaceous crystalline rocks.

5.2 Geologic Conditions

Based on the regional geologic map prepared by Kennedy and Tan (2007), the near surface geologic unit underlying the site consists of Tertiary Torrey Sandstone. Based on recent site explorations, Quaternary Previously Placed Fill and Residual Soil were observed over the Tertiary Torrey Sandstone. Regional geologic conditions are shown on Figure 3 and geologic cross sections are presented on Figure 2A. Descriptions of the geologic units encountered during the investigation are presented below.

5.2.1 Quaternary Previously Placed Fill

Quaternary Previously Placed Fill was encountered at depths ranging from approximately 1.5 to 19.5 feet below ground surface (bgs). The fill soils observed generally consisted of medium dense or very stiff, slightly moist to moist, yellowish to reddish brown, silty to clayey, fine grained sand and sandy clay. The fill was placed during mass grading of the site between 1970 and 1971 under testing and observation by Woodward-Clyde & Associates. Based on review of the previous grading plan and original site topography (Schoell Geritz Paul & Allard, Inc. 1971) the previously placed fill generally deepens to the southwest with a maximum depth of approximately 24 feet bgs beneath the athletic field area. In addition, a backfilled northeast-trending drainage underlies the northeastern portion of the campus.

5.2.2 Residual Soil

Residual soil was observed blanketing the underlying Torrey Sandstone. This unit ranged in thickness from approximately one to five feet. This unit generally consists of medium dense or very stiff, dark brown to dark olive gray, clayey fine to medium grained sand and sandy clay.

5.2.3 Tertiary Torrey Sandstone

Tertiary Torrey Sandstone was encountered as the underlying geologic unit in the exploratory borings and is anticipated at depth throughout the site. This unit generally consists of dense to very dense, reddish brown to light gray, silty to clayey fine to medium grained sandstone.

5.3 Groundwater Conditions

Groundwater was not encountered in the recent borings, which were advanced to a maximum explored depth of approximately 20 feet bgs. While groundwater conditions may vary, especially following periods of sustained precipitation or irrigation, it is generally not anticipated to adversely affect shallow construction activities or the completed improvements, if irrigation is limited and proper site drainage is designed, installed, and maintained per the recommendations of the project civil engineer. Based on noted geologic conditions, localized seepage may be encountered in site excavations.

5.4 Geologic Hazards

Geologic hazards that were considered to have potential impacts to site development were evaluated based on field observations, literature review, and laboratory test results. It appears that the geologic hazards at the site are primarily limited to those caused by shaking from earthquake-generated ground motions. The following paragraphs discuss the geologic hazards considered and their potential risk to the site.

5.4.1 Surface Fault Rupture

In accordance with the State of California Alquist-Priolo Earthquake Fault Zoning Act (AP Act), the State of California established Earthquake Fault Zones around known active faults. The purpose of the AP Act is to regulate the development structures intended for human occupancy near active fault traces in order to mitigate hazards associated with surface fault rupture. According to the California Geological Survey (Special Publication 42, Revised 2018), a fault that has had surface displacement within the last 11,700 years is defined as a Holocene-active fault and is either already zoned or pending zonation in accordance with the AP Act. There are several other definitions of fault activity that are used to regulate dams, power plants, and other critical facilities, and some agencies designate faults that are documented as older that Holocene (last 11,700 years) and younger than late Quaternary (1.6 million years) as potentially active faults that are subject to local jurisdictional regulations. Based on our site reconnaissance and review of referenced literature, the site is not located within a within a State designated Earthquake Fault Zone, and no known active fault traces underlie or project toward the site, and no known potentially active fault traces project toward the site.

5.4.2 Local and Regional Faulting

The United States Geological Survey (USGS), with support of State Geological Surveys, and reviewed published work by various researchers, have developed a Quaternary Fault and Fold Database of faults and associated folds that are believed to be sources of earthquakes with magnitudes greater than 6.0 that have occurred during the Quaternary (the past 1.6 million years). The faults and folds within the database have been categorized into four Classes (Class A-D) based on the level of evidence confirming that a Quaternary fault is of tectonic origin, and whether the structure is exposed for mapping or inferred from fault related deformational features. Class A faults have been mapped and categorized based on age of documented activity ranging from Historical faults (activity within last 150 years), Latest Quaternary faults (activity within last 15,000 years), Late Quaternary (activity within last 130,000 years), to Middle to late Quaternary (activity within last 1.6 million years). The Class A faults are considered to have the highest potential to generate earthquakes and/or surface rupture, and the earthquakes and surface rupture potential generally increases from oldest to youngest. The evidence for Quaternary deformation and/or tectonic activity progressively decreases for Class B and Class C faults. When geologic evidence such as joints, fractures, landslides, or erosional of fluvial scarps that resemble fault scarps, but demonstrate a non-tectonic origin indicate that a fault is not of tectonic origin it is considered to be a Class D structure,.

The nearest known Class A faults include both Latest Quaternary (<15,000 years) and undifferentiated Quaternary (<130,000 year) fault segments of the Rose Canyon Fault Zone, which is approximately 7.2 kilometers southwest of the site, and the Julian segment of the Elsinore Fault, which is located approximately 47.2 kilometers northeast of the site. The following Table 5.4.2 presents the known faults nearest to the site and estimated magnitude. The attached Figure 4 shows regional faults and seismicity with respect to the site.

TABLE 5.4.2
NEAR-SITE FAULT PARAMETERS

FAULT NAME	APPROXIMATE DISTANCE FROM SITE (KM)	MAXIMUM ESTIMATED EARTHQUAKE MAGNITUDE
Rose Canyon	7.2	7.2
Newport-Inglewood	23.9	7.1
Coronado Bank	28.8	7.6
Elsinore-Julian	46.7	7.1
Elsinore-Temecula	47.2	6.8
Earthquake Valley	65.6	6.5

The site could be subjected to significant shaking in the event of a major earthquake on any of the faults listed above or other faults in the southern California or northern Baja California area.

5.4.3 Historic Seismicity

The level of seismicity within recent history (last 50 years) of the greater San Diego area is relatively low compared to other areas of southern California and northwestern Baja California. Only a few small to moderate earthquakes have been reported in the San Diego area during the period of instrumental recordings, which began in the early 1900s. Most of the high seismic activity in the region is associated with the Elsinore Fault Zone and the San Jacinto Fault Zone, located approximately 47 and 83 kilometers northeast of the site respectively. In the western portion of San Diego County a series of small-to-moderate earthquakes in July 1985 were reportedly associated with the Rose Canyon Fault Zone (Reichle, 1985). The largest event in that series was M4.7, which was centered within San Diego Bay. A similar series of earthquakes in coastal San Diego occurred in 1964 (Simons, 1979).

Review of the USGS Earthquake Archives (http://earthquake.usgs. gov/earthquakes/search/) for significant earthquakes within 100 kilometers of the site with magnitudes greater than M5.5 are provided in Table 5.4.3.

TABLE 5.4.3 Regional Earthquake History				
EARTHQUAKE DATE (yr-mo-day)	EARTHQUAKE TIME (UTC)	MAGNITUDE	ESTIMATED DEPTH (km)	GENERAL LOCATION
1918-04-21	22:32:29	6.7	10.0	Southern California
1933-03-11	01:54:09	6.4	6.0	Long Beach
1951-12-26	00:46:54	5.8	6.0	NNE of San Clemente

The site could be subjected to significant shaking in the event of a major earthquake on any of the faults discussed above or other faults in the southern California or northern Baja California area.

5.4.4 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake-induced shaking and behave as a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking. Seismic settlement can occur with or without liquefaction; it results from densification of loose soils.

Due to the lack of shallow groundwater and the presence of medium dense Fill and dense to very dense Torrey Sandstone beneath the site, liquefaction, seismic settlement, and/or associated secondary effects are not anticipated to be significant at the subject site.

5.4.5 Tsunamis, Flooding, and Seiche Evaluation

According to Federal Emergency Management Agency flood hazard mapping (FEMA, 2012), the site is mapped in Zone X which represents an area of minimal flood hazard. California Emergency Management Agency mapping (2009) indicates that the site is not within a tsunami inundation area. Therefore, the risk of flooding or tsunami inundation at the site is considered to be low.

Damage resulting from oscillatory waves (seiches) is considered unlikely due to the absence of nearby confined bodies of water.

5.4.6 Landsliding

According to mapping by Tan (1995), the site is considered "Generally Susceptible" to landsliding. However, landslides are not mapped in the site area, and evidence of landsliding was not encountered during the recent field exploration. Based on the lack of noted landslide features and site slopes consisting of engineered fill placed during previous grading, landsliding is not considered to be a significant geologic hazard at the subject site.

5.4.7 Compressible and Expansive Soils

Based on observations and testing, the disturbed near surface previously placed fill is considered to be potentially compressible in its current condition. Therefore, it is recommended that these soils be overexcavated to the depth of competent underlying materials and properly compacted beneath improvement areas as recommended herein.

Based on site observations and testing, the deeper portion of the previously placed fill and underlying Torrey Sandstone are not anticipated to be subject to significant compressibility under the proposed loads.

Based on observation and laboratory testing, soils at the site are generally anticipated to exhibit low to medium expansion potential (Expansion Index of 90 or less). Recommendations presented herein are intended to reduce the potential adverse impacts of the moderately expansive clayey soils. Additional evaluation of potential expansive conditions should be conducted during grading to confirm that the soils encountered are as anticipated.

5.4.8 Corrosive Soils

Testing of representative site soils was performed to evaluate their potential corrosive effects on concrete foundations and buried metallic utilities. Soil environments detrimental to concrete generally have elevated levels of soluble sulfates and/or pH levels less than 5.5. According to the American Concrete Institute (ACI) Table 318 4.3.1, specific guidelines have been provided for concrete where concentrations of soluble sulfate (SO_4) in soil exceed 0.10 percent by weight. These guidelines include low water: cement ratios, increased compressive strength, and specific cement type requirements. Minimum resistivity values less than approximately 5,000 ohm-cm and/or soluble chloride levels in excess of 200 ppm generally indicate a corrosive environment for buried metallic utilities and untreated conduits.

Chemical test results indicate that near-surface soils at the site generally present a negligible corrosion potential for Portland cement concrete. Based on resistivity and chloride testing, the site soils have been interpreted to have a moderate to severe corrosivity potential to buried metallic improvements. Based on the results of the limited testing performed, it may be prudent to utilize plastic piping and conduits where buried and feasible. However, CTE does not practice corrosion engineering. Therefore, if corrosion of metallic or other improvements is of more significant concern, a qualified corrosion engineer could be consulted.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

Based on the investigation findings the proposed improvements at the site are considered feasible from a geotechnical standpoint, provided the recommendations in this report are incorporated into the design and construction of the project. Recommendations for the proposed earthwork and improvements are included in the following sections and Appendix D. However, recommendations in the text of this report supersede those presented in Appendix D should variations exist. These recommendations should either be evaluated as appropriate or updated during plan review and grading at the site.

6.2 Site Preparation

Based on the localized moderately expansive soils and noted differential fill thickness beneath proposed structure footprints, the following recommendations are provided. These excavation and recompaction recommendations are intended to help provide relatively uniform conditions under the proposed structure areas.

Prior to grading, the site should be cleared of existing construction debris and vegetation. Materials not suitable for structural backfill should be properly disposed of offsite. Within proposed structural areas, existing soils should be excavated to a minimum depth of six feet below existing grades or to the depth of competent materials, whichever is greater. Overexcavation should extend at least five feet laterally beyond the limits of the proposed structural improvements, or the distance resulting from a 1:1 (horizontal: vertical) from the bottom of footing to suitable underlying material, whichever is greater. If localized areas of loose or unsuitable materials are encountered at the base of the recommended overexcavations, deeper removals to the depth of competent soil may be necessary.

Portions of the onsite soils encountered during grading are anticipated to consist of clayey and medium to highly expansive material. Select grading or blending is recommended such that low expansion soils (EI of 50 or less) are placed within the upper four feet in structural improvement areas. Moderately to highly expansive soils should be placed below a depth of four feet in improvement areas. Alternatively, moderately to highly expansive soils may be placed in non-improvement areas or they should be exported from the site. If artificial turf is proposed, additional selective grading may be necessary, as required by the manufacturer.

For other proposed improvement areas, such as pavement and hardscape, existing soils should be excavated to the depth of competent materials, or to a minimum of 18 inches below proposed or existing subgrade elevation, whichever depth is greatest. Fill soil placed in the upper 18 inches should possess an Expansion Index of 50 or less (low expansion potential) for these ancillary improvement areas.

Existing below-ground utilities should be redirected around proposed structures. Existing utilities at an elevation to extend through the proposed footings should generally be sleeved and caulked to minimize the potential for moisture migration below the building slabs. Abandoned pipes exposed by grading should be securely capped to prevent moisture from migrating beneath foundation and slab soils or should be filled with minimum two-sack cement/sand slurry.

A CTE representative should observe the exposed bottom of excavations prior to placement of compacted fill or improvements. If localized areas of loose or unsuitable materials are encountered at the base of the overexcavations, deeper overexcavations to the depth of competent soil will be required.

6.3 Site Excavation

Based on site observations and anticipated subsurface conditions, shallow excavations at the site should generally be feasible using well-maintained heavy-duty construction equipment run by experienced operators.

6.4 Fill Placement and Compaction

Following recommended overexcavation of loose or disturbed soils, the areas to receive fills or improvements should be scarified a minimum of 8 inches, moisture conditioned and properly compacted. Granular fill and backfill should be compacted to a minimum relative compaction of 90 percent at a moisture content of at least three percent above optimum, as evaluated by ASTM D-1557. Shallow fills placed in proposed natural turf areas should be compacted as per the recommendations or requirements of the Landscape Architect or Project Architect. The upper four feet of fill soil placed beneath and five feet beyond structures should possess a low expansion potential (EI of 50 or less). Fill soils with a higher expansion potential should be placed at least four feet below finished subgrade elevations or in non-structural areas. The optimum lift thickness for fill soil depends on the type of compaction equipment used. Generally, backfill should be placed in uniform, horizontal lifts not exceeding eight inches in loose thickness. Fill placement and compaction should be conducted in conformance with local ordinances.

6.5 Fill Materials

Properly moisture-conditioned very low to low expansion potential (EI of 50 or less) soils derived from the on-site excavations are considered suitable for reuse on the site as compacted fill in the upper 18 inches beneath surface improvements and within the upper four feet below grade for structural improvements. Medium to highly expansive materials, if encountered (EI greater than 50) may be utilized outside building envelopes and ancillary improvement areas and/or may be placed at depths greater than four feet below proposed or existing grades, whichever is deeper. Fill soils should be screened of organics and materials generally greater than three inches in maximum dimension. Irreducible materials greater than three inches in maximum dimension generally should not be used in shallow fills (within four feet of proposed grades). In utility trenches, adequate bedding should surround pipes.

Imported fill beneath structures, flatwork, and pavements should have an Expansion Index of 20 or less (ASTM D 4829). Proposed import fill soils for use in structural or slope areas should be evaluated by the geotechnical engineer before being transported to the site.

If retaining walls are proposed, backfill located within a 45-degree wedge extending up from the heel of the wall should consist of soil having an Expansion Index of 20 or less (ASTM D 4829) with less than 30 percent passing the No. 200 sieve. The upper 12 to 18 inches of wall backfill should consist of lower permeability soils, in order to reduce surface water infiltration behind walls. The project structural engineer and/or architect should detail proper wall backdrains, including gravel drain zones, fills, filter fabric, and perforated drain pipes. However, a conceptual wall backdrain detail, which may be suitable for use at the site, is provided as Figure 5. Section 6.14 discusses recommendations for Controlled Low-Strength Material (CLSM).

Although this report is not intended to address environmental conditions at the subject site, it is anticipated that imported soils will be screened, sampled, and tested in accordance with the Department of Toxic Substances Control's (2001) advisory for clean imported fill soils for public school sites. CTE can provide those services as additional scope.

6.6 Temporary Construction Slopes

The following recommended temporary slopes should be relatively stable against deep-seated failure, but may experience localized sloughing. On-site soils are considered Type B and Type C soils with recommended slope ratios as set forth in Table 6.6.

TABLE 6.6 RECOMMENDED TEMPORARY SLOPE RATIOS		
SOIL TYPE	SLOPE RATIO (Horizontal: vertical)	MAXIMUM HEIGHT
B (Torrey Sandstone)	1:1 (OR FLATTER)	10 Feet
C (Previously Placed Fill and Residual Soil)	1.5:1 (OR FLATTER)	10 Feet

Actual field conditions and soil type designations must be verified by a "competent person" while excavations exist, according to Cal-OSHA regulations. In addition, the above sloping recommendations do not allow for surcharge loading at the top of slopes by vehicular traffic, equipment or materials. Appropriate surcharge setbacks must be maintained from the top of all unshored slopes.

6.7 Foundations and Slab Recommendations

The following recommendations are for preliminary design purposes only. These foundation recommendations should be further evaluated after review of the project grading and foundation plans, and after completion of rough grading of the building pad areas. Upon completion of rough grading, Expansion Index of near surface soils should be further evaluated and recommendations provided herein updated, as necessary. Additional corrosivity testing of soils may also be performed following rough grading, if necessary. Lightly loaded upright structures such as flagpoles and other supports may be designed in accordance with current California Building Code or applicable standards assuming code minimum design values, or as per the recommendations provided herein.

6.7.1 Shallow Spread Foundations

Foundation recommendations presented herein are based on the anticipated very low to low expansion potential of site soils (Expansion Index of 50 or less) in the upper four feet below finished subgrade elevations.

Following the recommended preparatory grading, continuous and isolated spread footings are anticipated to be suitable for use at this site. It is anticipated that the proposed footings will be founded entirely in properly compacted fill placed as recommended herein. Footings should not straddle cut-fill interfaces. If deeper footings are proposed, additional overexcavation and compaction may be required in order to provide a minimum of 24 inches of fill beneath all foundation elements.

Foundation dimensions and reinforcement should be based on an allowable bearing value of 2,500 pounds per square foot for footings founded in suitable fill materials and embedded a minimum of 30 inches below the lowest adjacent rough subgrade elevation. If utilized, continuous footings should be at least 15 inches wide; isolated footings should be at least 24 inches in least dimension. The above bearing value may be increased by one third for short duration loading which includes the effects of wind or seismic forces. If elastic foundation design is utilized, an uncorrected modulus of subgrade reaction of 150 pci is anticipated to be appropriate.

Minimum footing reinforcement for continuous footings should consist of four No. 5 reinforcing bars; two placed near the top and two placed near the bottom, or as per the project structural engineer. The structural engineer should design isolated footing reinforcement. Footing excavations should be maintained at, or be brought to, a minimum moisture content of at least three percent above optimum, just prior to concrete placement.

6.7.2 Foundation Settlement

The maximum total settlement for foundations embedded in properly compacted fill is expected to be on the order of one inch; the maximum differential settlement is expected to be on the order of 0.5 inch over a distance of approximately 40 feet.

6.7.3 Foundation Setback

Footings for structures should be designed such that the horizontal distance from the face of adjacent slopes to the outer edge of the footing is at least 10 feet. In addition, footings should bear beneath a 1:1 plane extended up from the nearest bottom edge of adjacent trenches and/or excavations. Deepening of affected footings may be a suitable means of attaining the prescribed setbacks.

6.7.4 Interior Concrete Slabs-On-Grade

Concrete slabs should be designed based on the anticipated loading, but measure at least 5.0 inches in thickness. Slab reinforcement should at least consist of No. 4 reinforcing bars, placed on maximum 18-inch centers, each way, at or above mid-slab height, but with proper concrete cover.

Slabs subjected to heavier loads may require thicker slab sections and/or increased reinforcement. A 125-pci subgrade modulus is considered suitable for elastic design of minimally embedded improvements such as slabs-on-grade. Slabs on grade areas should be maintained at a minimum three percent above optimum moisture content or be brought to three percent above optimum moisture content just prior to placement of underlayments or concrete.

In moisture-sensitive floor areas, a suitable vapor retarder of at least 15-mil thickness (with all laps or penetrations sealed or taped) overlying a four-inch layer of consolidated crushed aggregate or gravel (with SE of 30 or more) should be installed, as per the CBC/Green Building Code. An optional maximum two-inch layer of similar material may be placed above the vapor retarder to help protect the membrane during steel and concrete placement. This recommended protection is generally considered typical in the industry. If proposed floor areas or coverings are considered especially sensitive to moisture emissions, additional recommendations from a specialty consultant could be obtained. CTE is not an expert at preventing moisture penetration through slabs. A qualified architect or other experienced professional should be contacted if moisture penetration is a more significant concern.

6.8 Seismic Design Criteria

The seismic ground motion values listed in the table below were derived in accordance with the ASCE 7-10 Standard and 2016 CBC. This was accomplished by establishing the Site Class based on the soil properties at the site, and calculating the site coefficients and parameters using the United States Geological Survey Seismic Design Maps application and site coordinates of 33.0035 degrees latitude and -117.2502 degrees longitude. These values are intended for the design of structures to resist the effects of earthquake ground motions.

TABLE 6.8 SEISMIC GROUND MOTION VALUES		
PARAMETER	VALUE	CBC REFERENCE (2016)
Site Class	C	ASCE 7, Chapter 20
Mapped Spectral Response Acceleration Parameter, S_S	1.092	Figure 1613.3.1 (1)
Mapped Spectral Response Acceleration Parameter, S_1	0.421	Figure 1613.3.1 (2)
Seismic Coefficient, F_a	1.000	Table 1613.3.3 (1)
Seismic Coefficient, F_v	1.379	Table 1613.3.3 (2)
MCE Spectral Response Acceleration Parameter, S_{MS}	1.092	Section 1613.3.3
MCE Spectral Response Acceleration Parameter, S_{M1}	0.580	Section 1613.3.3
Design Spectral Response Acceleration, Parameter S_{DS}	0.728	Section 1613.3.4
Design Spectral Response Acceleration, Parameter S_{D1}	0.387	Section 1613.3.4
PGA_M	0.446	ASCE 7, Equation 11.8-1

6.9 Lateral Resistance and Earth Pressures

Lateral loads acting against structures may be resisted by friction between the footings and the supporting compacted fill soil or passive pressure acting against structures. If frictional resistance is used, an allowable coefficient of friction of 0.30 (total frictional resistance equals the coefficient of friction multiplied by the dead load) is recommended for concrete cast directly against compacted fill. A design passive resistance value of 250 pounds per square foot per foot of depth (with a maximum value of 2,000 pounds per square foot) may be used. The allowable lateral resistance can be taken as the sum of the frictional resistance and the passive resistance, provided the passive resistance does not exceed two-thirds of the total allowable resistance.

Retaining walls up to approximately eight feet high and backfilled using granular soils may be designed using the equivalent fluid weights given below.

TABLE 6.9
EQUIVALENT FLUID UNIT WEIGHTS
(pounds per cubic foot)

WALL TYPE	LEVEL BACKFILL	SLOPE BACKFILL 2:1 (HORIZONTAL: VERTICAL)
CANTILEVER WALL (YIELDING)	30	48
RESTRAINED WALL	60	75

Lateral pressures on cantilever retaining walls (yielding walls) due to earthquake motions may be calculated based on work by Seed and Whitman (1970). The total lateral thrust against a properly drained and backfilled cantilever retaining wall above the groundwater level can be expressed as:

$$P_{AE} = P_A + \Delta P_{AE}$$

For non-yielding (or "restrained") walls, the total lateral thrust may be similarly calculated based on work by Wood (1973):

$$P_{KE} = P_K + \Delta P_{KE}$$

Where P_A/b = Static Active Earth Pressure = $G_h H^2/2$

P_K/b = Static Restrained Wall Earth Pressure = $G_h H^2/2$

$\Delta P_{AE}/b$ = Dynamic Active Earth Pressure Increment = $(3/8)\ k_h\ \gamma H^2/2$

$\Delta P_{KE}/b$ = Dynamic Restrained Earth Pressure Increment = $k_h\ \gamma H^2/2$

b = unit length of wall (usually 1 foot)

k_h = 2/3 PGA_m (PGA_m given previously Table 5.8)

G_h = Equivalent Fluid Unit Weight (given previously Table 5.9)

H = Total Height of the retained soil

γ = Total Unit Weight of Soil ≈ 135 pounds per cubic foot

*We anticipate that the 1/2 reduction factor will be appropriate for proposed walls that are not substantially sensitive to movement during the design seismic event. Proposed walls that are more sensitive to such movement could utilize a 2/3 reduction factor. If any proposed walls require minimal to no movement during the design seismic event, no reduction factor to the peak ground acceleration should be used. The project structural engineer of record should determine the appropriate reduction factor to use (if any) based on the specific proposed wall characteristics.

The increment of dynamic thrust may be distributed triangularly with a line of action located at H/3 above the bottom of the wall (SEAOC, 2013).

These values assume non-expansive backfill and free-draining conditions. Some onsite soils will not be suitable for use as wall backfill. Measures should be taken to prevent moisture buildup behind all retaining walls. Waterproofing should be as specified by the project architect.

In addition to the recommended earth pressure, subterranean structure walls adjacent to the streets or other traffic loads should be designed to resist a uniform lateral pressure of 100 psf. This is the result of an assumed 300-psf surcharge behind the walls due to normal street traffic. If the traffic is kept back at least 10 feet or a distance equal to the retained soil height from the subject walls, whichever is less, the traffic surcharge may be neglected. The project architect or structural engineer should determine the necessity of waterproofing any subterranean structure walls to reduce moisture infiltration.

Temporary shoring is generally not anticipated to be necessary based on current plans. However, temporary shoring recommendations may be provided should conditions arise to necessitate such.

6.10 Exterior Flatwork

To reduce the potential for cracking in exterior flatwork caused by minor movement of subgrade soils and typical concrete shrinkage, it is recommended that such flatwork be installed with crack-control joints at appropriate spacing as designed by the project architect, and measure a minimum 5.0 inches in thickness. Additionally, it is recommended that flatwork be installed with at least number 4 reinforcing bars on maximum 18-inch centers, each way, at above mid-height of slab but with proper concrete cover, or other reinforcement per the project consultants. Flatwork, which should be installed with crack control joints, includes driveways, sidewalks, and architectural features. Doweling of flatwork joints at critical pathways or similar could also be beneficial in resisting minor subgrade movements.

All subgrades should be prepared according to the earthwork recommendations previously given before placing concrete. Positive drainage should be established and maintained next to all flatwork. Subgrade materials shall be maintained at, or be elevated to, above optimum moisture content prior to concrete placement.

6.11 Vehicular Pavements

The proposed improvements are anticipated to include paved vehicle drive and parking areas. Presented in Table 6.11 are preliminary pavement sections utilizing laboratory determined "R"-Values and estimated Traffic Index Values. The upper 12 inches of subgrade and base materials beneath pavement areas should be compacted to 95% relative compaction in accordance with ASTM D1557, at no lower than two percent above the optimum moisture content.

TABLE 6.11
RECOMMENDED PAVEMENT THICKNESS

Traffic Area	Assumed Traffic Index	Preliminary Subgrade "R"-Value	Asphalt Pavements		Portland Cement Concrete Pavements On Subgrade Soils (inches)
			AC Thickness (inches)	Aggregate Base Thickness (inches)	
Light Drive Areas (Including Infrequently Used Fire Lanes)	6.0	5+	4.0	12.0	7.5
Automobile Parking Only Areas	4.5	5+	3.0	8.0	6.5

* Caltrans class 2 aggregate base or "Greenbook" Processed Miscellaneous Base
** Concrete should have a modulus of rupture of at least 600 psi

Following rough site grading, CTE recommends laboratory testing of representative at-grade soils for as-graded "R"-Value, and adjusting the proposed pavement sections, as necessary.

Asphalt paved areas should be designed, constructed and maintained in accordance with the recommendations of the Asphalt Institute or other widely recognized authority. Concrete paved areas should be designed and constructed in accordance with the recommendations of the American Concrete Institute or other widely recognized authority, particularly with regard to thickened edges, joints, and drainage. Typically, concrete pavements may be unreinforced provided expansion/contraction/construction joints are spaced no more than 24 times the pavement thickness, both ways, in nearly square patterns. However, doweling of pavement joints at critical pathways or similar could be beneficial in resisting minor subgrade movements. The Standard Specifications for Public Works construction ("Greenbook") or Caltrans Standard Specifications may be referenced for pavement materials specifications.

6.12 Drainage

Surface runoff should be collected and directed away from improvements by means of appropriate erosion-reducing devices and positive drainage that should be established around the proposed improvements. Positive drainage should be directed away from improvements and slope areas at a minimum gradient of two percent for a distance of at least five feet. However, the project civil engineer should evaluate the on-site drainage, and make necessary provisions to keep surface water from affecting the site.

Generally, CTE recommends against allowing water to infiltrate building pads or adjacent to slopes and improvements. However, it is understood that some agencies are encouraging the use of storm-water cleansing devices. A discussion of general infiltration feasibility is provided in Appendix F.

6.13 Slopes

Based on anticipated soil strength characteristics, minor slopes should be constructed at ratios of 2:1 (horizontal: vertical) or flatter. These slope inclinations should exhibit factors of safety greater than 1.5.

Although properly constructed slopes on this site should be grossly stable, the soils will be somewhat erodible. Therefore, runoff water should not be permitted to drain over the edges of slopes unless that water is confined to properly designed and constructed drainage facilities. Erosion-resistant vegetation should be maintained on the face of all slopes. Typically, soils along the top portion of a fill slope face will creep laterally. CTE recommends against building distress-sensitive hardscape improvements within five feet of slope crests.

6.14 Controlled Low Strength Materials (CLSM)

Controlled Low Strength Materials (CLSM) may be used in lieu of compacted soils below foundations, within building pads, and/or adjacent to retaining walls or other structures, provided the appropriate geotechnical recommendations are also incorporated. Minimum overexcavation depths recommended herein beneath bottom of footings, slabs, flatwork, and other areas may be applicable beneath CLSM if/where CLSM is to be used, and excavation bottoms should be observed by CTE prior to placement of CLSM. Prior to CLSM placement, the excavation should be free of debris, loose soil materials, and water. Once specific areas to utilize CLSM have been determined, CTE should review the locations to determine if additional recommendations are appropriate.

CLSM should consist of a minimum three-sack cement/sand slurry with a minimum 28-day compressive strength of 100 psi (or equal to or greater than the maximum allowable short term soil bearing pressure provided herein, whichever is higher) as determined by ASTM D4832. If re-excavation is anticipated, the compressive strength of CLSM should generally be limited to a maximum of 150 psi per ACI 229R-99. Where re-excavation is required, two-sack cement/sand slurry may generally be used to help limit the compressive strength. The allowable soils bearing pressure and coefficient of friction provided herein should still govern foundation design. CLSM may not be used in lieu of structural concrete where required by the structural engineer.

6.15 Plan Review

CTE should be authorized to review the project grading and foundation plans, and/or earthwork specifications as applicable, prior to commencement of earthwork to check for potential variations with the intent of the geotechnical recommendations.

6.16 Construction Observation

The recommendations provided in this report are based on preliminary design information for the proposed construction and the subsurface conditions observed in the explorations performed. The interpolated subsurface conditions should be checked in the field during construction to evaluate that conditions are as anticipated. Foundation recommendations may be revised upon completion of grading and as-built laboratory test results.

Recommendations provided in this report are based on the understanding and assumption that CTE will provide the observation and testing services for the project. Such services by any other party are at their sole risk. All earthwork should be observed and tested to check that grading activities have been performed according to the recommendations contained within this report. The project geotechnical engineer should evaluate all footing trenches before reinforcing steel and concrete placement.

7.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing, and geotechnical analysis presented in this report have been conducted according to current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction. The recommendations presented herein have been developed in order to reduce the potential adverse effects of expansive soils and differential soil settlement. However, even with the design and construction precautions provided, some post-construction movement and associated distress may occur.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years. CTE's conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, this office should be notified and additional recommendations, if required, will be provided.

The opportunity to be of service on this project is appreciated. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Respectfully submitted,
CONSTRUCTION TESTING & ENGINEERING, INC.

Dan T. Math, GE #2665
Principal Engineer

Jay F. Lynch, CEG #1890
Principal Engineering Geologist

Aaron J. Beeby, CEG #2603
Project Engineering Geologist

AJB/JFL/DTM:nri

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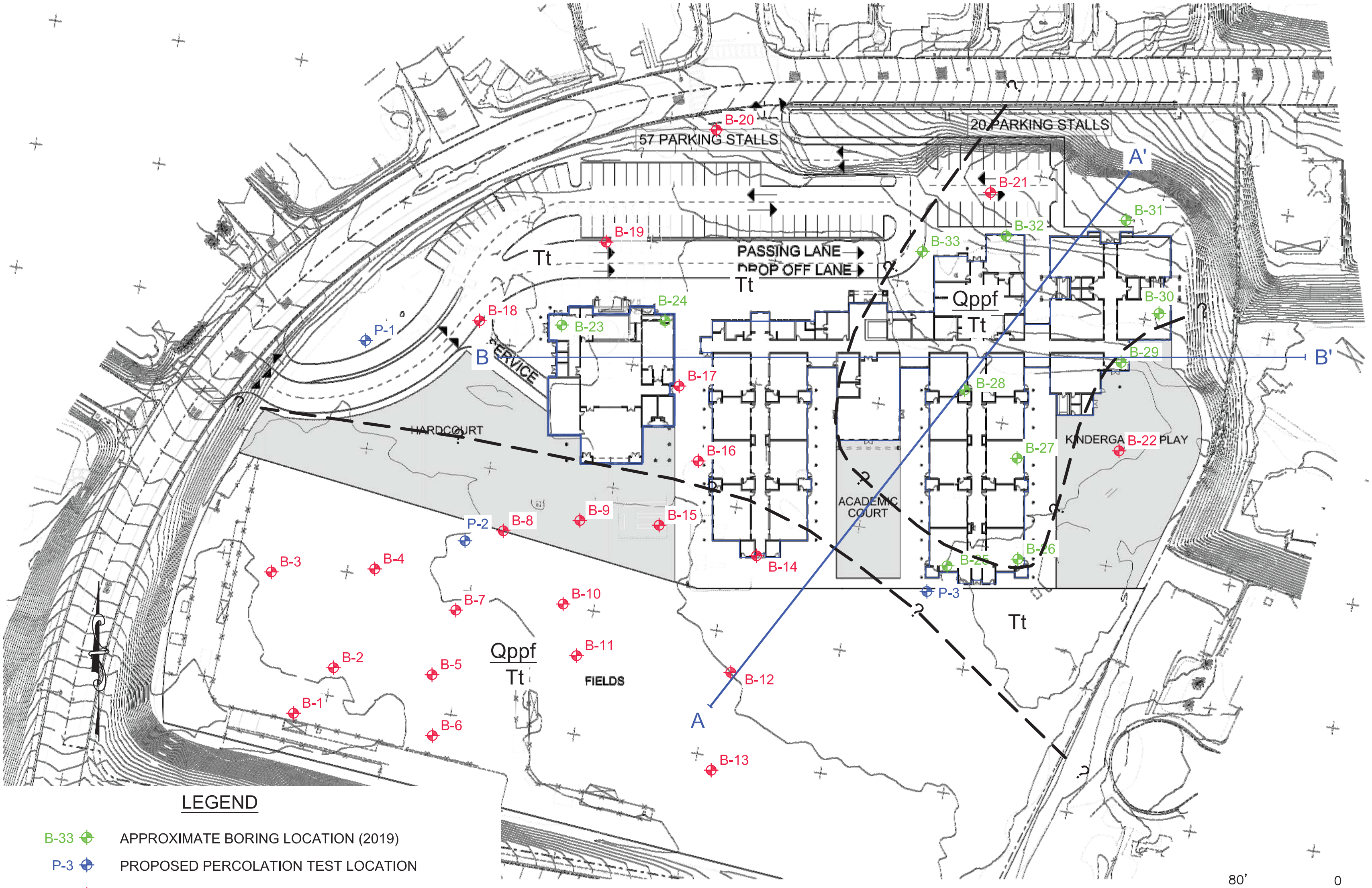
SITE INDEX MAP PROPOSED SOLANA VISTA MODERNIZATION 780 SANTA VICTORIA SOLANA BEACH, CALIFORNIA	SCALE: AS SHOWN	DATE: 5/19
	CTE JOB NO.: 10-14327G	FIGURE: 1



LEGEND

- B-33 APPROXIMATE BORING LOCATION (2019)
- P-3 PROPOSED PERCOLATION TEST LOCATION
- B-22 APPROXIMATE BORING LOCATION (2018)
- Qppf / Tt QUATERNARY PREVIOUSLY PLACED FILL OVER TERTIARY TORREY SANDSTONE

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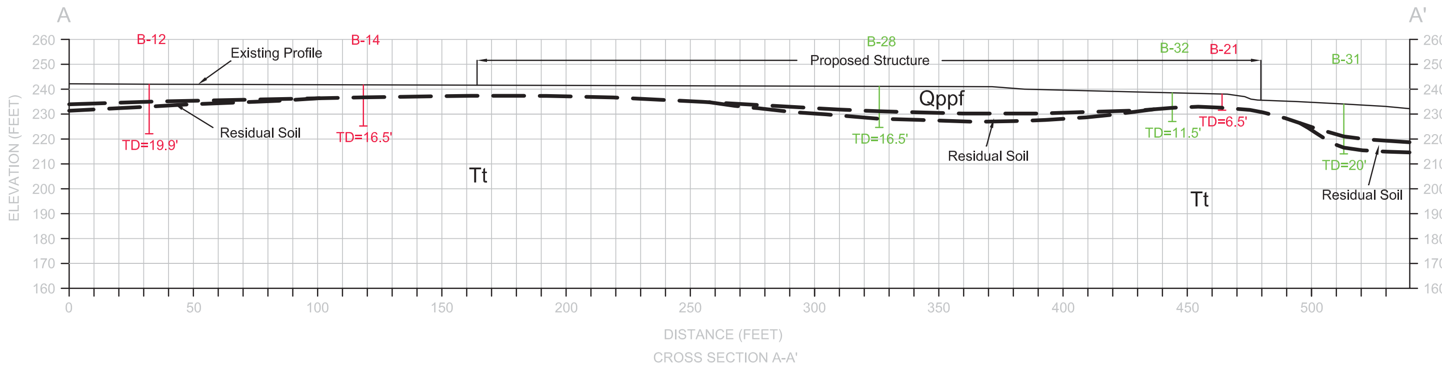
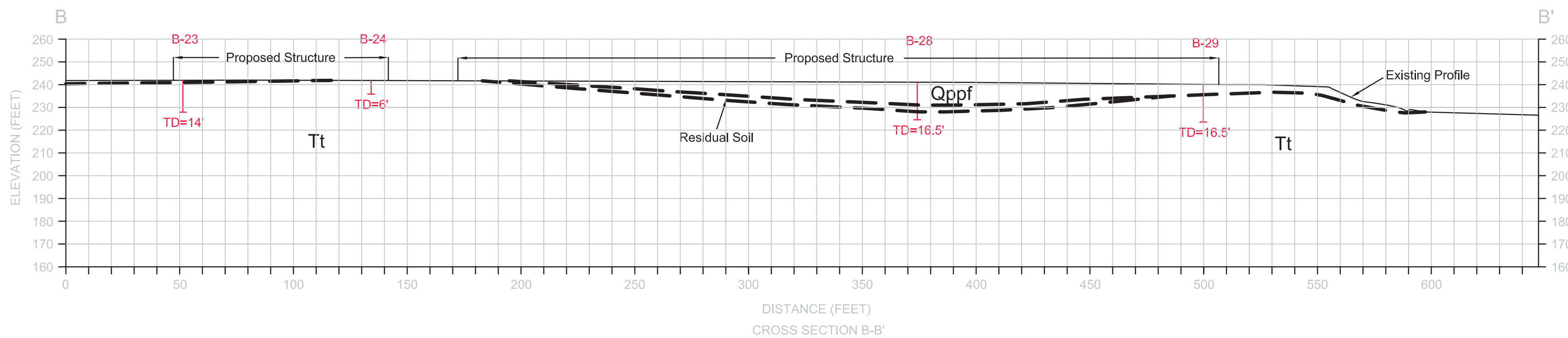
GEOLOGIC/EXPLORATION LOCATION MAP
PROPOSED SOLANA VISTA MODERNIZATION
780 SANTA VICTORIA
SOLANA BEACH, CALIFORNIA

CTE JOB NO: 10-14327G	
SCALE: 1" = 80'	
DATE: 5/19	FIGURE: 2

\\ESC_SERVER\Projects\10-14327G\New Report\Figure 2.dwg





LEGEND

Qppf QUATERNARY PREVIOUSLY PLACED FILL

Tt TERTIARY TORREY SANDSTONE

APPROXIMATE GEOLOGIC CONTACT

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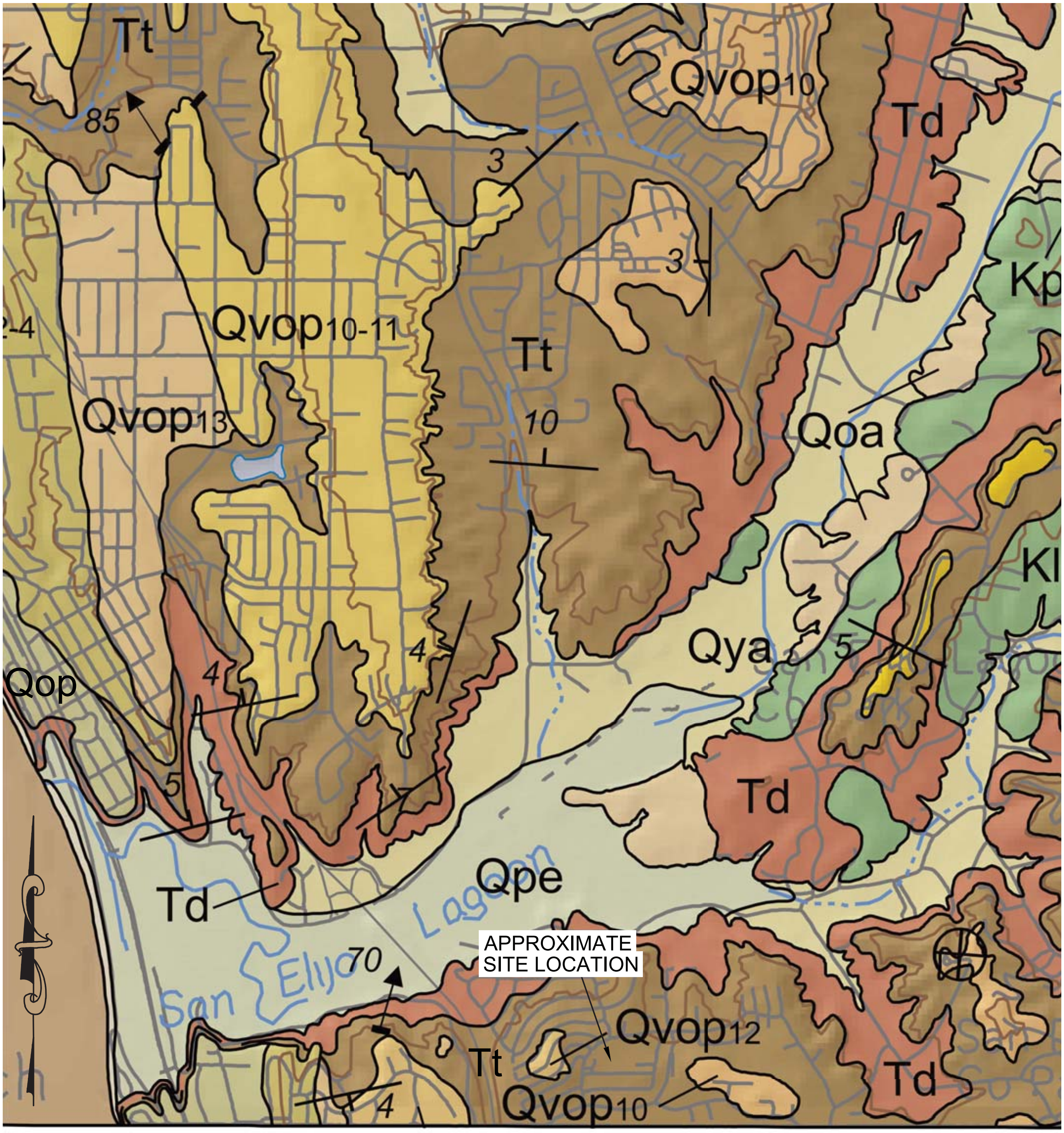
CROSS SECTIONS A–A' and B–B'
PROPOSED SOLANA VISTA MODERNIZATION
780 SANTA VICTORIA
SOLANA BEACH, CALIFORNIA

CTE JOB NO: 10-14327G
SCALE: 1" = 40'
DATE: 4/19
FIGURE: 2

\\ESC_SERVER\Projects\10-14327G\New Report\Figure 2B (Cross Sections A-A' and B-B').dwg



LEGEND

Qpe	Paralic Estuarine Deposits
Qya	Young Alluvial Flood Plain Deposits
Qoa	Old Alluvial Flood Plain Deposits
Qop	Old Paralic Deposits
Qvop	Very Old Paralic Deposits
Tt	Torrey Sandstone
Td	Del Mar Formation
Kl	Lusardi Formation

NOTE: Base Map by Kennedy and Tan, 2007, Geologic Map of the Oceanside 30' x 60' Quadrangle, California.

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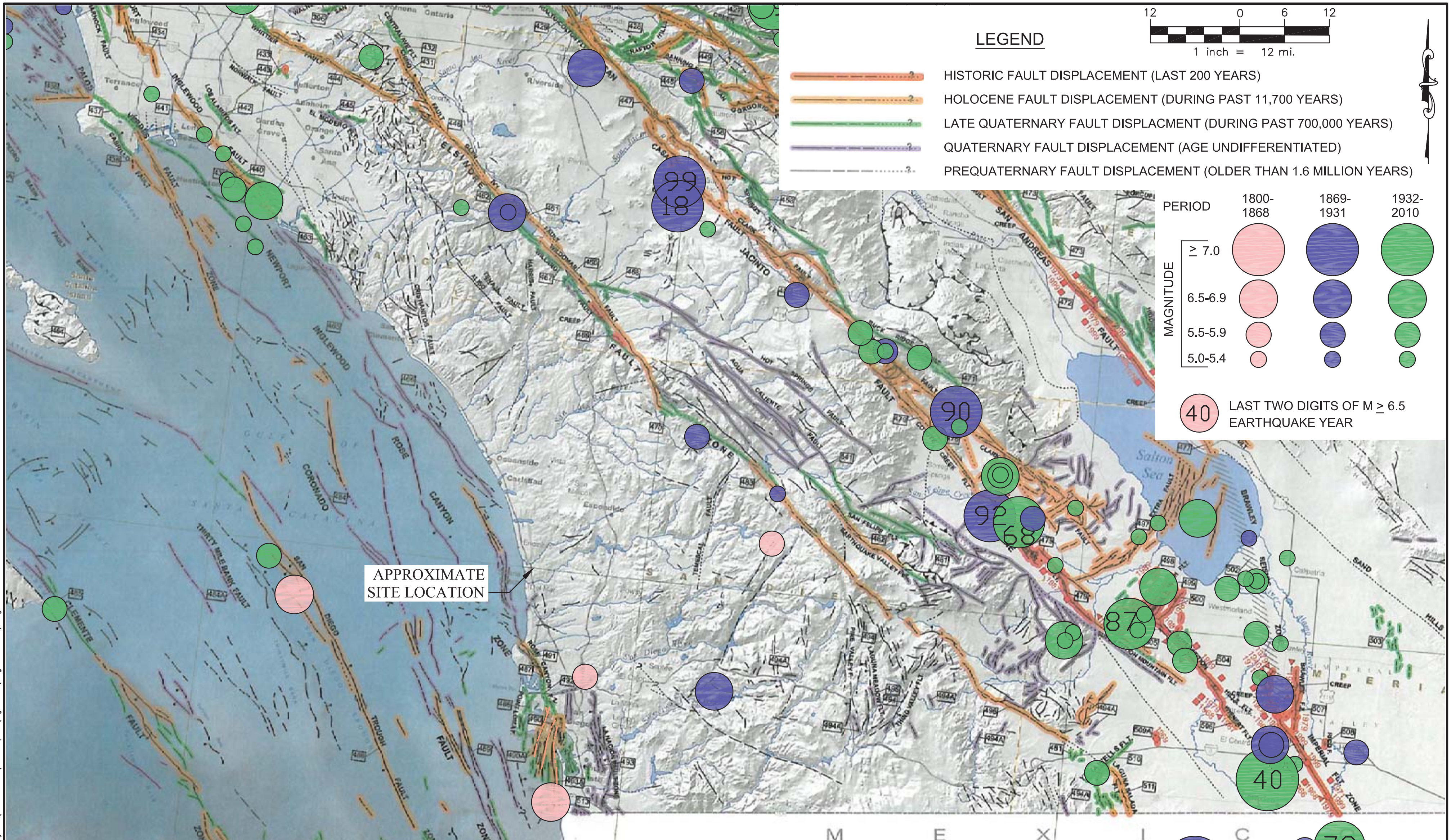
REGIONAL GEOLOGIC MAP

PROPOSED SOLANA VISTA MODERNIZATION
780 SANTA VICTORIA
SOLANA BEACH, CALIFORNIA

SCALE: 1"~4,000'	DATE: 5/19
CTE JOB NO.: 10-14327G	FIGURE: 3

\\Esc_server\projects\10-14327G\Figure 3 (Geo Map).dwg



NOTES: FAULT ACTIVITY MAP OF CALIFORNIA, 2010, CALIFORNIA GEOLOGIC DATA MAP SERIES MAP NO. 6;
EPICENTERS OF AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800-1999 ADAPTED AFTER TOPPOZADA, BRANUM, PETERSEN, HALLSTORM, CRAMER, AND REICHLE, 2000, CDMG MAP SHEET 49
REFERENCE FOR ADDITIONAL EXPLANATION; MODIFIED WITH CISN AND USGS SEISMIC MAPS

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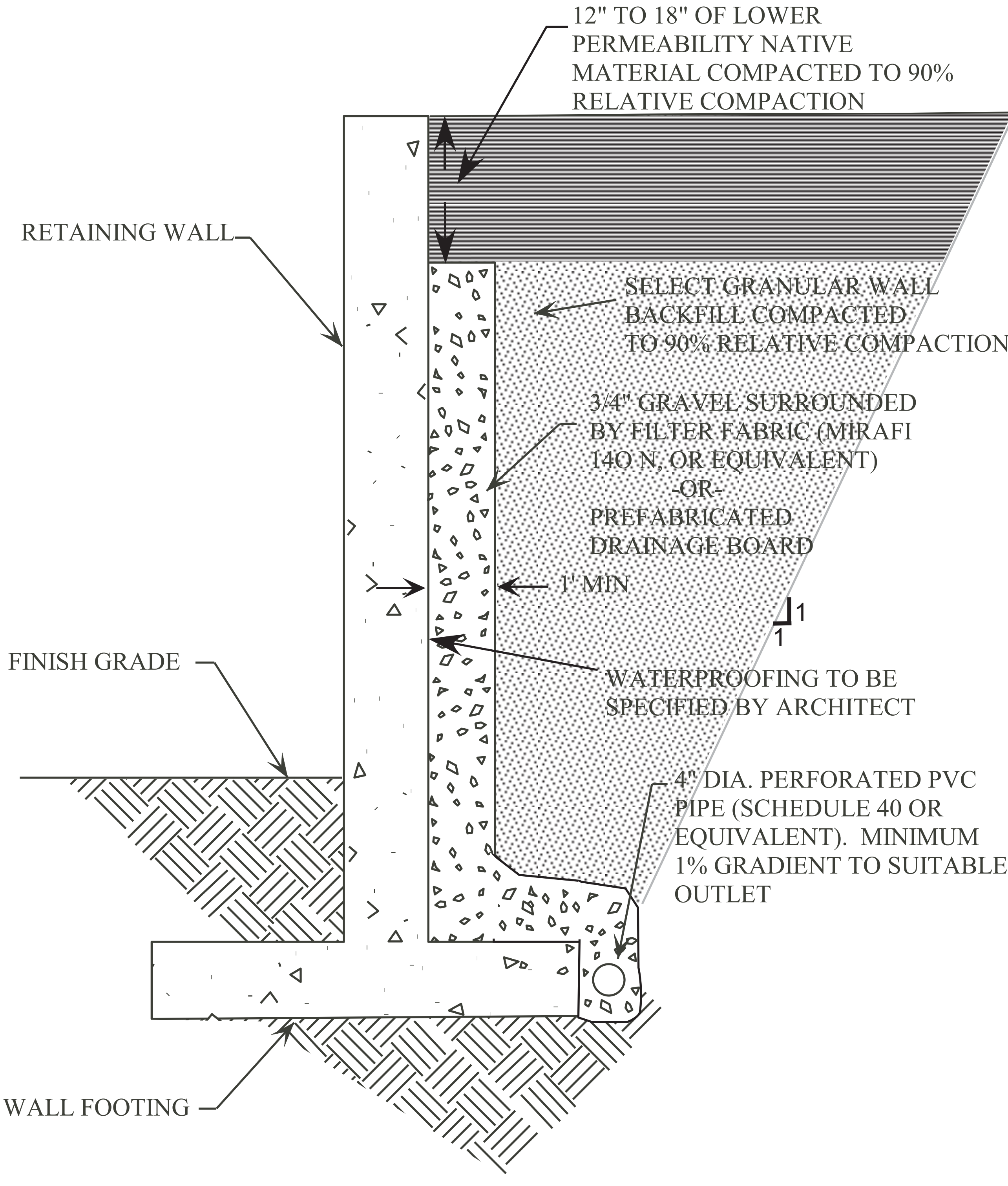
REGIONAL FAULT AND SEISMICITY MAP
PROPOSED SOLANA VISTA MODERNIZATION
780 SANTA VISTORIA
SOLANA BEACH, CALIFORNIA

CTE JOB NO: 10-14327G
SCALE: 1 inch = 12 miles
DATE: 5/19
FIGURE: 4



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RETAINING WALL DRAINAGE DETAIL

CTE JOB NO: 10-14327G	
SCALE: NO SCALE	
DATE: 07/19	FIGURE: 5

APPENDIX A

REFERENCES

REFERENCES

1. American Society for Civil Engineers, 2010, “Minimum Design Loads for Buildings and Other Structures,” ASCE/SEI 7-10.

2. ASTM, 2002, “Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort,” Volume 04.08

3. Blake, T.F., 2000, “EQFAULT,” Version 3.00b, Thomas F. Blake Computer Services and Software.

4. California Building Code, 2016, “California Code of Regulations, Title 24, Part 2, Volume 2 of 2,” California Building Standards Commission, published by ICBO, June.

5. California Department of Toxic Substance Control, October 2001, “Information Advisory Clean Fill Import.”

6. California Division of Mines and Geology, CD 2000-003 “Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region,” compiled by Martin and Ross.

7. California Emergency Management Agency, 2009, Tsunami Inundation Map for Emergency Planning, State of California ~ County of San Diego, Encinitas Quadrangle, Dated June, 2009.

8. Federal Emergency Management Agency, 2012, Flood Insurance Rate Map, San Diego County California and Incorporated Areas, Panels 1045 and 1063 of 2375.

9. Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R. L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., Rukstales,K.S.,2002, Documentation for the 2002 update of the National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2002-420, 39p

10. Hart, Earl W., Revised 2007, “Fault-Rupture Hazard Zones in California, Alquist Priolo, Special Studies Zones Act of 1972,” California Division of Mines and Geology, Special Publication 42.

11. Jennings, Charles W., 1994, “Fault Activity Map of California and Adjacent Areas” with Locations and Ages of Recent Volcanic Eruptions.

12. Kennedy, M.P. and Tan, S.S., 2007, “Geologic Map of the Oceanside 30’ x 60’ Quadrangle, California”, California Geological Survey, Map No. 2, Plate 1 of 2.

13. Reichle, M., Bodin, P., and Brune, J., 1985, The June 1985 San Diego Bay Earthquake swarm [abs.]: EOS, v. 66, no. 46, p.952.

14. Schoell Geritz Paul & Allard, Inc. 1971, Grading Plan, Solana Vista School, Sheet C-4, dated January 19.

15. SEAOC, Blue Book-Seismic Design Recommendations, “Seismically Induced Lateral Earth Pressures on Retaining Structures and Basement Walls,” Article 09.10.010, October 2013.

16. Seed, H.B., and R.V. Whitman, 1970, “Design of Earth Retaining Structures for Dynamic Loads,” in Proceedings, ASCE Specialty Conference on Lateral Stresses in the Ground and Design of Earth-Retaining Structures, pp. 103-147, Ithaca, New York: Cornell University.

17. Simons, R.S., 1979, Instrumental Seismicity of the San Diego area, 1934-1978, in Abbott, P.L. and Elliott, W.J., eds., Earthquakes and other perils, San Diego region: San Diego Association of Geologists, prepared for Geological Society of America field trip, November 1979, p.101-105.

18. Tan, Siang S., 1995 “Landslide Hazards in the Northern Part of The San Diego Metropolitan Area, San Diego County, California, Relative Landslide Susceptibility and Landslide Distribution Map, Rancho Santa Fe Quadrangle” and “Encinitas Quadrangle”, Map No. 4.

19. Wood, J.H. 1973, Earthquake-Induced Soil Pressures on Structures, Report EERL 73-05. Pasadena: California Institute of Technology.

20. Woodward-Clyde & Associates, 1971, Soil Compaction Report of Grading Performed, dated February 24.

APPENDIX B

EXPLORATION LOGS

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DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" 4 10 40 200

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride
Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed

PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded

PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

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PROJECT:	DRILLER:	SHEET: of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:
LOGGED BY:	SAMPLE METHOD:	ELEVATION:

BORING LEGEND

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								Block or Chunk Sample	
								Bulk Sample	
5									
								Standard Penetration Test	
10								Modified Split-Barrel Drive Sampler (Cal Sampler)	
								Thin Walled Army Corp. of Engineers Sample	
15								Groundwater Table	
								Soil Type or Classification Change	
20								? — ? — ? — ? — ? — ? — ? —	
								Formation Change [(Approximate boundaries queried (?)]	
25						"SM"		Quotes are placed around classifications where the soils exist in situ as bedrock	

FIGURE: BL2

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-1

Depth (Feet)	Sample: Bulk	Sample: Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SM		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, slightly moist, reddish brown, silty fine grained SAND.	
	X					SC		Medium dense, moist, grayish brown, clayey fine to medium grained SAND with trace gravel.	CHM
	X					CL		Medium stiff, moist, grayish brown, fine to medium grained sandy CLAY.	
5		Ring	3 7 6			SC		Medium dense, slightly moist, brown to grayish brown, clayey fine to medium graiend SAND, with silty sand and sandy clay interbeds.	
						CL		Very stiff, moist, dark gray, fine to medium grained sandy CLAY.	
10		SPT	8 13 18			SC		Dense, slightly moist, grayish brown, clayey fine to medium grained SAND.	CN
						SC/CL		Dense, moist, dark gray, clayey fine to medium grained SAND/ sandy CLAY.	
15		SPT	5 13 25						CN
		Ring	22 50/3"			"SM/SC"		**TERTIARY TORREY SANDSTONE:** Very dense, slightly moist, light gray, silty to clayey fine to medium grained SAND, oxidized nodules.	
20								Total Depth: 19.3' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/20/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-3

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown, fine to medium grained SAND.	
						CL		Hard, moist, olive brown, fine to medium grained sandy CLAY.	
5			8 19 33						
						SC		Medium dense, moist, olive gray, fine to medium grained clayey SAND.	
						SC		**RESIDUAL SOIL:** Medium dense, moist, dark gray, clayey fine to medium grained SAND.	
10			7 18 25			"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, reddish brown, clayy fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
15			19 30 40						GS
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
			25 40 47						
20								Total Depth: 20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/20/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-4

Depth (Feet)	Sample: Bulk	Sample Type: Driven	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown, fine to medium grained SAND.	
						CL		Stiff, moist, yellowish olive, fine to medium grained sandy CLAY.	
5						SC		Medium dense, moist, yellowish olive, clayey fine to medium grained SAND.	
		☒	10 12 19						CN
						CL		**RESIDUAL SOIL:** Very stiff, moist, dark brown, fine to medium grained sandy CLAY.	
10		▯	17 28 42						
						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, reddish brown, clayy fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, oxidized blebs, massive.	
15		▯	20 34 50/5"						
								Total Depth: 16.5' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/20/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-5

Depth (Feet)	Bulk Sample	Driven Sample Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X (0–5)					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown, fine to medium grained SAND.	
3						CL		Stiff, moist, brown, fine to medium grained sandy CLAY.	EI
5		Ring	5 6 7						GS
10		Ring	4 4 8						AL
13						SC		**RESIDUAL SOIL:** Medium dense, moist, dark brown, clayey fine to medium grained SAND.	
15		SPT	4 7 22						
17						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, reddish brown, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
18.5		Ring	18 18 19						
20								Total Depth: 20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/20/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-6

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown, fine to medium grained SAND.	
						CL		Stiff, moist, brown, fine to medium grained sandy CLAY.	
5			6 5 5						
						SC		Medium dense, moist, olive gray, clayey fine to medium grained SAND.	
10			10 10 15						
15			11 13 9					Minor wood fragments	
						SC		**RESIDUAL SOIL:** Medium dense, moist, dark gray, clayey fine to medium grained SAND.	
			13 21 30			"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, olive gray, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
20								Total Depth: 20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/20/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-7

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown, fine to medium grained SAND.	
5		X	7 5 6						
						CL		Stiff, moist, yellowish gray, fine to medium grained sandy CLAY.	
10		X	12 10 9			SC		**RESIDUAL SOIL:** Medium dense, moist, dark gray, clayey fine to medium grained SAND.	
						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, yellowish gray, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
15		X	11 17 23			"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
		X	23 39 50/5"						
20								Total Depth: 20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-8

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown to brown fine to medium grained SAND.	
						CL		Stiff, moist, brown, fine to medium grained sandy CLAY.	
5			18 28 30						
						SM		**RESIDUAL SOIL:** Medium dense, slightly moist, dark gray, silty fine grained SAND.	
						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, yellowish brown, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
10			22 46 50/6"						
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
15			20 30 50/6"						
								Total Depth: 20' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-9

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown, fine to medium grained SAND.	
						SM		Medium dense, moist, grayish brown, silty fine to medium grained SAND.	
5		X	6 5 6						
						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, light reddish gray, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
10		X	25 33 43						
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
15		X	23 16 23						
		X	22 27 50/5"						
20								Total Depth: 20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-10

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish brown, fine to medium grained SAND.	
5		X	7, 8, 7					Gravel	
						CL		Very stiff, moist, dark grayish brown, fine to medium grained sandy CLAY.	
						CL		**RESIDUAL SOIL:** Very stiff, moist, dark gray, fine to medium grained sandy CLAY.	
10		X	7, 10, 12						
						"CL"		**TERTIARY TORREY SANDSTONE:** Very stiff, moist, reddish gray, fine to medium grained sandy CLAYSTONE, oxidized, severely weathered.	
						"SC"		Very dense, slightly moist, reddish gray, clayey fine to medium grained SANDSTONE with trace gravel, oxidized, severely weathered.	
15		X	22, 26, 38						
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, oxidized blebs, massive.	
		X	25, 46, 50/3"						
20								Total Depth: 20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-11

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish gray, fine to medium grained SAND.	
5		Ring	7 9 7						
						CL		Very stiff, moist, grayish broan, fine to medium grained SAND.	
						CL		**RESIDUAL SOIL:** Very stiff, moist, dark brown, fine to medium grained sandy CLAY.	
10		SPT	8 15 21						CN
						"CL"		**TERTIARY TORREY SANDSTONE:** Very stiff, moist, reddish olive, fine to medium grained sandy CLAYSTONE, oxidized mottling, carbonate nodules.	
15		Ring	7 11 18						AL
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
		Ring	24 46 50/4"						
20								Total Depth: 20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-12

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish gray, fine to medium grained SAND.	
4						CL		Very stiff, moist, dark brown, fine to medium grained sandy CLAY.	
5		ring	4 5 12						
7						CL		**RESIDUAL SOIL:** Very stiff, moist, grayish brown, fine to medium grained sandy CLAY.	
9						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, slightly moist, reddish gray, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
10		ring	12 15 21						
13								Gravel	
15		ring	42 44 42						
18		ring	20 36 50/5"						
20								Total Depth: 19.9' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-13

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, yellowish gray, fine to medium grained SAND.	
5		Ring	5 9 11						
						CL		Very stiff, moist, yellowish gray, fine to medium grained sandy CLAY.	
						"SC"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, reddish gray, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
10		SPT	25 45 50/3"						
								Gravel	
15		Ring	9 12 16					Becomes medium dense	
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
		Ring	21 36 50/3"						
20								Total Depth: 19.9' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~240 FEET

BORING: B-14

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, brown, fine to medium grained SAND.	
	X					CL		Stiff, moist, brown, fine to medium grained sandy CLAY.	EI, GS
5		ring	36 31 31			"SC"		**TERTIARY TORREY SANDSTONE:** Very dense, slightly moist, reddish gray, clayey fine to medium grained SANDSTONE, oxidized, severely weathered.	
10		ring	11 14 22						
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive. Gravel	
15		ring	18 25 32						
								Total Depth: 16.5' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~240 FEET

BORING: B-15

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, light reddish brown, clayey fine to medium grained SAND.	
						CL		Stiff, moist, grayish brown, fine to medium grained sandy CLAY,	
5			10 15 18			SC		**RESIDUAL SOIL:** Medium dense, moist, dark brown, clayey fine to medium grained SAND.	
						CL		Stiff, moist, dark gray, fine to medium grained sandy CLAY.	
						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, reddish gray, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
10			13 17 26						GS
								Gravel	
								Total Depth: 13.5' (Refusal on gravel) No Groundwater Encountered	
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~240 FEET

BORING: B-16

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, brown, fine to medium grained SAND.	
						SM		**RESIDUAL SOIL:** Medium dense, moist, dark brown, silty fine to medium grained SAND.	
						CL		Stiff, moist, dark brownish gray, fine to medium grained sandy CLAY.	
5		X	11 13 10			SC		Medium dense, moist, dark grayish brown, clayey fine to medium grained SAND.	
						"CL"		**TERTIARY TORREY SANDSTONE:** Dense, slightly moist, reddish brown, clayey fine to medium grained SANDSTONE with gravel, oxidized, severely weathered.	
10		X	20 25 30						AL
						"SC"		Very dense, slightly moist, reddish gray, clayey fine to medium grained SANDSTONE, oxidized, severely weathered.	
15		X	20 30 50/6"						
								Total Depth: 16.5' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-17

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-2" Base material: 2-4" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, light reddish brown, clayey fine to medium grained SAND.	
						CL		Stiff, moist, olive brown, fine to medium grained sandy CLAY with few sand layers.	
5			23 50/2"						
						"SC"		**TERTIARY TORREY SANDSTONE:** Dense, moist, reddish gray, clayey fine to medium grained SANDSTONE, oxidized, massive, severely weathered.	
10			19 36 50/5"						
						"SM"		Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
15			25 42 50/5"						
								Total Depth: 16.5' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-18

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SM/SC		Asphalt: 0-2" Base material: 2-5" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, yellowish brown, silty to clayey fine to medium grained SAND.	
						"SM"		**TERTIARY TORREY SANDSTONE:** Dense, moist, light gray, silty fine to medium grained SANDSTONE oxidized mottling, massive.	
5		▯	19 28 37						
								Total Depth: 6.5' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-19

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SM		Asphalt: 0-2" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, yellowish brown, silty fine to medium grained SAND with trace clay.	RV
	X	Ring	34 50/5"			"SM"		**TERTIARY TORREY SANDSTONE:** Dense, moist, light gray, silty fine to medium grained SANDSTONE oxidized mottling, massive.	
5								Total Depth: 5' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~233 FEET

BORING: B-20

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		Asphalt: 0-3" Base material: 3-7" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, yellowish brown, clayey fine to medium grained SAND.	
	X					SM		Medium dense, slightly moist, yellowish brown, fine to medium grained SAND with trace clay.	RV
	X					"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light gray, silty fine to medium grained SANDSTONE oxidized mottling, massive.	
5		X	40 42 50/2"						
								Total Depth: 6.2' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~235 FEET

BORING: B-21

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		Asphalt: 0-5" Base material: 5-11" **QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, olive brown, clayey fine to medium grained SAND.	
	X					CL		Stiff, moist, brownish gray, fine to medium grained sandy CLAY. Increased sand content	GS
5		X	6 7 8			"SC"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light gray, clayey fine to medium grained SANDSTONE oxidized mottling, massive.	GS
								Total Depth: 6.5' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	6/19/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~240 FEET

BORING: B-22

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, yellowish brown, clayey fine to medium	
	X					"SC"		**TERTIARY TORREY SANDSTONE:** Medium dense, moist, yellowish brown, clayey fine to medium grained SANDSTONE, oxidized, severely weathered.	
	X					SM		Dense, moist, light grayish brown, silty fine to medium grained SANDSTONE with trace clay, oxidized.	
5		▯	8 12 22						
10		▯	10 27 34					Becomes very dense	
								Total Depth: 11.5' No Groundwater Encountered	
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-23

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		Asphalt: 0-3" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, yellowish brown, clayey fine to medium	
	X					"SM"		**TERTIARY TORREY SANDSTONE:** Dense, slightly moist, light brown with orange mottling, silty fine to medium grained SANDSTONE, poorly cemented.	
	X	X	34 50/4"					Becomes very dense	
5									
								Trace clay	
								Becomes light gray	
10		X	24 36 50/5"						
15								Total Depth:14' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-24

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						"SM"		Asphalt: 0-3" **TERTIARY TORREY SANDSTONE:** Dense, slightly moist, light brown with orange mottling, silty fine to medium grained SANDSTONE, poorly cemented.	
								Trace clay	
								Becomes very dense	
5		✓	32 50/5"						
								Total Depth: 6' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-25

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-3" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, yellowish brown, clayey fine to medium	
						"SM"		**TERTIARY TORREY SANDSTONE:** Dense, slightly moist, light brown, silty fine to medium grained SANDSTONE, poorly cemented. Becomes very dense with trace clay	
5			21 50/5"						
10								Trace clay	
15								Total Depth:13' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-26

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Top Soil: 0-6"	
						"SM"		**TERTIARY TORREY SANDSTONE:** Dense, slightly moist, light brown, silty fine to medium grained SANDSTONE, poorly cemented. Becomes very dense with trace clay	
			28 50/5"						
5			18 23 28						
								Total Depth:6.5' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~240 FEET

BORING: B-27

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Top Soil: 0-6"	
						"SM"		**TERTIARY TORREY SANDSTONE:** Dense, moist, light brown, silty fine to medium grained SANDSTONE with trace clay. Becomes very dense with trace clay	
			14 20 23						
5								Total Depth:4.5' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-28

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-3" Base Material: 3-7" **QUATERNARY PREVIOUSLY PLACED FILL:** Very stiff, slightly moist, dark grayish brown, silty fine grained sandy CLAY. Becomes very stiff	
5		SPT	10 14 30			SC		Dense, slightly moist, grayish brown, clayey fine to medium grained SAND with trace subrounded gravel. Reduced clay content	
10		Ring	12 13 17			SM		**RESIDUAL SOIL:** Medium dense, slightly moist, reddish brown, silty fine grained SAND.	
						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light brown, silty fine to medium grained SANDSTONE.	
15		Ring	16 24 36						
								Total Depth:16.5' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

BORING: B-29

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC/CL		Asphalt: 0-2" Base Material: 2-5" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff to medium dense, moist, dark reddish to grayish brown, fine to medium grained SAND.	
						SC		Medium dense, moist, dark reddish brown, clayey fine to medium grained SAND.	
5		SPT	20 24 50/6"			"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, slightly moist, grayish brown with orange mottling, silty fine to medium grained SANDSTONE with trace clay and subrounded gravel.	
10		Ring	20 25 34						
15		Ring	21 30 28						
								Total Depth:16.5' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~238 FEET

BORING: B-30

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X (0–5)					SM		Asphalt: 0-2" Base Material: 2-5" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, slightly moist, light brown, silty fine to medium grained SAND with trace clay.	
5		Ring	6 7 7						
8						SM		**RESIDUAL SOIL:** Very dense, slightly moist, light grayish brown with orange mottling, silty fine grained SAND.	
10		Ring	18 22 50/4"						
12.5						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light brown, silty fine to medium grained SANDSTONE.	
15		Ring	50/2"						
								Total Depth:15.2' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~233 FEET

BORING: B-31

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								Asphalt: 0-5"	
						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, slightly moist, grayish brown, clayey fine to medium grained SAND.	
								Reduced sand content	
5		SPT	11 10 23						
								Becomes reddish brown	
						SM		Medium dense, slightly moist, dark gray, silty fine grained SAND.	
10		Ring	6 7 7						
						SM/SC		**RESIDUAL SOIL:** Dense, moist, light grayish brown with oxidized mottling, silty to clayey, fine to medium grained SAND	
15		Ring	12 18 24						
						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, slightly moist, light grayish brown with oxidized mottling, silty fine to medium grained SANDSTONE with trace clay.	
		Ring	20 28 20						
20								Total Depth:20' No Groundwater Encountered	
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~235 FEET

BORING: B-32

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SM/SC		Asphalt: 0-3" Base Material: 3-6" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, yellowish brown, silty to clayey fine to medium grained SAND.	
	X					SC		Dense, slightly ,moist, dark gray, clayey fine to medium grained SAND.	
5		Driven	4 14 20			CL		Stiff, moist, dark gray, fine to medium grained sandy CLAY.	
						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light brown, silty fine to medium grained SANDSTONE.	
10		Driven	20 27 23						
								Total Depth:11.5' No Groundwater Encountered	
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~236 FEET

BORING: B-33

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL		Asphalt: 0-3" Base Material: 3-6" **QUATERNARY PREVIOUSLY PLACED FILL:** Very stiff, moist, dark grayish brown, fine grained sandy CLAY.	
5		SPT	8 9 16			SM		Medium dense, light brown, silty fine to medium grained SAND.	
						SC		**RESIDUAL SOIL:** Medium dense, moist, grayish brown, clayey fine to medium grained SAND.	
10		Ring	8 8 14						
						CL		Very stiff, moist, grayish brown, fine to medium grained sandy CLAY.	
						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light brown, silty fine to medium grained SANDSTONE.	
15		Ring	3 23 36						
								Total Depth:16.5' No Groundwater Encountered	
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

PERCOLATION TEST: P-1

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SM		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, grayish brown, silty fine to mediunm grained SAND with trace gravel.	
						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light brown, silty fine to medium grained SANDSTONE with trace clay.	
								Total Depth:3' No Groundwater Encountered	
5									
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

PERCOLATION TEST: P-2

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC/CL		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense or very stiff, slightly moist, grayish brown, clayey fine grained SAND/ sandy CLAY.	
						SC		Medium dense, moist, grayish brown, clayey fine grained SAND.	
						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light brown, silty fine to medium grained SANDSTONE.	
5								Total Depth:4' No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	SOLANA VISTA MODERNIZATION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14327G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	4/9/2019
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~239 FEET

PERCOLATION TEST: P-3

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						"SM"		**TERTIARY TORREY SANDSTONE:** Very dense, moist, light brown, silty fine to medium grained SANDSTONE with trace clay.	
								Total Depth:3' No Groundwater Encountered	
5									
10									
15									
20									
25									

APPENDIX C

LABORATORY METHODS AND RESULTS

APPENDIX C
LABORATORY METHODS AND RESULTS

Laboratory Testing Program
Laboratory tests were performed on representative soil samples to detect their relative engineering properties. Tests were performed following test methods of the American Society for Testing Materials or other accepted standards. The following presents a brief description of the various test methods used.

Classification
Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D2487. The soil classifications are shown on the Exploration Logs in Appendix B.

Expansion Index
Expansion testing was performed on selected samples of the matrix of the on-site soils according to ASTM D 4829.

Resistance "R"-Value
The resistance "R"-value was determined by the California Materials Method No. 301 for representative subbase soils. Samples were prepared and exudation pressure and "R"-value determined. The graphically determined "R"- value at exudation pressure of 300 psi is the value used for pavement section calculation

Particle-Size Analysis
Particle-size analyses were performed on selected representative samples according to ASTM D 422.

Atterberg Limits
The procedure of ASTM D4518-84 was used to measure the liquid limit, plastic limit and plasticity index of representative samples.

Direct Shear
Direct shear tests were performed on either samples direct from the field or on samples recompacted to a specific density. Direct shear testing was performed in accordance with ASTM D 3080. The samples were inundated during shearing to represent adverse field conditions.

Consolidation
To assess their compressibility and volume change behavior when loaded and wetted, relatively undisturbed samples of representative samples from the investigation were subject to consolidation tests (ASTM D2435).

Chemical Analysis
Soil materials were collected with sterile sampling equipment and tested for Sulfate and Chloride content, pH, Corrosivity, and Resistivity.

IN-PLACE MOISTURE AND DENSITY

LOCATION	DEPTH (feet)	% MOISTURE	DRY DENSITY
B-1	10	14.0	112.2
B-1	15	16.7	107.1
B-4	5	14.7	108.0
B-11	10	17	111
B-28	5	14.9	108.5
B-29	5	7.2	119.5
B-31	5	9.8	118.4

EXPANSION INDEX TEST

ASTM D 4829

LOCATION	DEPTH (feet)	EXPANSION INDEX	EXPANSION POTENTIAL
B-5	0-5	17	VERY LOW
B-14	0-5	84	MEDIUM
B-28	0-5	69	MEDIUM

RESISTANCE "R"-VALUE

CALTEST 301

LOCATION	DEPTH (feet)	R-VALUE
B-19	0-5	11
B-20	0-5	7

SULFATE

LOCATION	DEPTH (feet)	RESULTS ppm
B-1	0-5	135.8
B-28	0-5	231

CHLORIDE

LOCATION	DEPTH (feet)	RESULTS ppm
B-1	0-5	72
B-28	0-5	3.3

p.H.

LOCATION	DEPTH (feet)	RESULTS
B-1	0-5	8.14
B-28	0-5	9.13

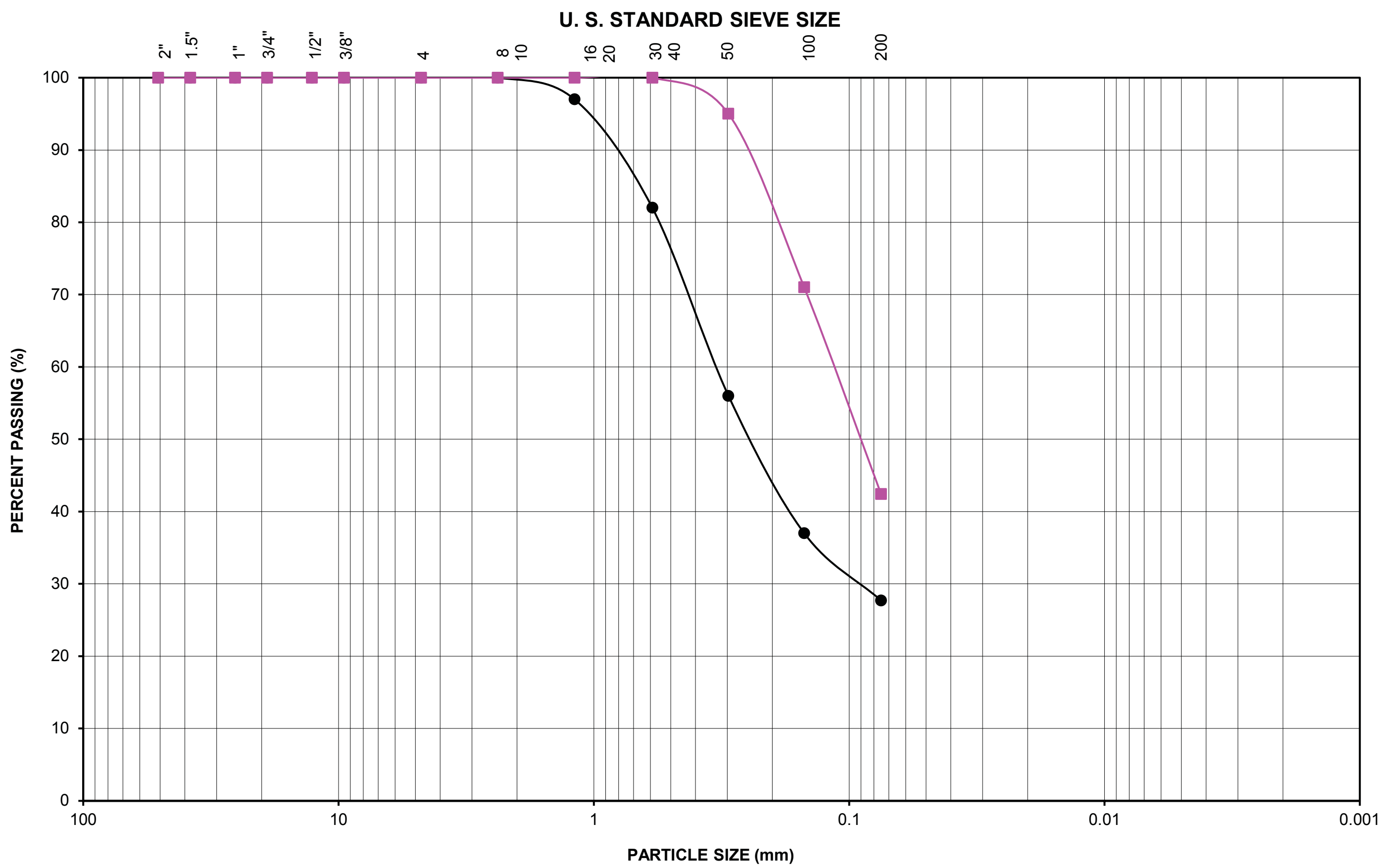
RESISTIVITY

CALIFORNIA TEST 424

LOCATION	DEPTH (feet)	RESULTS ohms-cm
B-1	0-5	1315
B-28	0-5	2670

ATTERBERG LIMITS

LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-5	10	35	24	CL
B-11	15	44	31	CL
B-16	10	36	24	CL



PARTICLE SIZE ANALYSIS

CTE INC. Construction Testing & Engineering, Inc.
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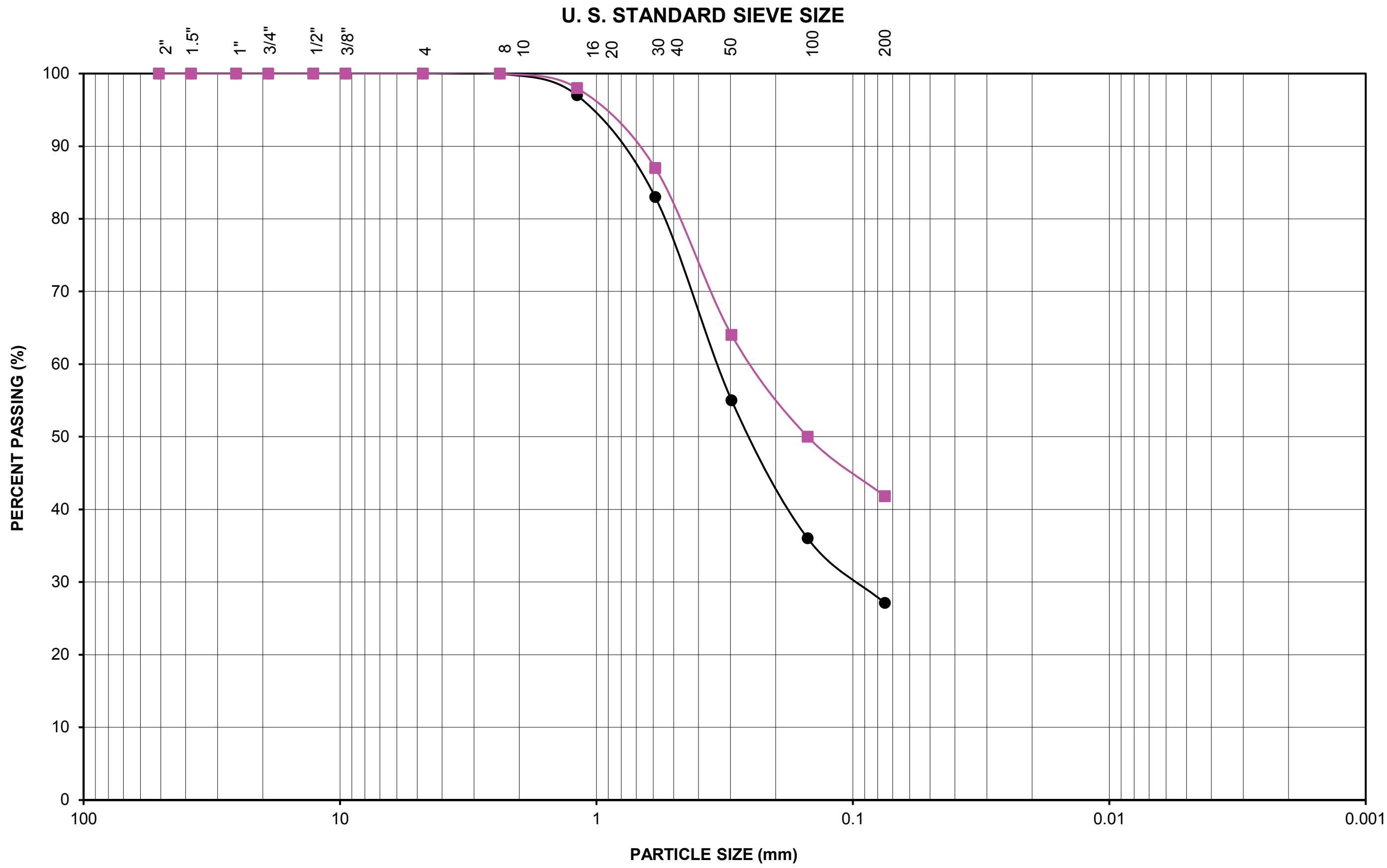
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-2	5	●	0	0	SC
B-3	15	■	0	0	SC
CTE JOB NUMBER:		10-14327G		FIGURE:	C-1



PARTICLE SIZE ANALYSIS

CTE INC. Construction Testing & Engineering, Inc.
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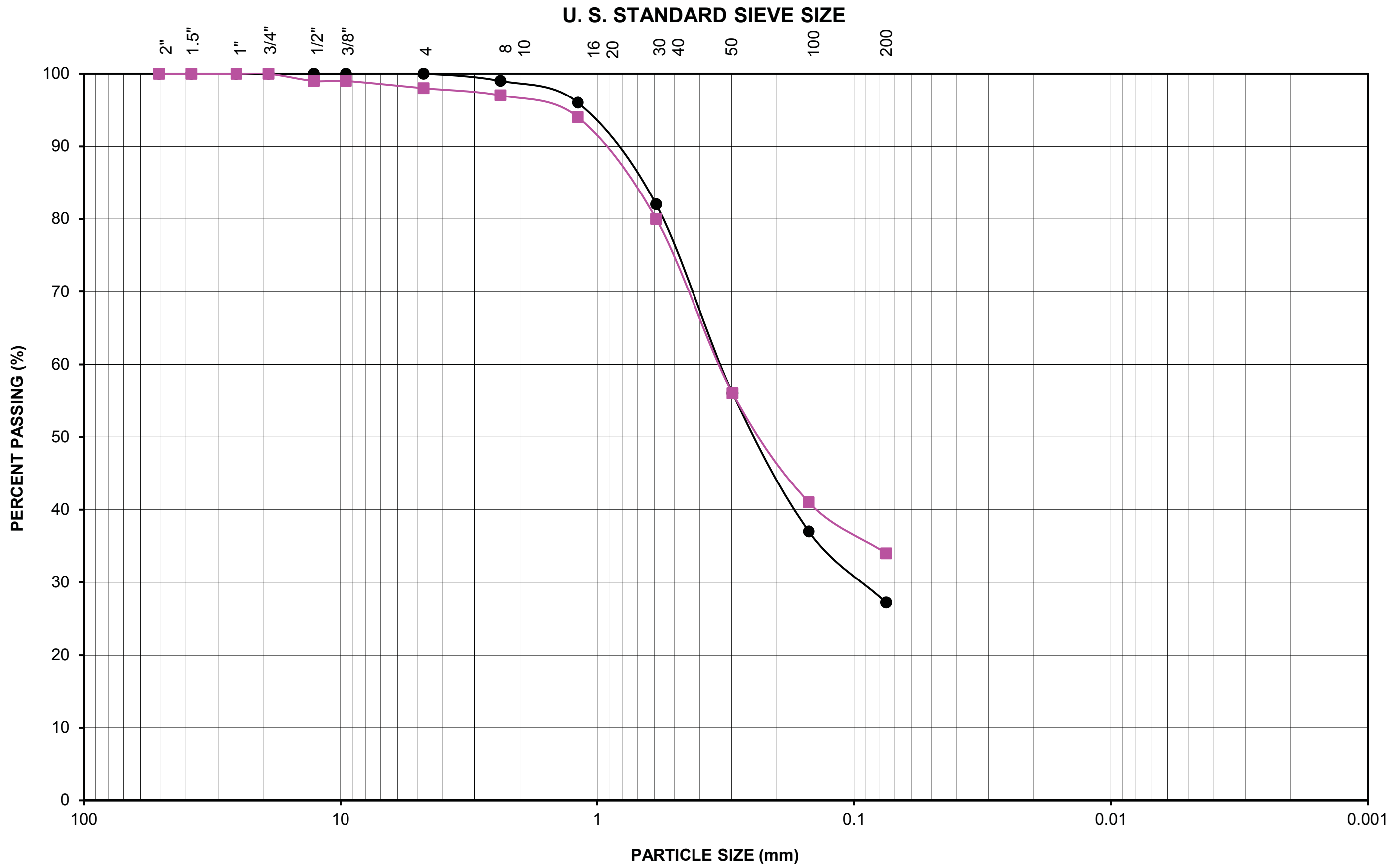
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-5	5	●	0	0	SC
B-14	0-5	■	0	0	SC
CTE JOB NUMBER:		10-14327G		FIGURE:	C-2



PARTICLE SIZE ANALYSIS

CTE INC.
Construction Testing & Engineering, Inc.
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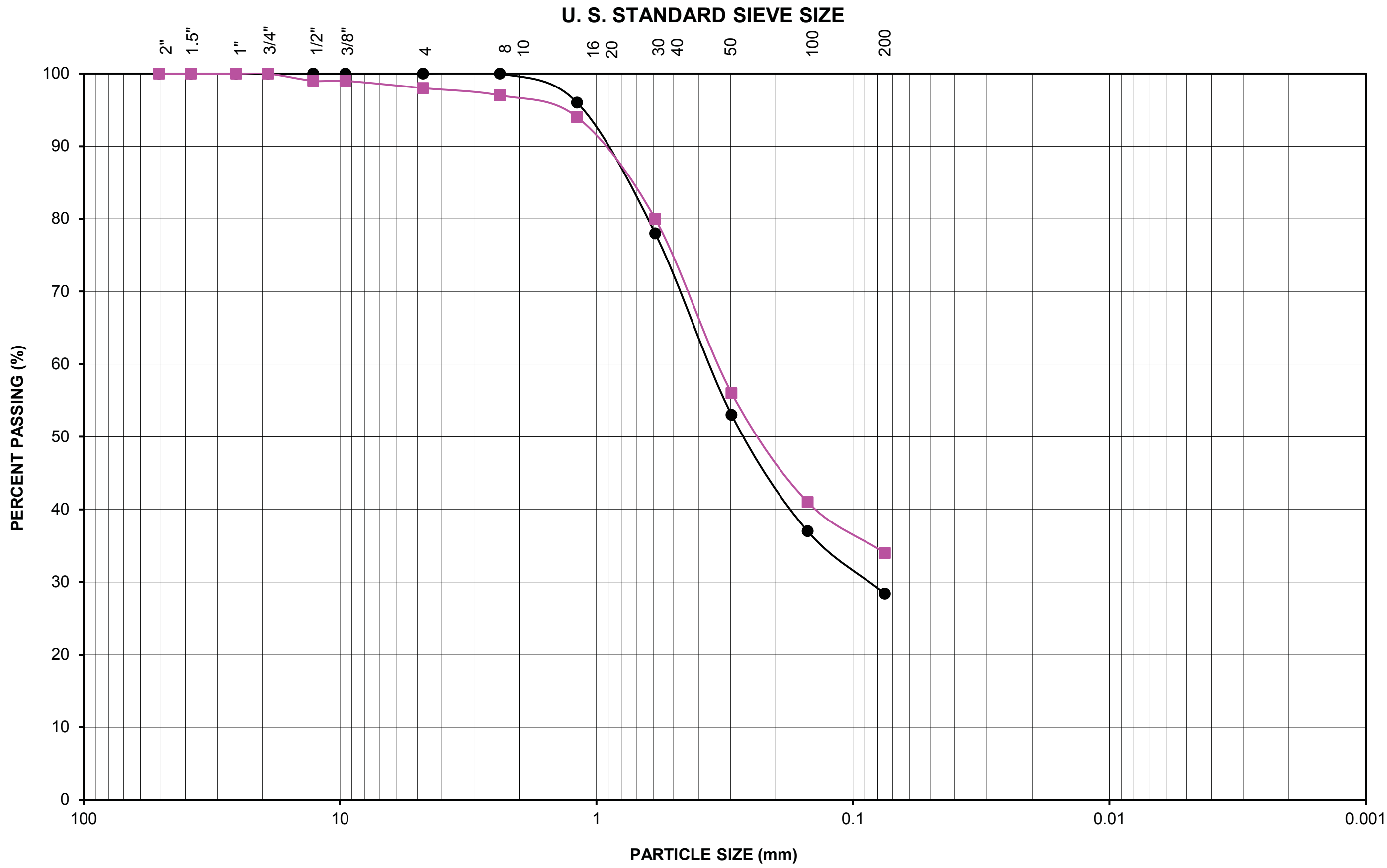
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-15	10	●	0	0	SC
B-21	0-5	■	0	0	SC
CTE JOB NUMBER:		10-14327G		FIGURE:	C-3



PARTICLE SIZE ANALYSIS

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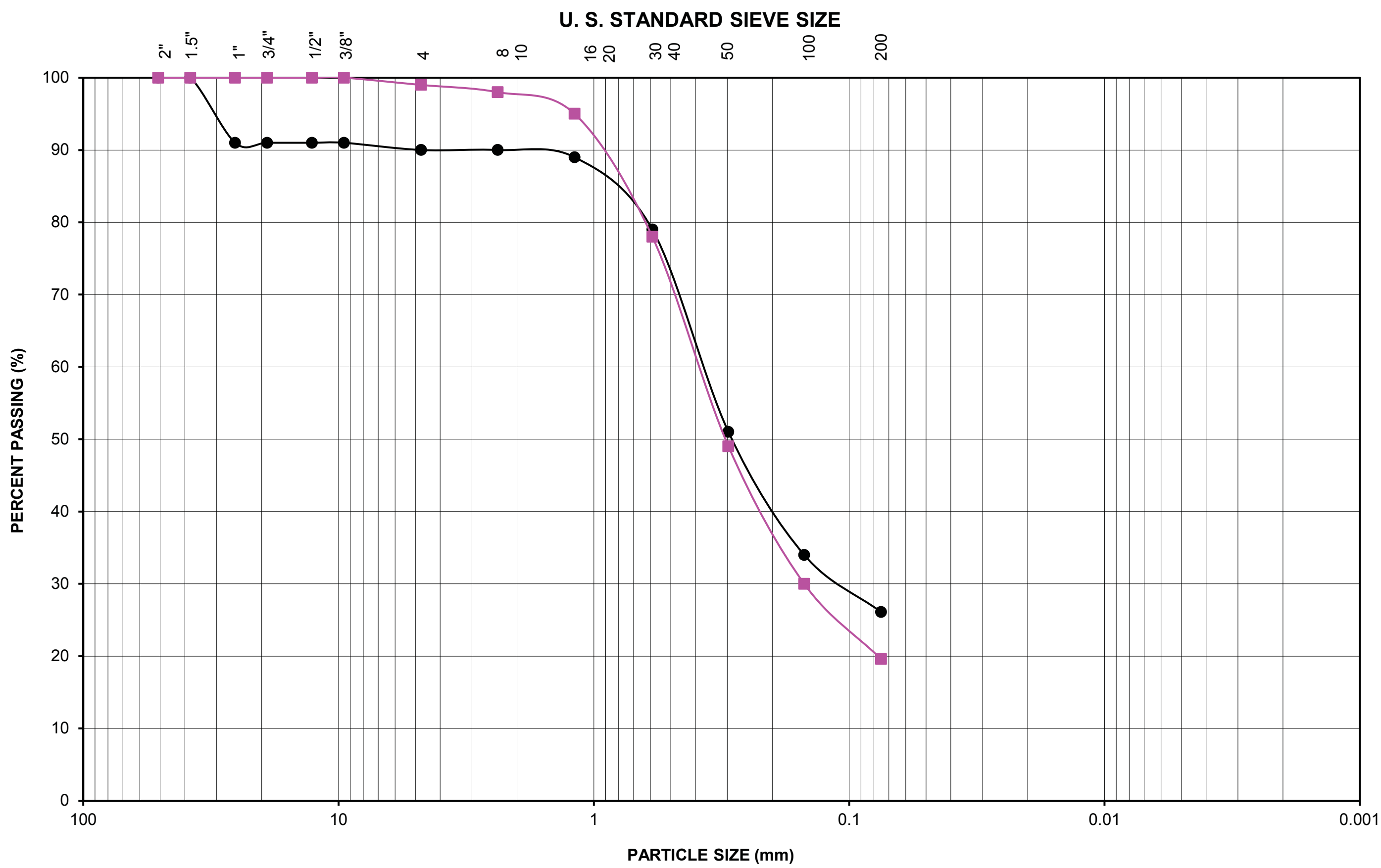
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-21	5	●	0	0	SC
B-28	0-5	■	0	0	SC
CTE JOB NUMBER:		10-14327G		FIGURE:	C-4



PARTICLE SIZE ANALYSIS

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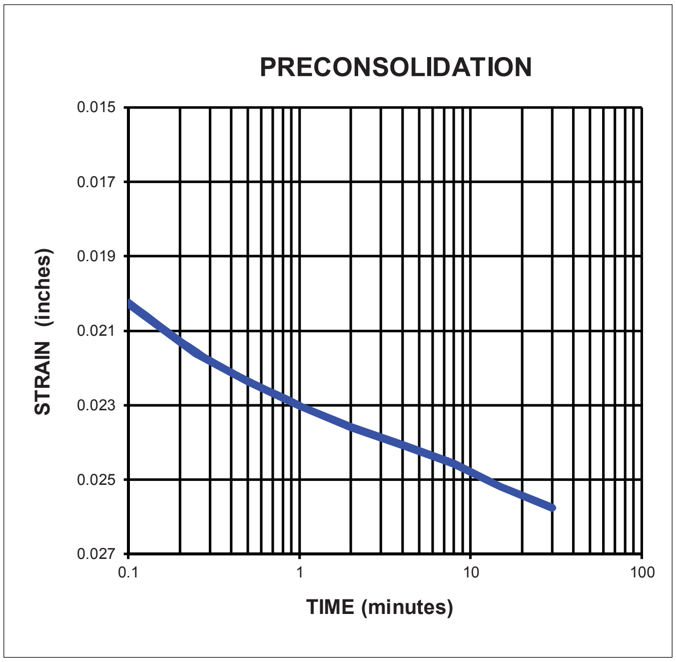
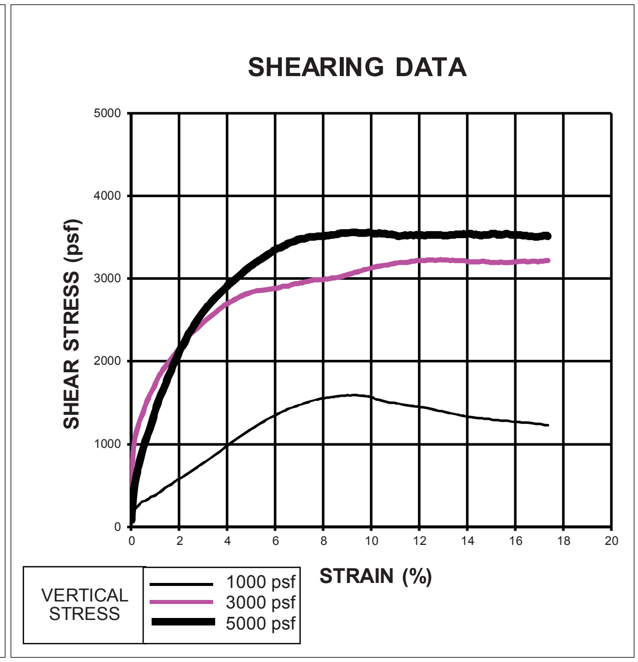
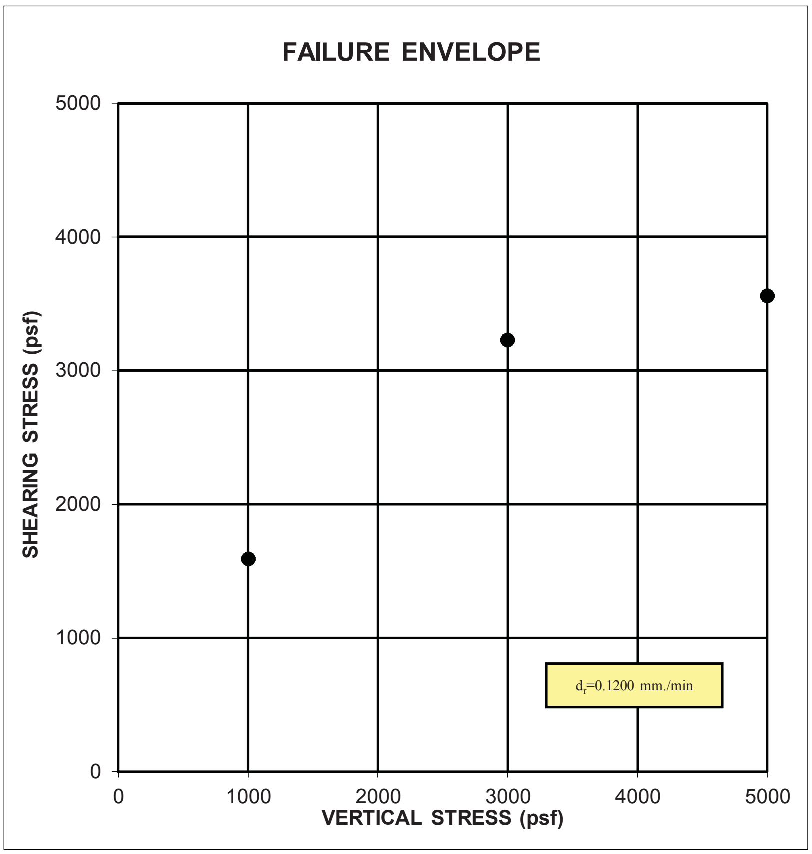
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-28	10	●	0	0	SC
B-31	10	■	0	0	SC
CTE JOB NUMBER:		10-14327G		FIGURE:	C-5

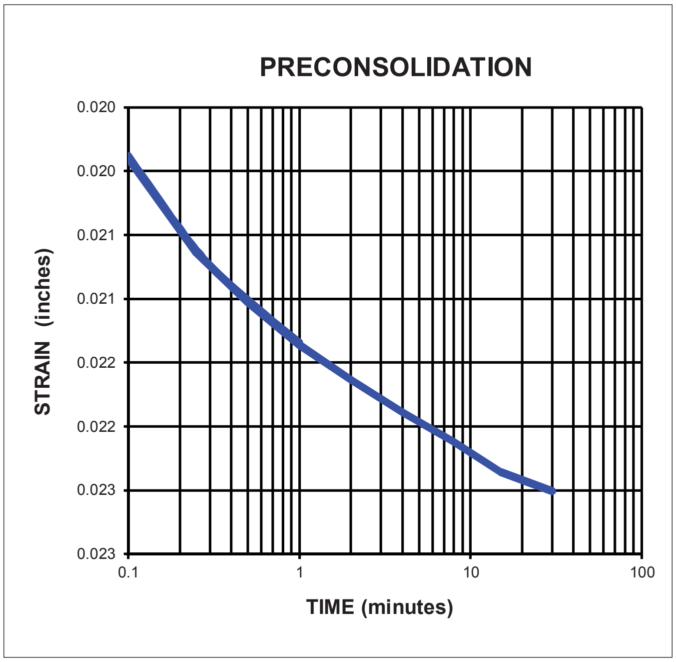


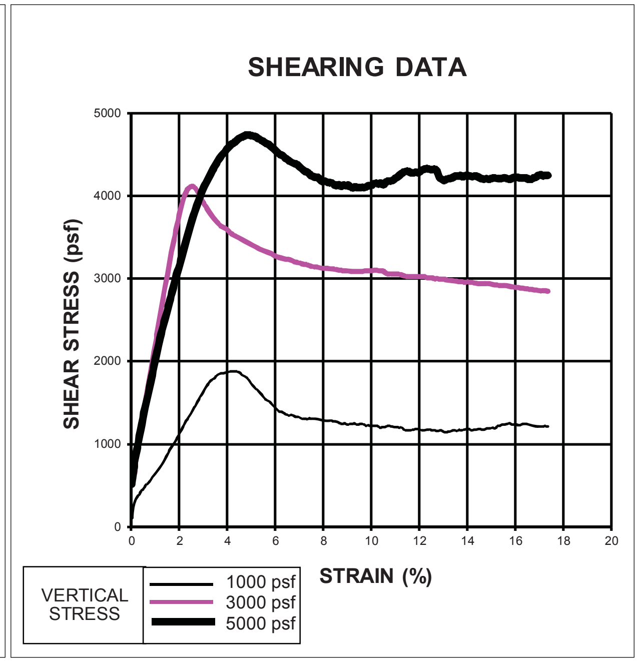


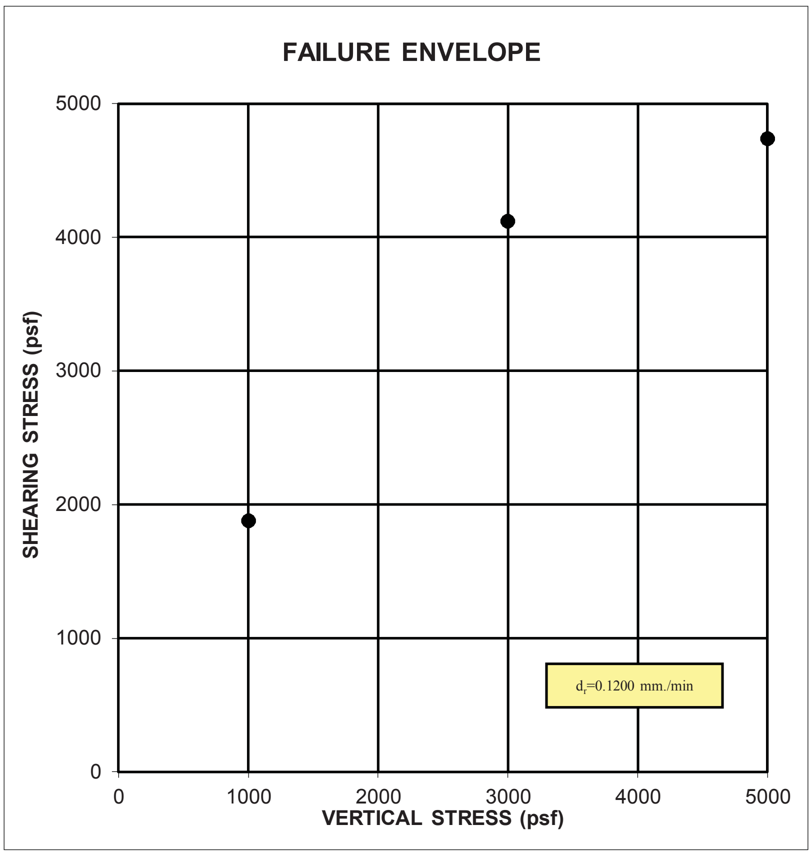


SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Solana Vista Mod / Reconstruct Project			Initial Dry Density (pcf):	108.5
Project Number:	10-14327	Sample Date:	4/9/2019	Initial Moisture (%):	14.9
Lab Number:	29449	Test Date:	4/26/2019	Final Moisture (%):	21.5
Sample Location:	B-28 @ 5'	Tested by:	JNC	Cohesion:	1310 psf
Sample Description:	Moderate Brown SM with CL			Angle Of Friction:	26.2

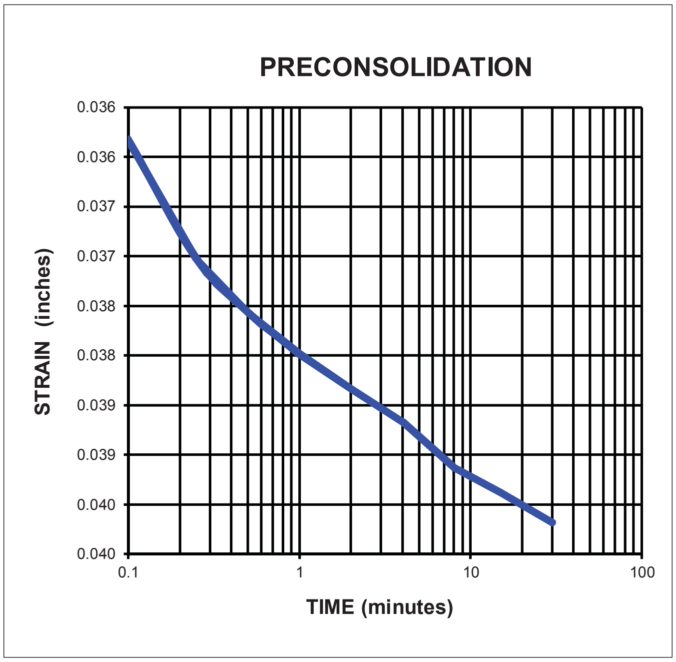


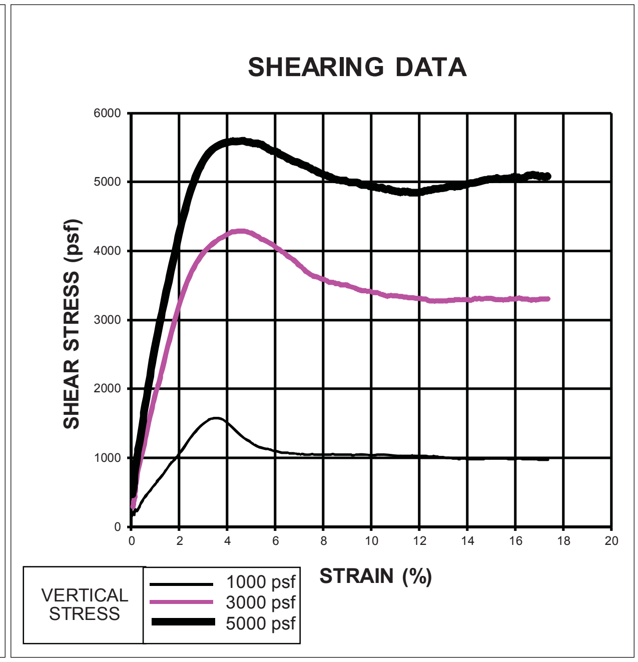


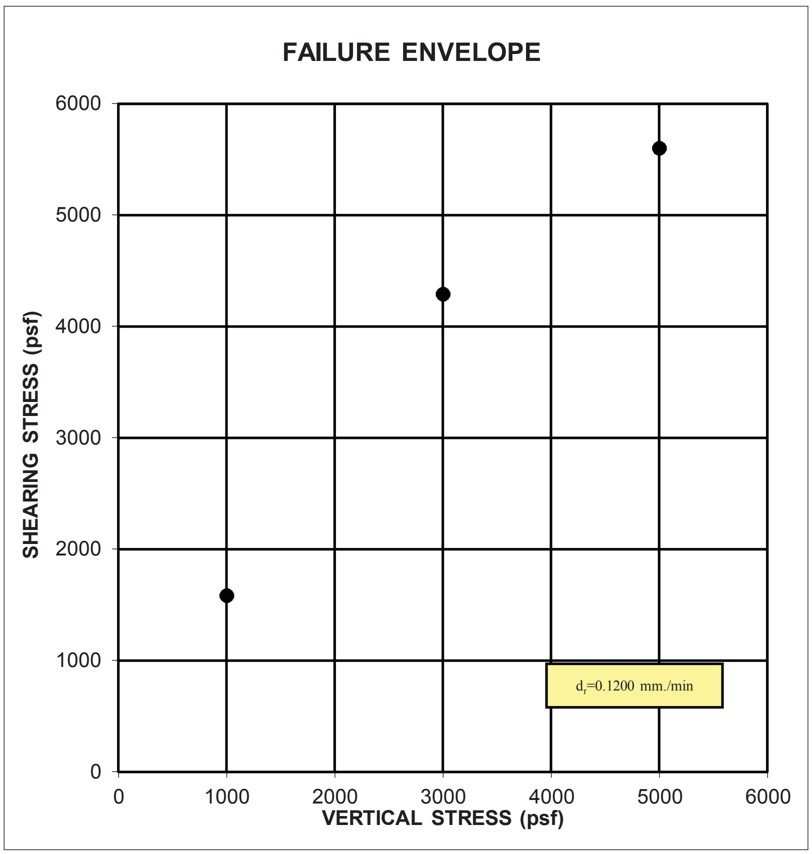


SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Solana Vista Mod / Reconstruct Project			Initial Dry Density (pcf):	119.5
Project Number:	10-14327	Sample Date:	4/9/2019	Initial Moisture (%):	7.2
Lab Number:	29449	Test Date:	5/11/2019	Final Moisture (%):	10.0
Sample Location:	B-29 @ 5'	Tested by:	JNC	Cohesion:	1430 psf
Sample Description:	Light Greyish Brown SM-SC			Angle Of Friction:	35.5

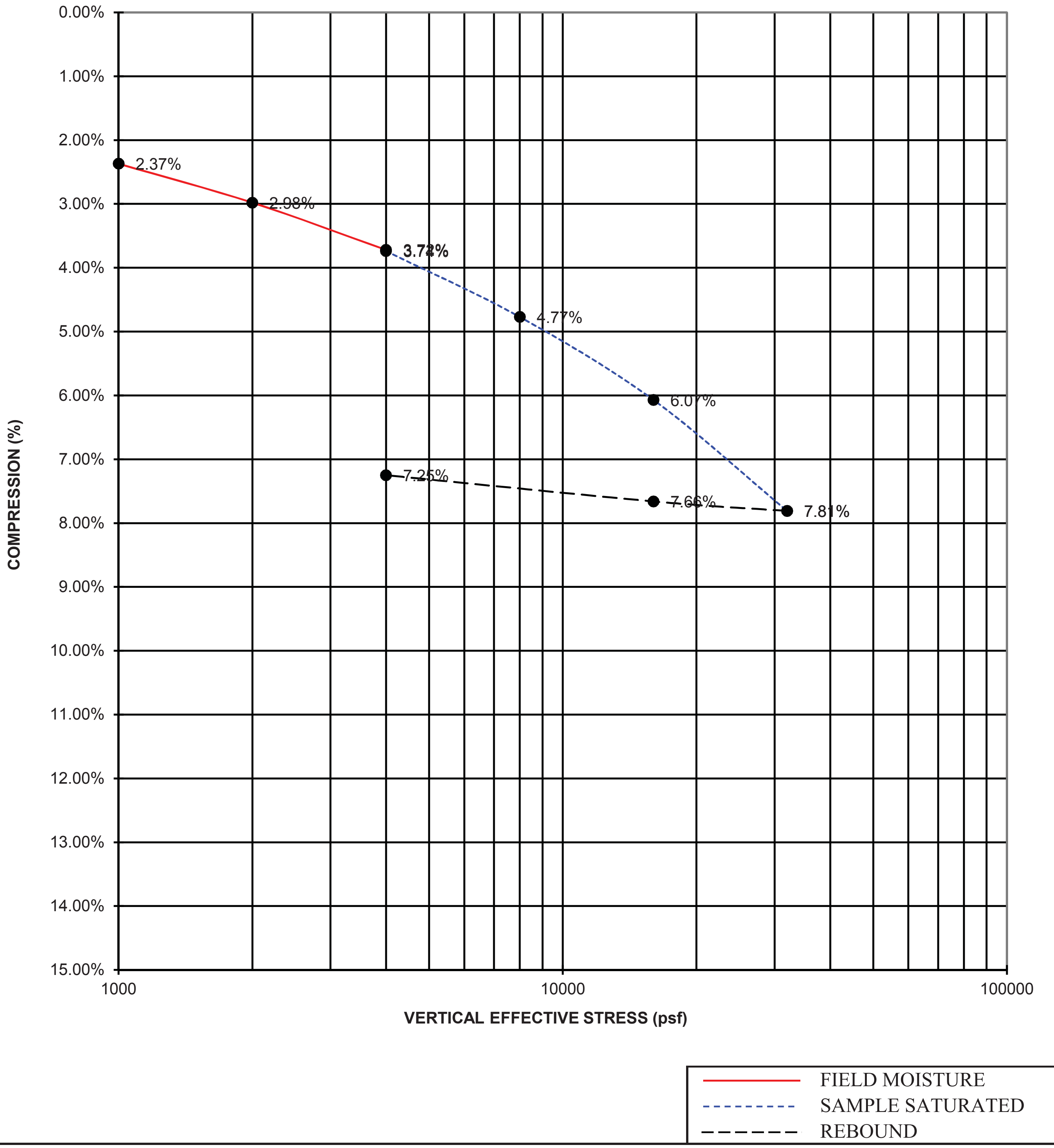






SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Solana Vista Mod / Reconstruct Project			Initial Dry Density (pcf):	118.4
Project Number:	10-14327	Sample Date:	4/9/2019	Initial Moisture (%):	9.8
Lab Number:	29449	Test Date:	5/7/2019	Final Moisture (%):	13.1
Sample Location:	B-31 @ 5'	Tested by:	JNC	Cohesion:	810 psf
Sample Description:	Light Yellowish Brown SM-SC			Angle Of Friction:	45.1

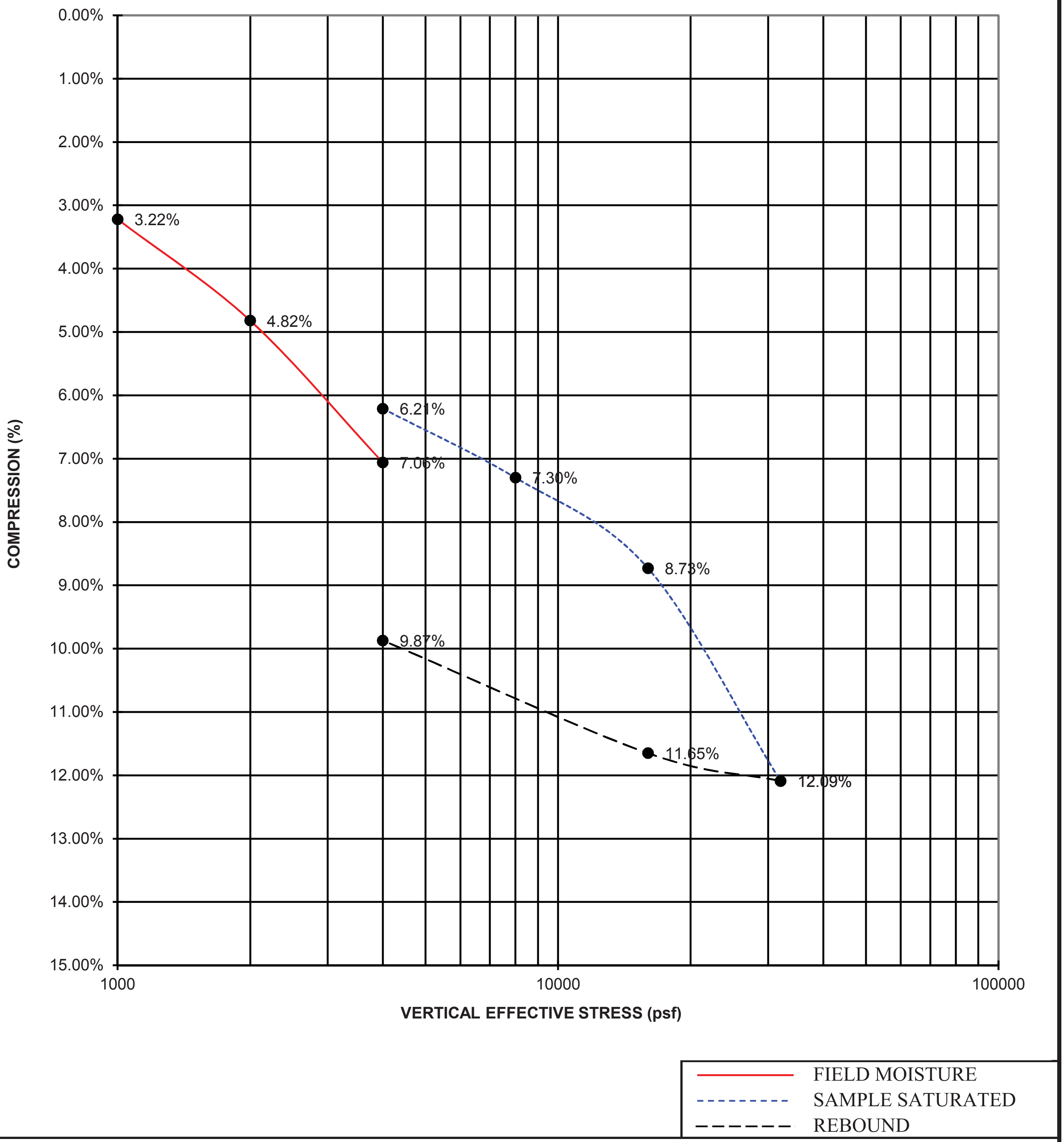


Consolidation Test ASTM D2435

Project Name:	Solana Vista Mod/Reconstruct Project				
Project Number:	10-14327G	Sample Date:	6/19/2018	Initial Moisture (%):	14.0
Lab Number:	28578	Test Date:	6/25/2018	Final Moisture (%):	12.5
Sample Location:	B-1 @ 10'	Tested By:	JNC	Initial Dry Density (PCF):	108.0
Sample Description:	Light grayish-brown SC			Final Dry Density (PCF):	121.0

Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

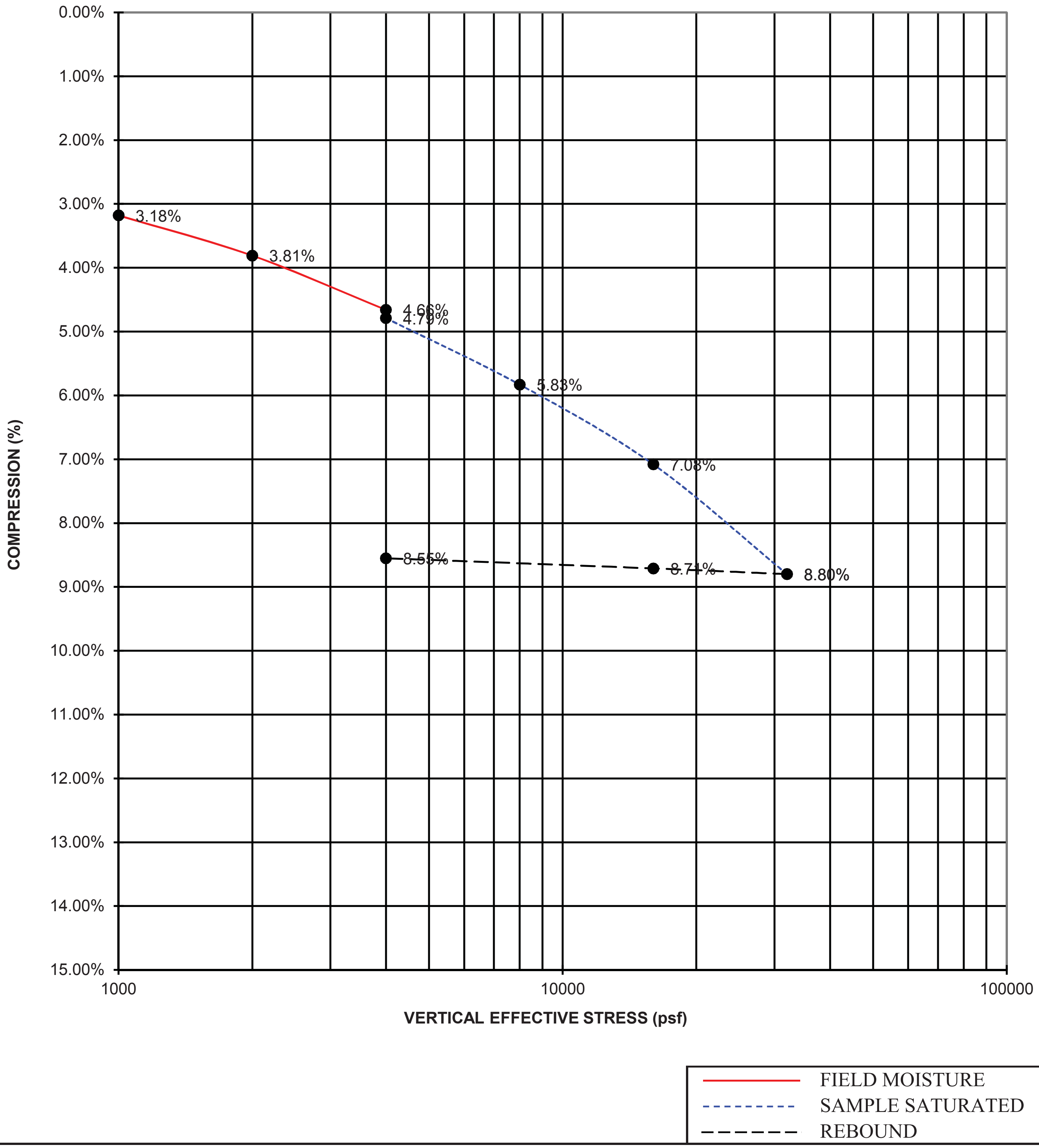


Consolidation Test ASTM D2435

Project Name:	Solana Vista Mod/Reconstruct Project		
Project Number: 10-14327G	Sample Date: 6/19/2018	Initial Moisture (%):	16.7
Lab Number: 28578	Test Date: 6/25/2018	Final Moisture (%):	16.4
Sample Location: B-1 @ 15'	Tested By: JNC	Initial Dry Density (PCF):	107.1
Sample Description: Dark gray SC		Final Dry Density (PCF):	118.9

Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Consolidation Test ASTM D2435

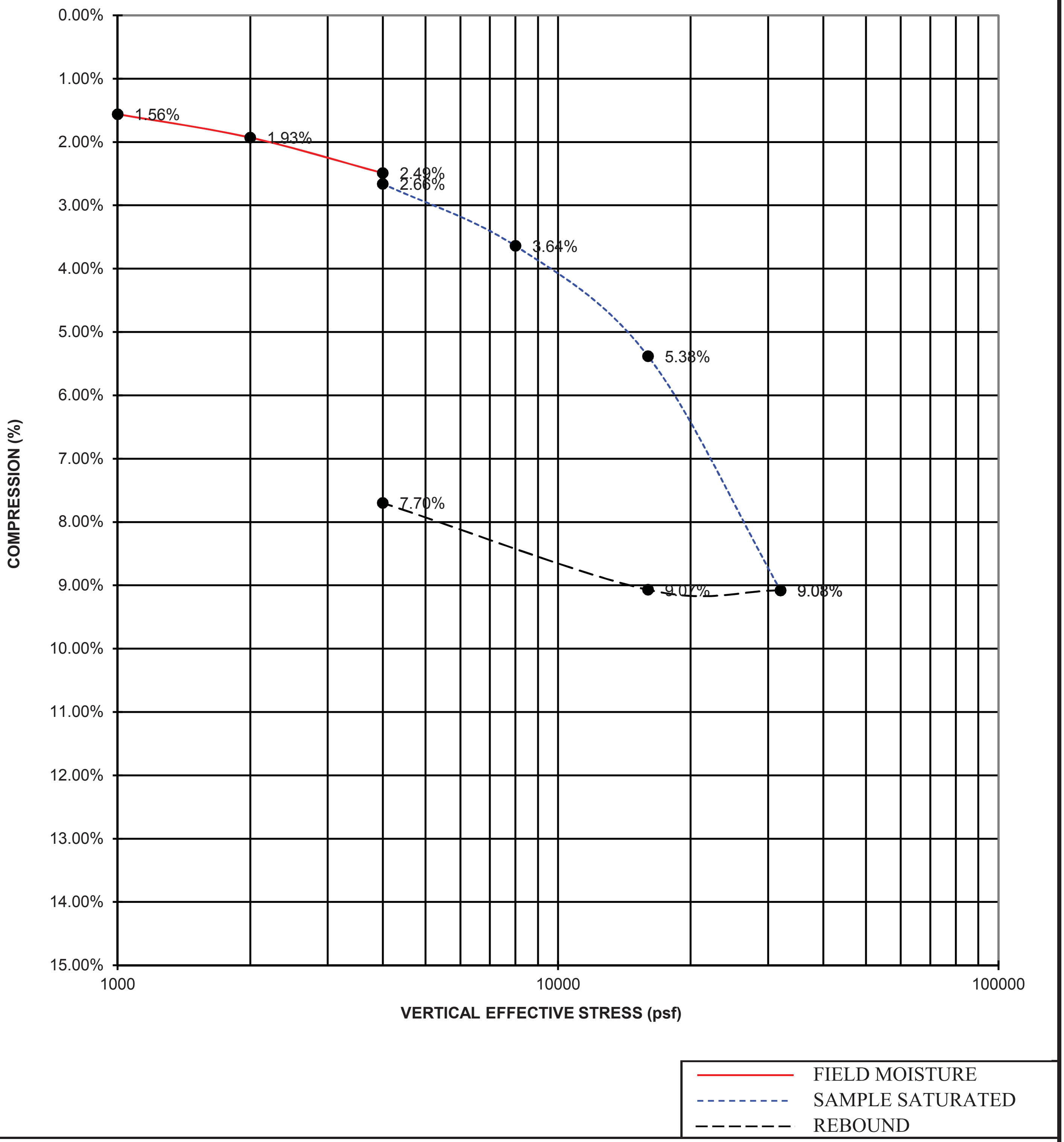
Project Name: Solana Vista Mod/Reconstruct Project

Project Number: 10-14327G
Sample Date: 6/19/2018
Lab Number: 28578
Test Date: 7/2/2018
Sample Location: B-4 @ 5'
Tested By: JNC
Sample Description: Light yellowish brown SC

Initial Moisture (%): 14.7
Final Moisture (%): 14.9
Initial Dry Density (PCF): 108.0
Final Dry Density (PCF): 118.0

Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Consolidation Test ASTM D2435

Project Name:	Solana Vista Mod/Reconstruct Project				
Project Number:	10-14327G	Sample Date:	6/19/2018	Initial Moisture (%):	17.0
Lab Number:	28578	Test Date:	7/5/2018	Final Moisture (%):	13.1
Sample Location:	B-11 @ 10'	Tested By:	JNC	Initial Dry Density (PCF):	111.0
Sample Description:	Dark brown SC/CL			Final Dry Density (PCF):	120.3

APPENDIX D

STANDARD SPECIFICATIONS FOR GRADING

Section 1 - General

Construction Testing & Engineering, Inc. presents the following standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications. Recommendations contained in the body of the previously presented soils report shall supersede the recommendations and or requirements as specified herein. The project geotechnical consultant shall interpret disputes arising out of interpretation of the recommendations contained in the soils report or specifications contained herein.

Section 2 - Responsibilities of Project Personnel

The geotechnical consultant should provide observation and testing services sufficient to general conformance with project specifications and standard grading practices. The geotechnical consultant should report any deviations to the client or his authorized representative.

The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the geotechnical consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

The Contractor is responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including, but not limited to, earth work in accordance with the project plans, specifications and controlling agency requirements.

Section 3 - Preconstruction Meeting

A preconstruction site meeting should be arranged by the owner and/or client and should include the grading contractor, design engineer, geotechnical consultant, owner's representative and representatives of the appropriate governing authorities.

Section 4 - Site Preparation

The client or contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, root of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the contractor from damage or injury.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the geotechnical consultant.

Section 5 - Site Protection

Protection of the site during the period of grading should be the responsibility of the contractor. Unless other provisions are made in writing and agreed upon among the concerned parties, completion of a portion of the project should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the geotechnical consultant, the client and the regulating agencies.

Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

Rain related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions as determined by the geotechnical consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the geotechnical consultant.

The contractor should be responsible for the stability of all temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant should not be considered to preclude requirements that are more restrictive by the regulating agencies. The contractor should provide during periods of extensive rainfall plastic sheeting to prevent unprotected slopes from becoming saturated and unstable. When deemed appropriate by the geotechnical consultant or governing agencies the contractor shall install checkdams, desilting basins, sand bags or other drainage control measures.

In relatively level areas and/or slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot; they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. If field conditions dictate, the geotechnical consultant may recommend other slope repair procedures.

Section 6 - Excavations

6.1 Unsuitable Materials

Materials that are unsuitable should be excavated under observation and recommendations of the geotechnical consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic compressible natural soils and fractured, weathered, soft bedrock and nonengineered or otherwise deleterious fill materials.

Material identified by the geotechnical consultant as unsatisfactory due to its moisture conditions should be overexcavated; moisture conditioned as needed, to a uniform at or above optimum moisture condition before placement as compacted fill.

If during the course of grading adverse geotechnical conditions are exposed which were not anticipated in the preliminary soil report as determined by the geotechnical consultant additional exploration, analysis, and treatment of these problems may be recommended.

6.2 Cut Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal: vertical).

The geotechnical consultant should observe cut slope excavation and if these excavations expose loose cohesionless, significantly fractured or otherwise unsuitable material, the materials should be overexcavated and replaced with a compacted stabilization fill. If encountered specific cross section details should be obtained from the Geotechnical Consultant.

When extensive cut slopes are excavated or these cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top of the slope.

6.3 Pad Areas

All lot pad areas, including side yard terrace containing both cut and fill materials, transitions, located less than 3 feet deep should be overexcavated to a depth of 3 feet and replaced with a uniform compacted fill blanket of 3 feet. Actual depth of overexcavation may vary and should be delineated by the geotechnical consultant during grading, especially where deep or drastic transitions are present.

For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm drainage swale and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

Section 7 - Compacted Fill

All fill materials should have fill quality, placement, conditioning and compaction as specified below or as approved by the geotechnical consultant.

7.1 Fill Material Quality

Excavated on-site or import materials which are acceptable to the geotechnical consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement. All import materials anticipated for use on-site should be sampled tested and approved prior to and placement is in conformance with the requirements outlined.

Rocks 12 inches in maximum and smaller may be utilized within compacted fill provided sufficient fill material is placed and thoroughly compacted over and around all rock to effectively fill rock voids. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve. The geotechnical consultant may vary those requirements as field conditions dictate.

Where rocks greater than 12 inches but less than four feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with the recommendations below. Rocks greater than four feet should be broken down or disposed off-site.

7.2 Placement of Fill

Prior to placement of fill material, the geotechnical consultant should observe and approve the area to receive fill. After observation and approval, the exposed ground surface should be scarified to a depth of 6 to 8 inches. The scarified material should be conditioned (i.e. moisture added or air dried by continued discing) to achieve a moisture content at or slightly above optimum moisture conditions and compacted to a minimum of 90 percent of the maximum density or as otherwise recommended in the soils report or by appropriate government agencies.

Compacted fill should then be placed in thin horizontal lifts not exceeding eight inches in loose thickness prior to compaction. Each lift should be moisture conditioned as needed, thoroughly blended to achieve a consistent moisture content at or slightly above optimum and thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

The contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials and weather conditions.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least six-foot wide benches and a minimum of four feet of vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill should be placed in an area after keying and benching until the geotechnical consultant has reviewed the area. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill.

Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, moisture conditioning as needed to at or slightly above optimum moisture content, thoroughly blended and recompacted to a minimum of 90 percent of laboratory maximum dry density. Where unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be over-excavated.

Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described herein.

Rocks 12 inch in maximum dimension and smaller may be utilized in the compacted fill provided the fill is placed and thoroughly compacted over and around all rock. No oversize material should be used within 3 feet of finished pad grade and within 1 foot of other compacted fill areas. Rocks 12 inches up to four feet maximum dimension should be placed below the upper 10 feet of any fill and should not be closer than 15 feet to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean, overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized material should be staggered so those successive strata of oversized material are not in the same vertical plane.

It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the geotechnical consultant at the time of placement.

The contractor should assist the geotechnical consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill. The contractor should provide this work at no additional cost to the owner or contractor's client.

Fill should be tested by the geotechnical consultant for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-00, D 2922-04. Tests should be conducted at a minimum of approximately two vertical feet or approximately 1,000 to 2,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the geotechnical consultant.

7.3 Fill Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal: vertical).

Except as specifically recommended in these grading guidelines compacted fill slopes should be over-built two to five feet and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the geotechnical consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

At the discretion of the geotechnical consultant, slope face compaction may be attempted by conventional construction procedures including backrolling. The procedure must create a firmly compacted material throughout the entire depth of the slope face to the surface of the previously compacted firm fill intercore.

During grading operations, care should be taken to extend compactive effort to the outer edge of the slope. Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately established desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding four feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly dozer trackrolled.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished using a berm and pad gradient of at least two percent.

Section 8 - Trench Backfill

Utility and/or other excavation of trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

Within slab areas, but outside the influence of foundations, trenches up to one foot wide and two feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheel-rolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the contractor may elect the utilization of light weight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which should be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review of the geotechnical consultant at the time of construction.

In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedures should be considered subject to review by the geotechnical consultant. Clean granular backfill and/or bedding are not recommended in slope areas.

Section 9 - Drainage

Where deemed appropriate by the geotechnical consultant, canyon subdrain systems should be installed in accordance with CTE's recommendations during grading.

Typical subdrains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications.

Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, and concrete swales).

For drainage in extensively landscaped areas near structures, (i.e., within four feet) a minimum of 5 percent gradient away from the structure should be maintained. Pad drainage of at least 2 percent should be maintained over the remainder of the site.

Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns could be detrimental to slope stability and foundation performance.

Section 10 - Slope Maintenance

10.1 - Landscape Plants
To enhance surficial slope stability, slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants relative to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect should be the best party to consult regarding actual types of plants and planting configuration.

10.2 - Irrigation
Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

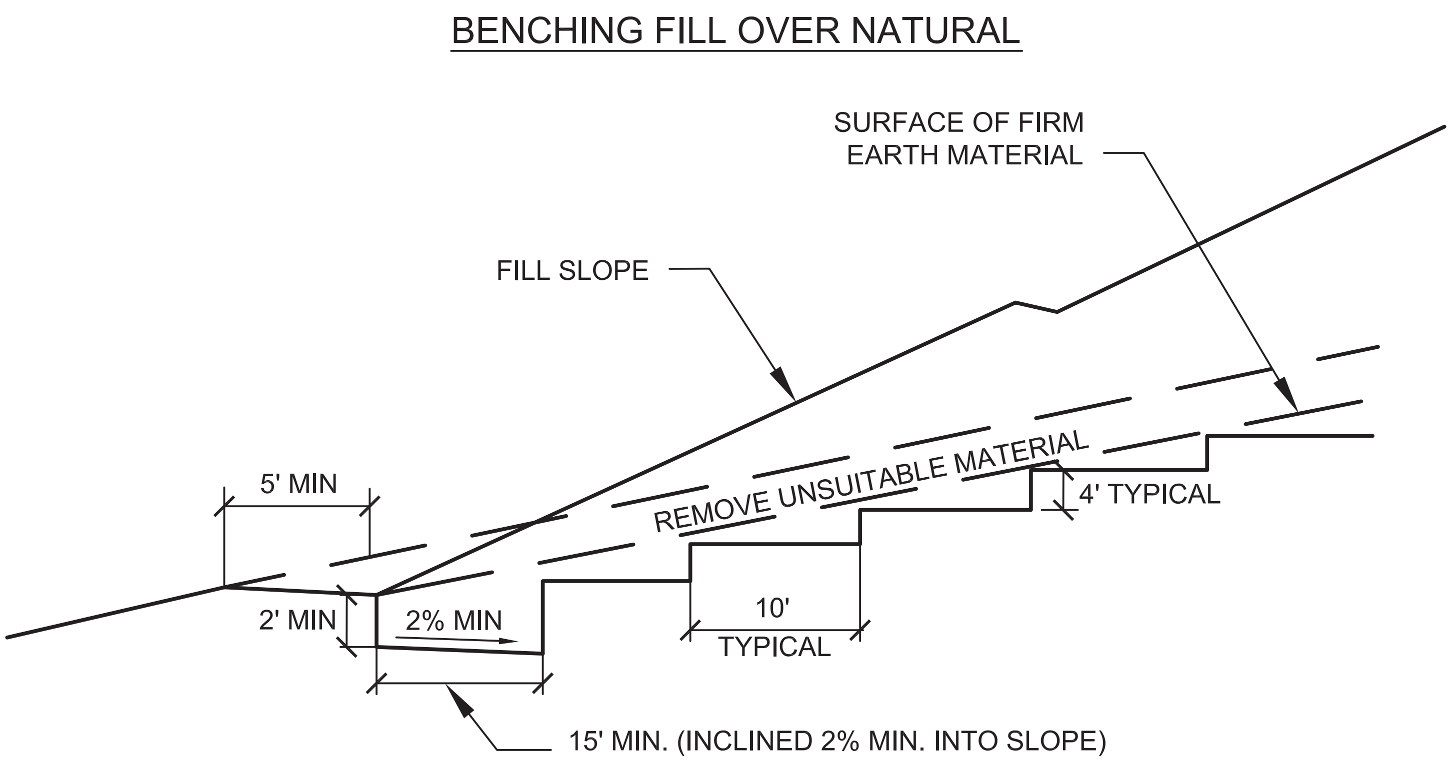
Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provisions should be made for interrupting normal irrigation during periods of rainfall.

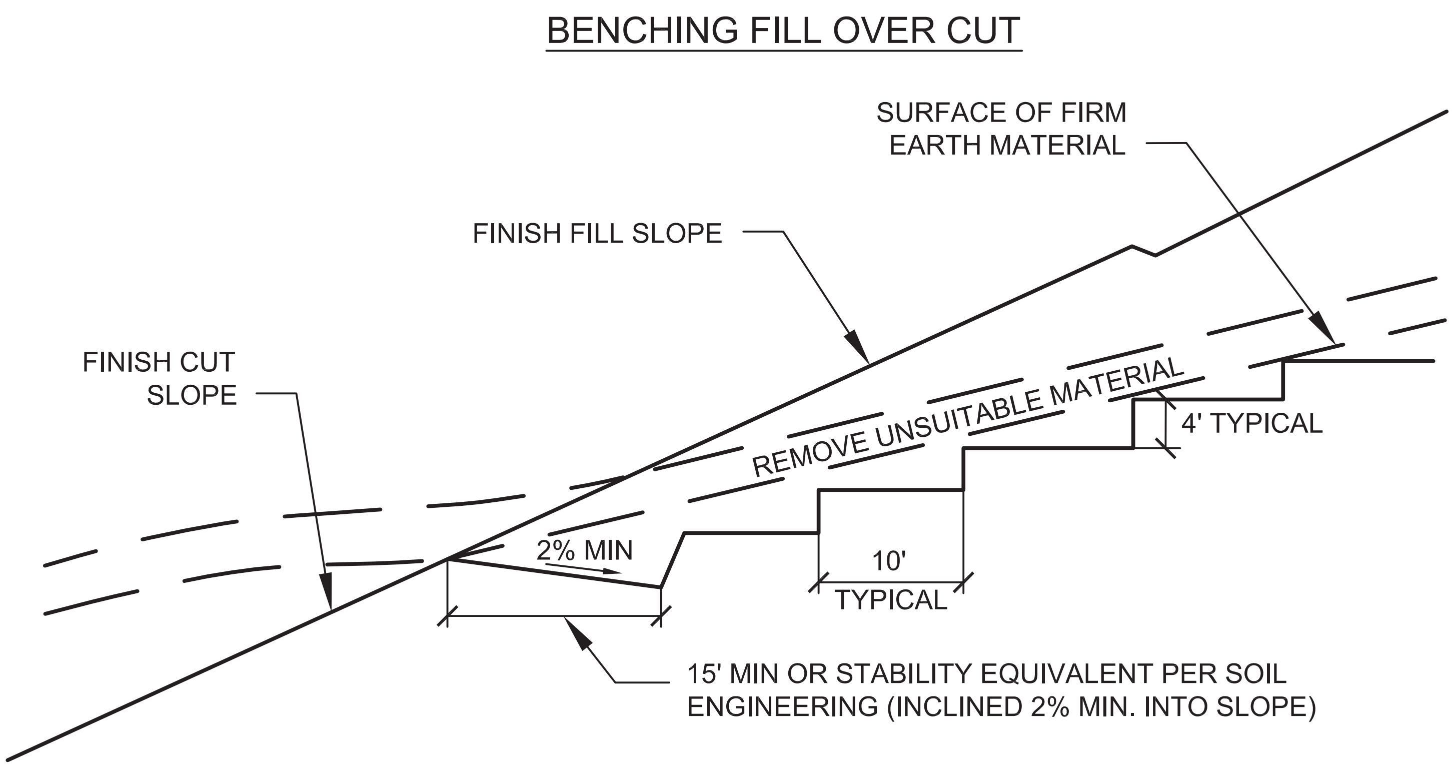
10.3 - Repair
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

If slope failures occur, the geotechnical consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

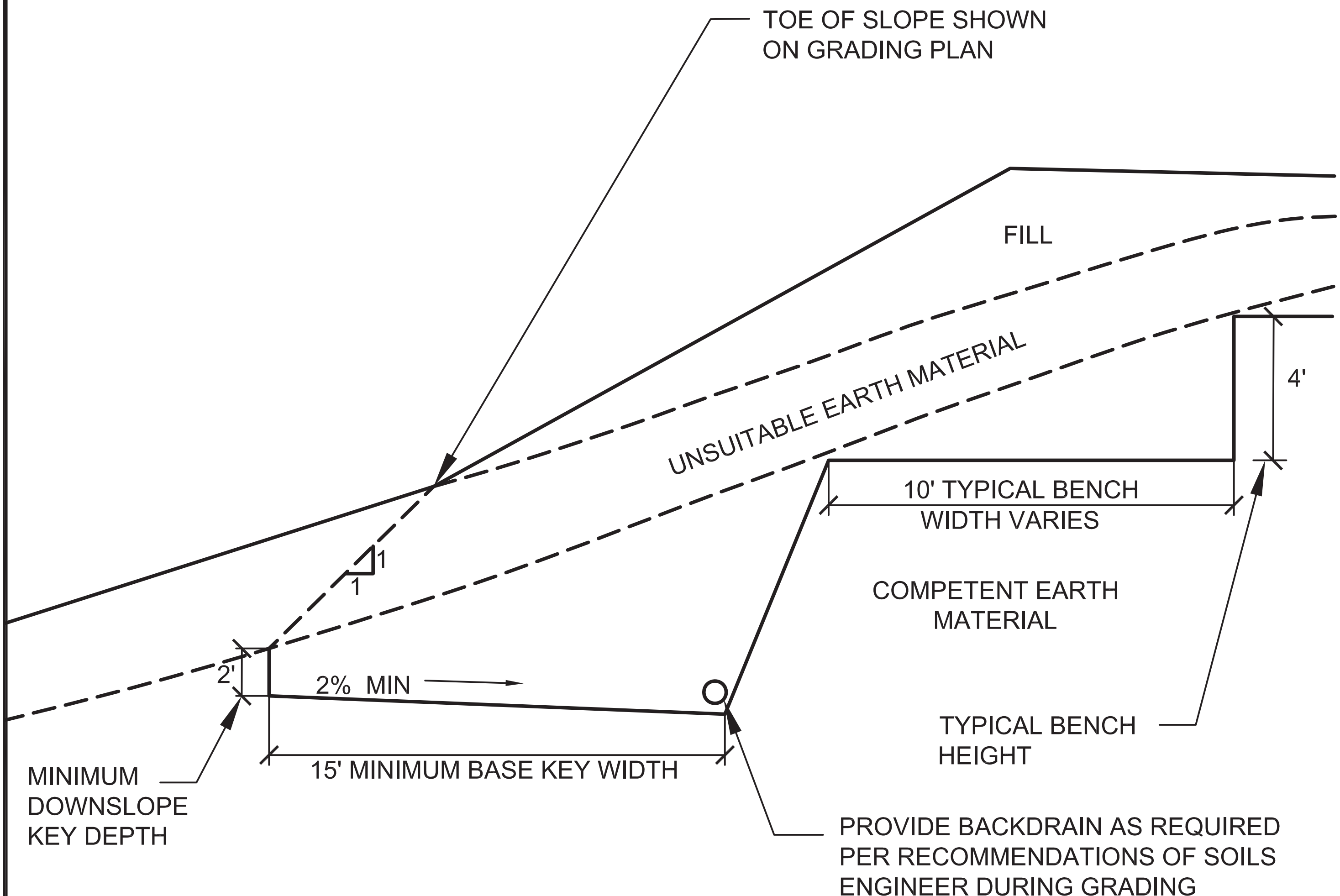
In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer one foot to three feet of a slope face).





NOT TO SCALE

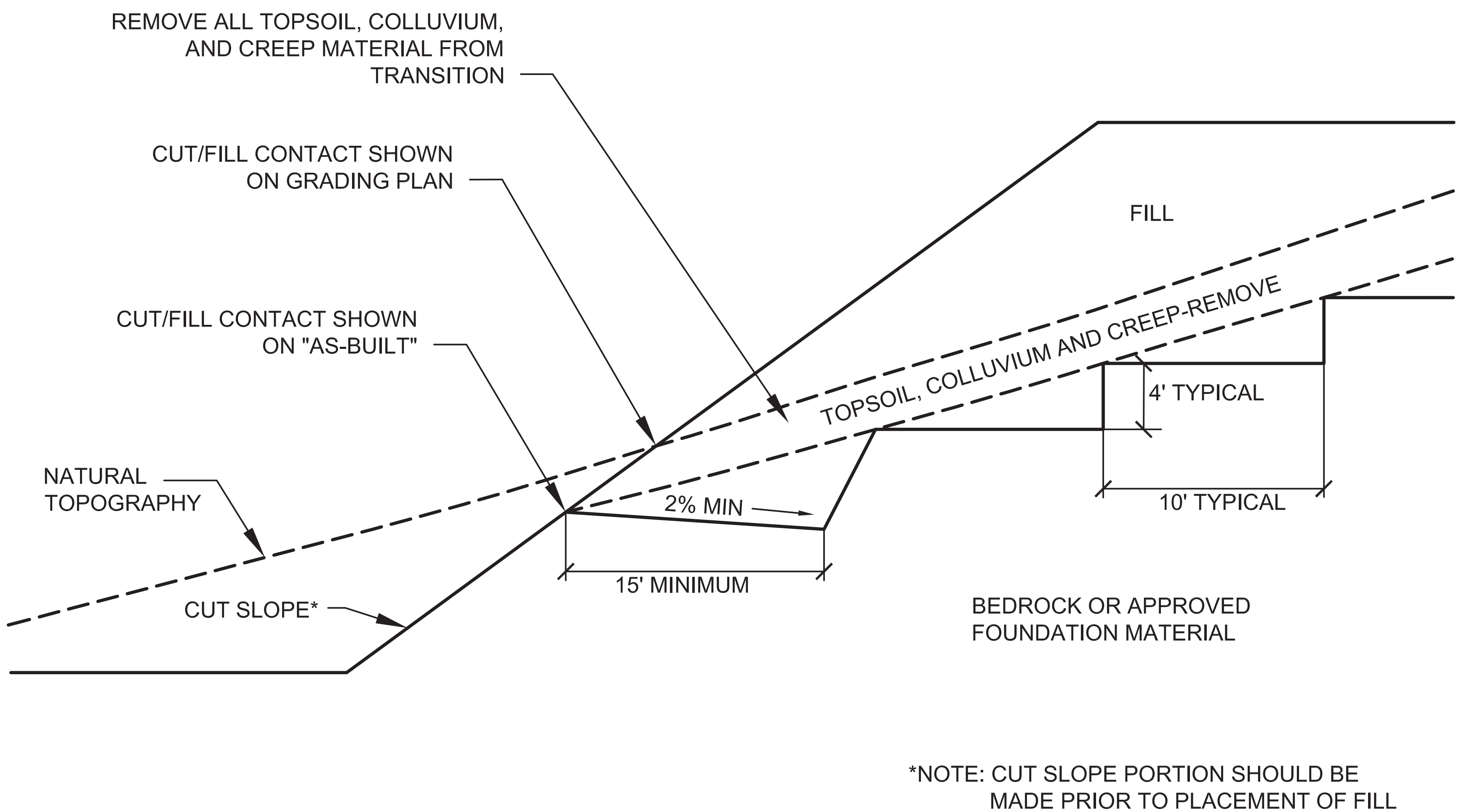
BENCHING FOR COMPACTED FILL DETAIL



WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

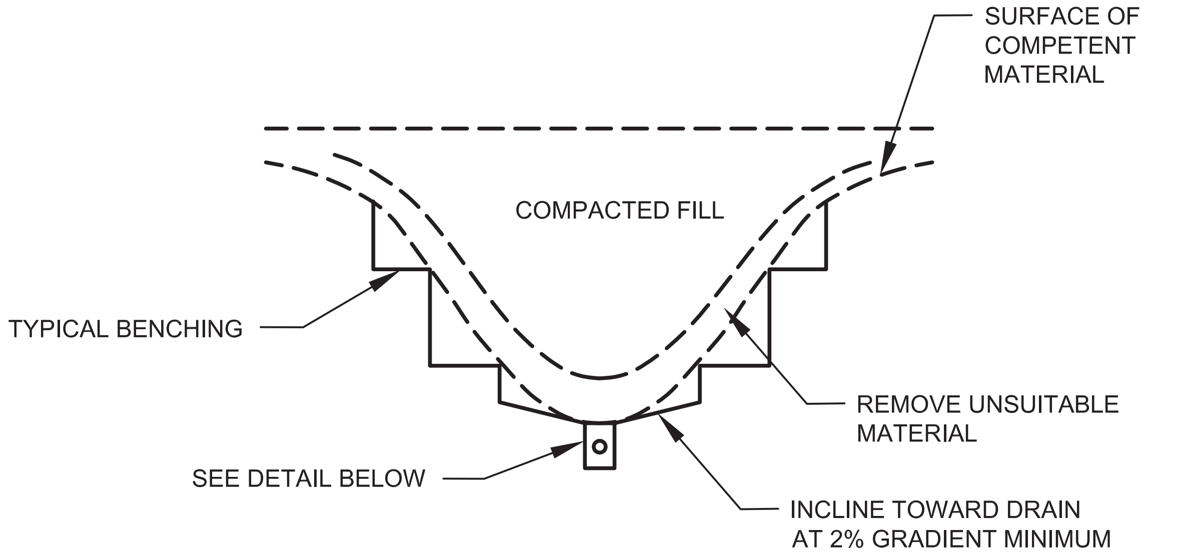
NOT TO SCALE

FILL SLOPE ABOVE NATURAL GROUND DETAIL

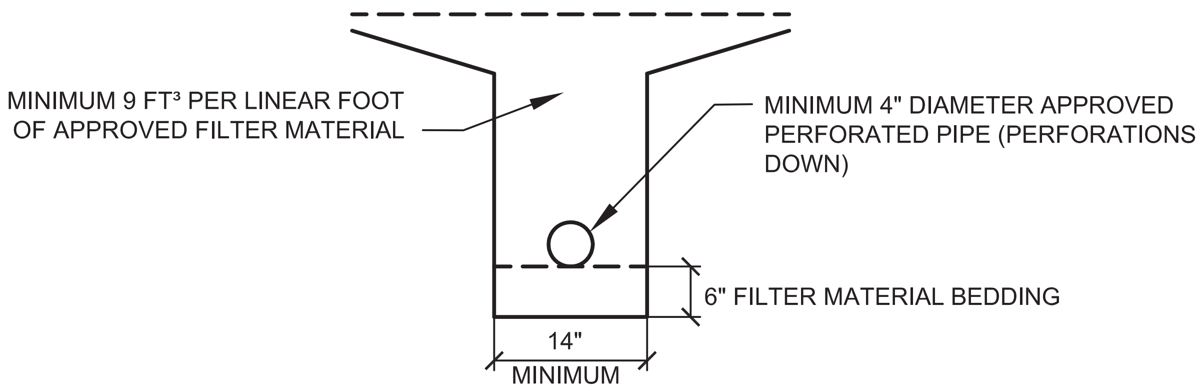


NOT TO SCALE

FILL SLOPE ABOVE CUT SLOPE DETAIL



DETAIL



CALTRANS CLASS 2 PERMEABLE MATERIAL FILTER MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi

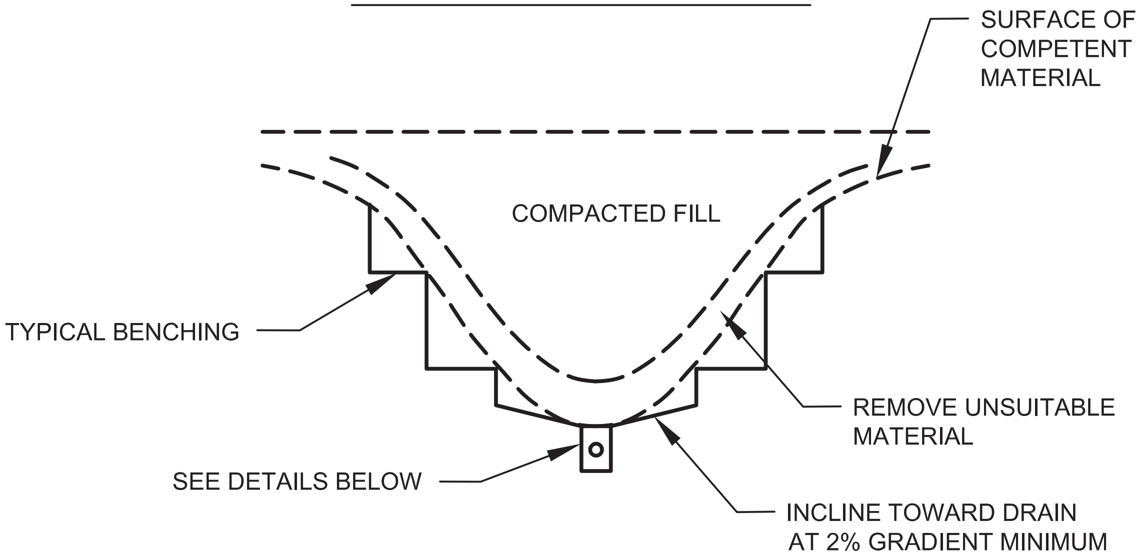
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

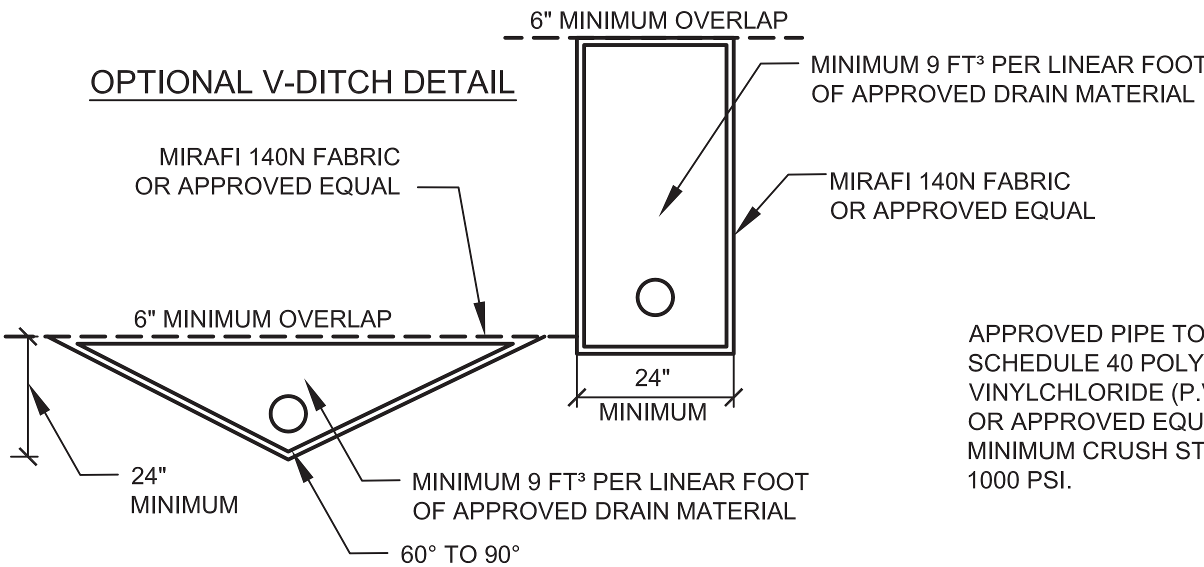
NOT TO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

CANYON SUBDRAIN DETAILS



TRENCH DETAILS



APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYLCHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 PSI.

DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	88-100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

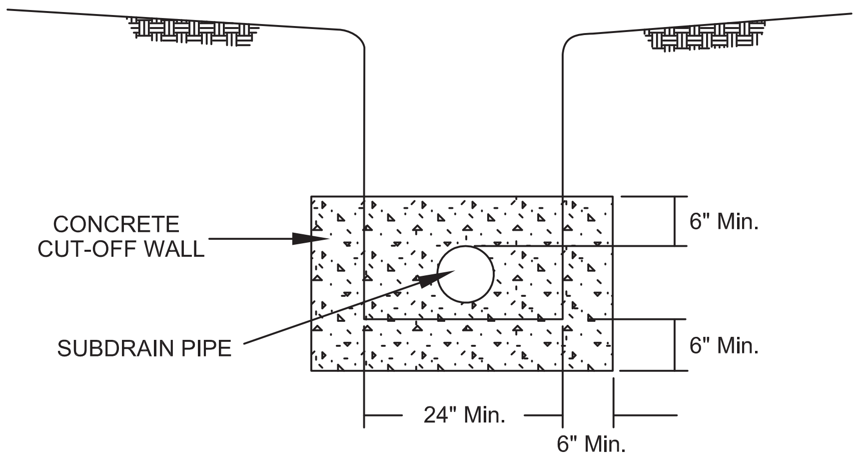
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

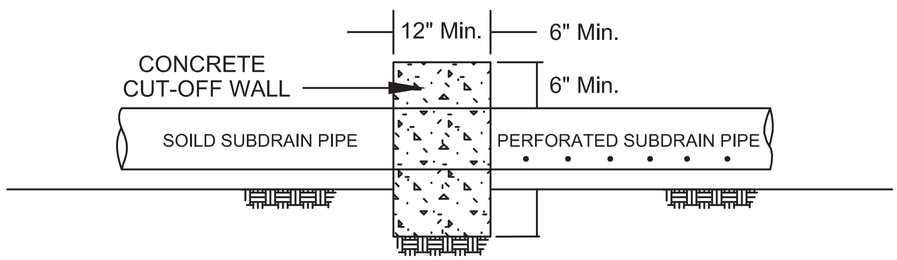
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



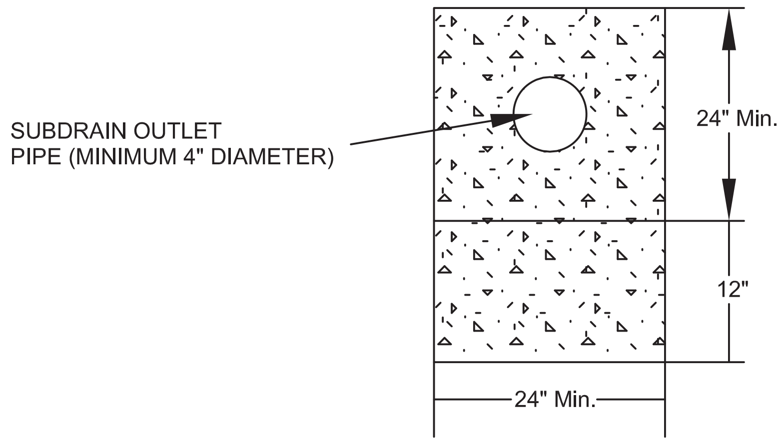
SIDE VIEW



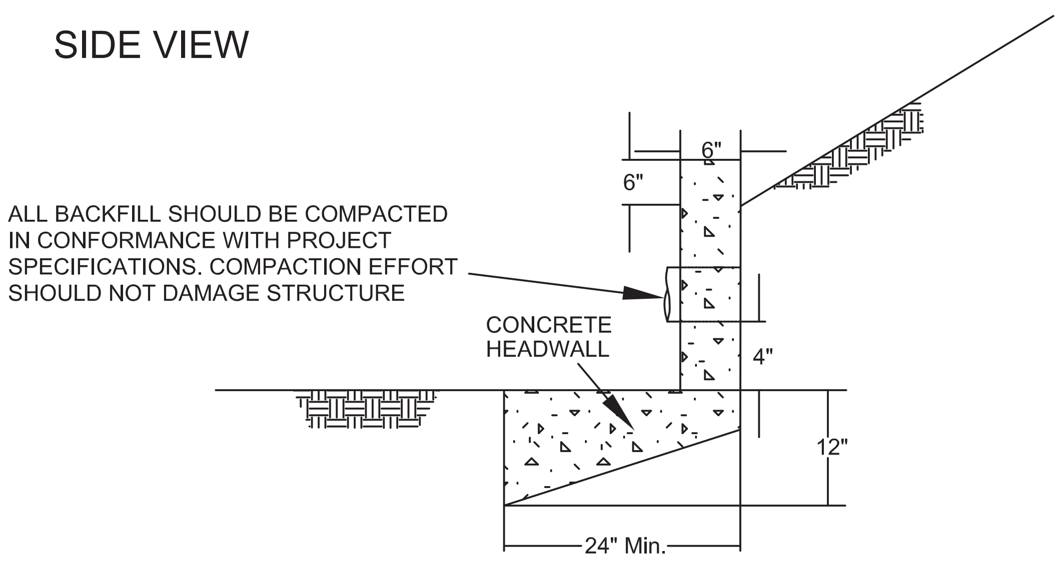
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



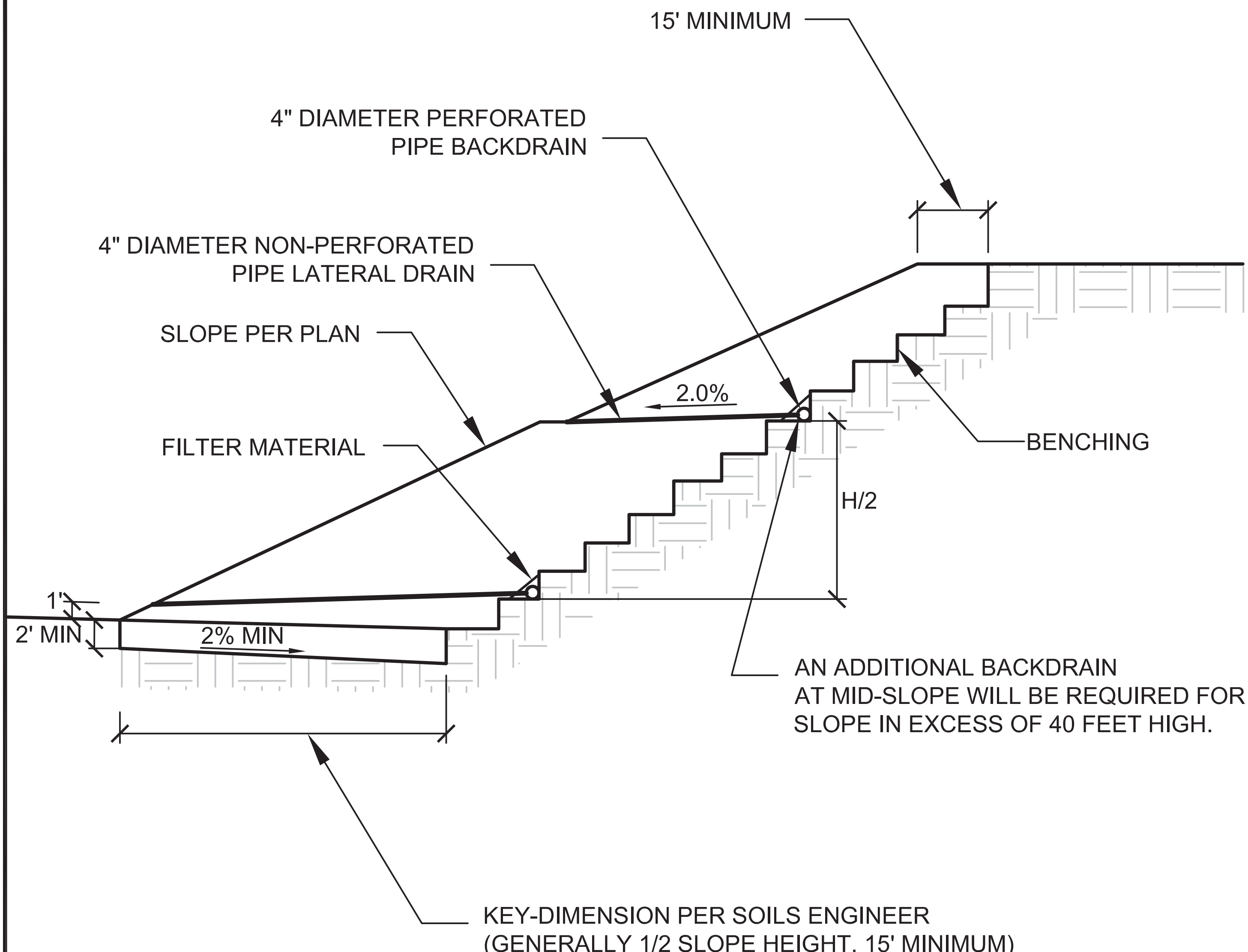
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

ALL DISCHARGE SHOULD BE CONTROLLED

THIS DETAIL IS A MINIMUM DESIGN AND MAY BE MODIFIED DEPENDING UPON ENCOUNTERED CONDITIONS AND LOCAL REQUIREMENTS

NOT TO SCALE

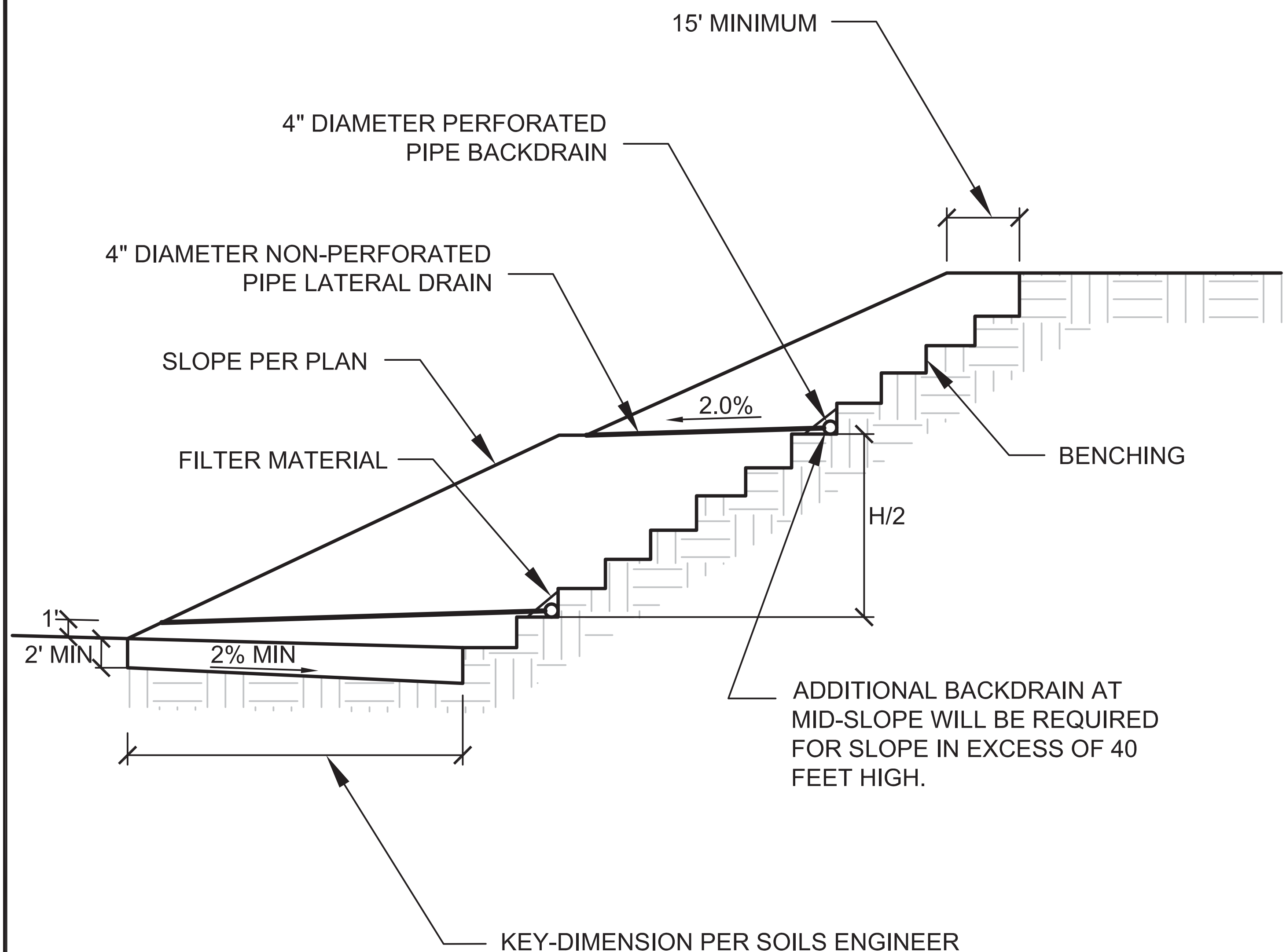
TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

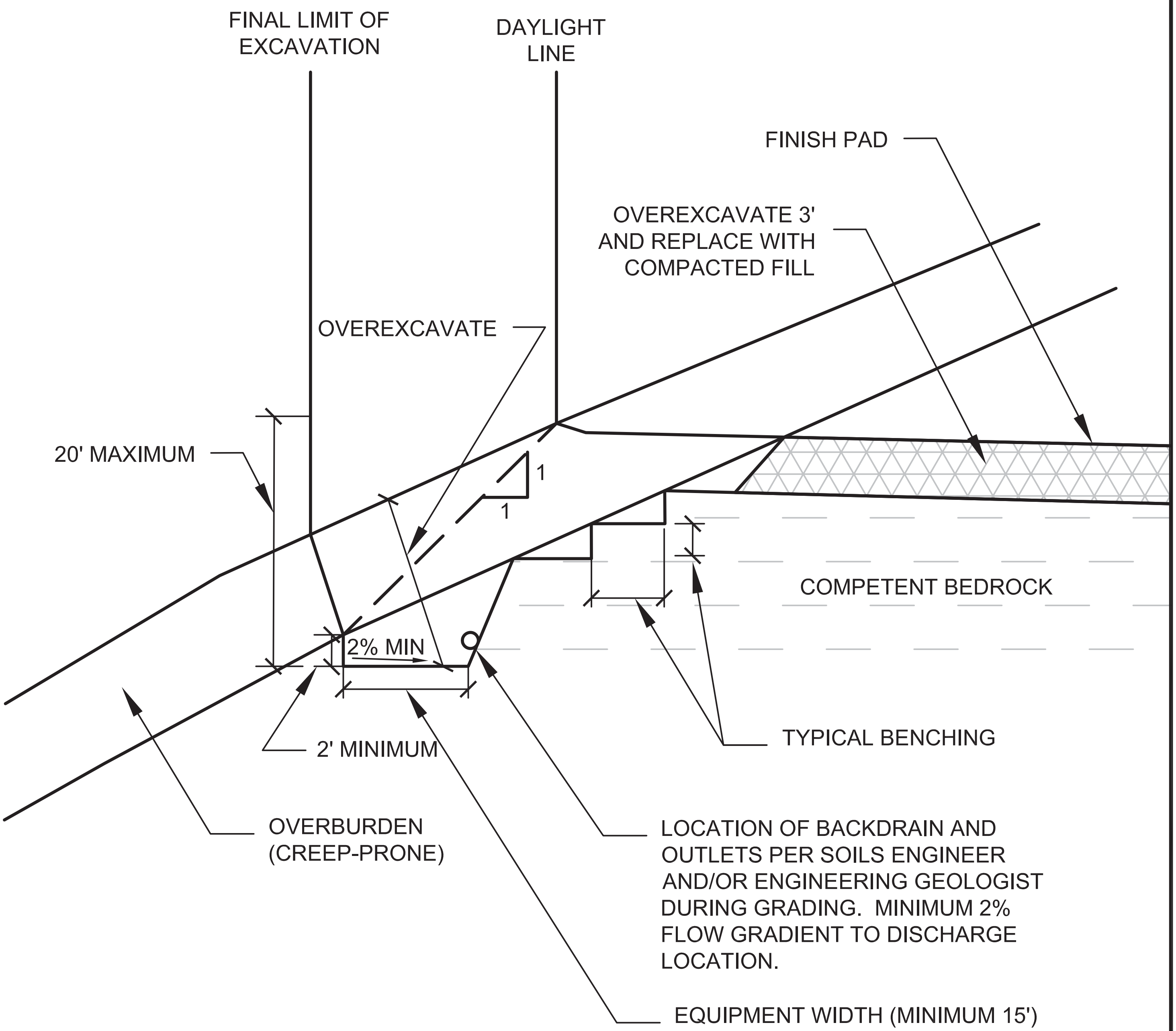
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

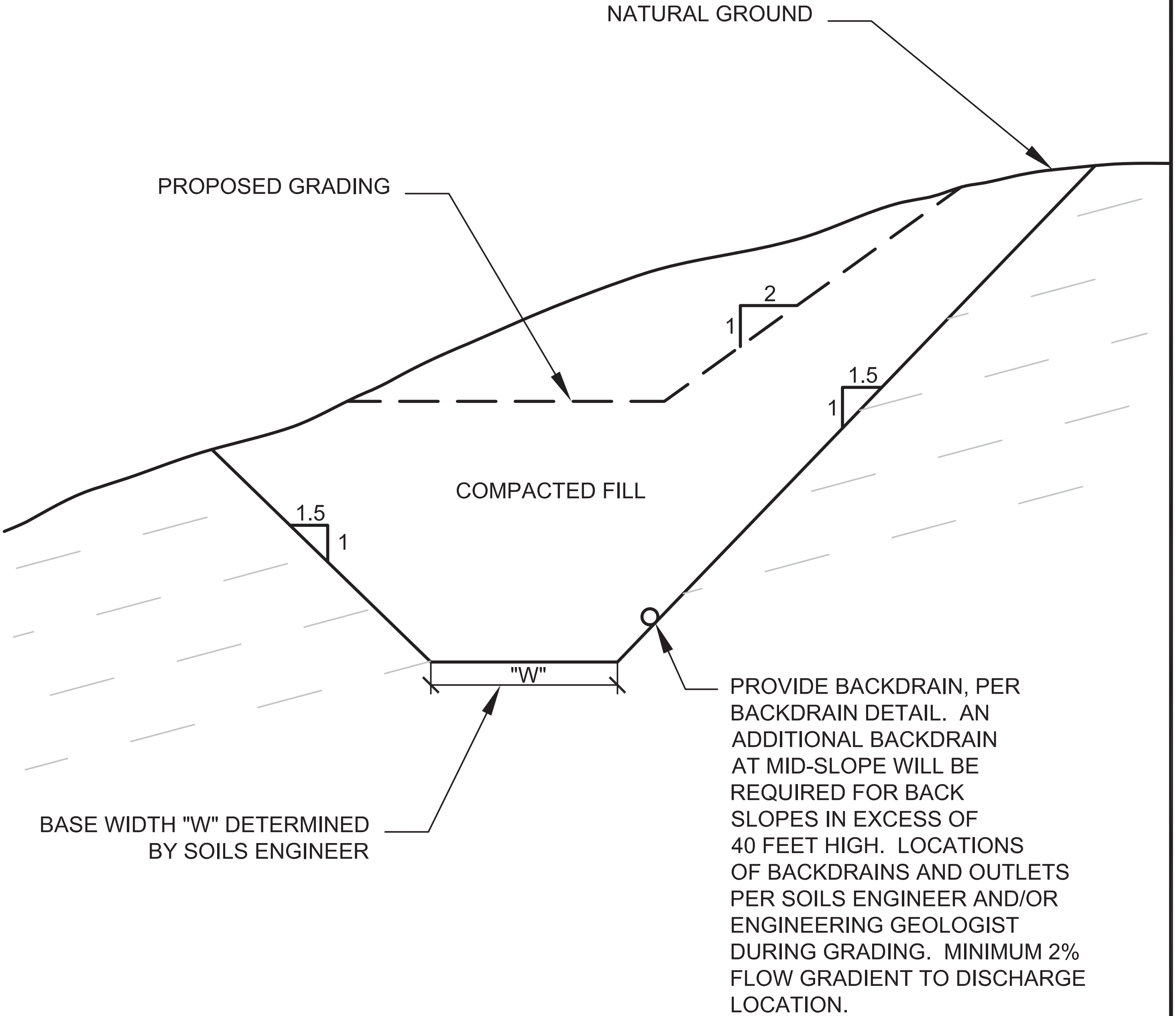
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL



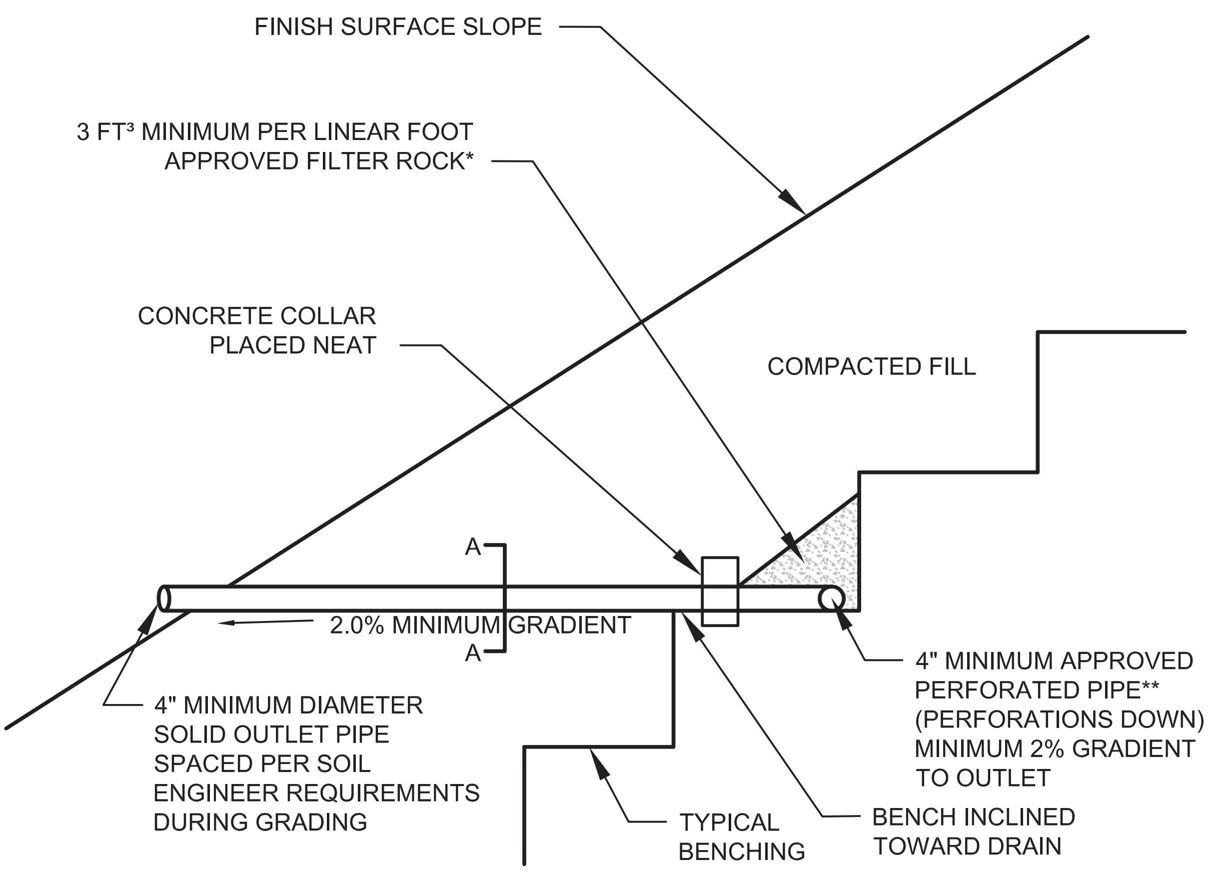
NOT TO SCALE

DAYLIGHT SHEAR KEY DETAIL

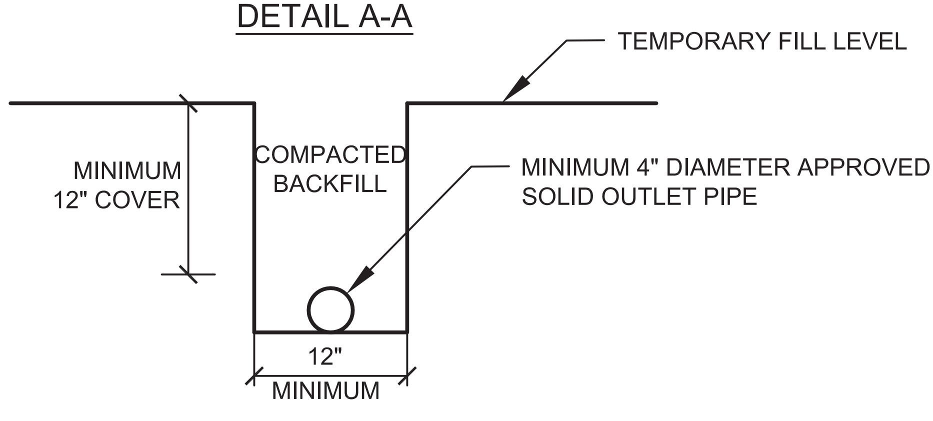


NOT TO SCALE

TYPICAL SHEAR KEY DETAIL



DETAIL A-A



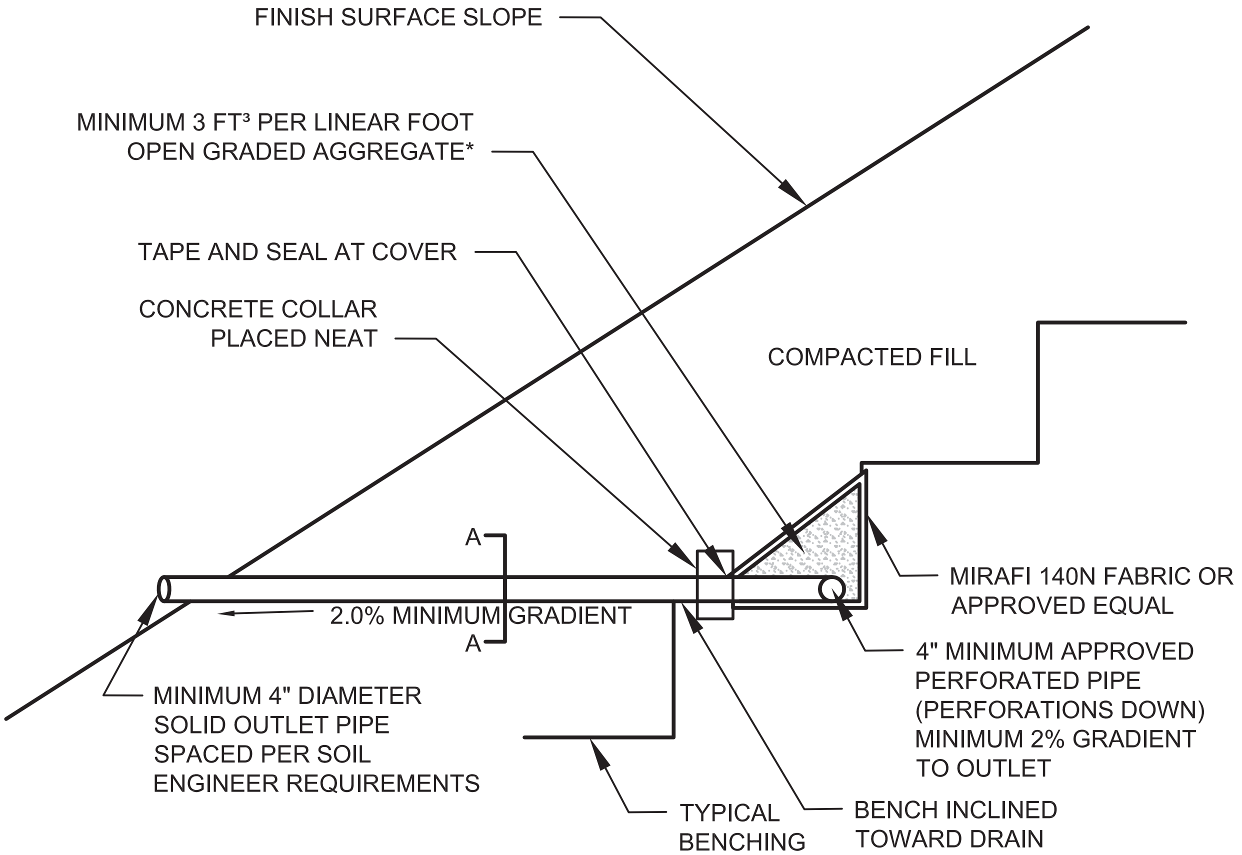
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE (P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

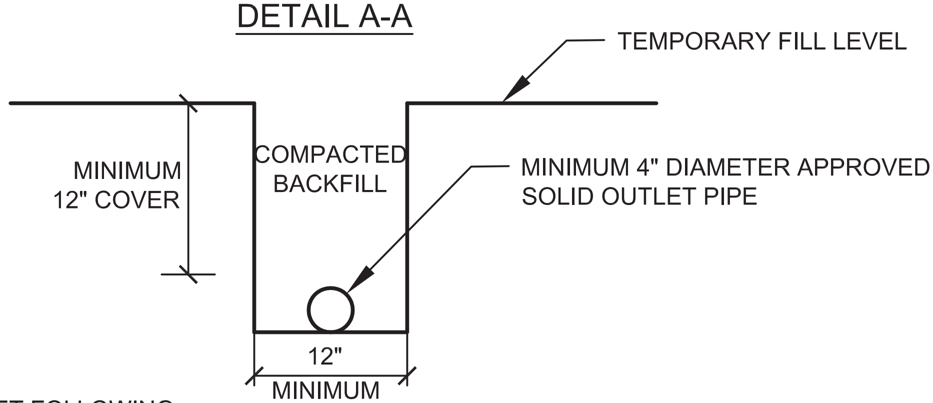
SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

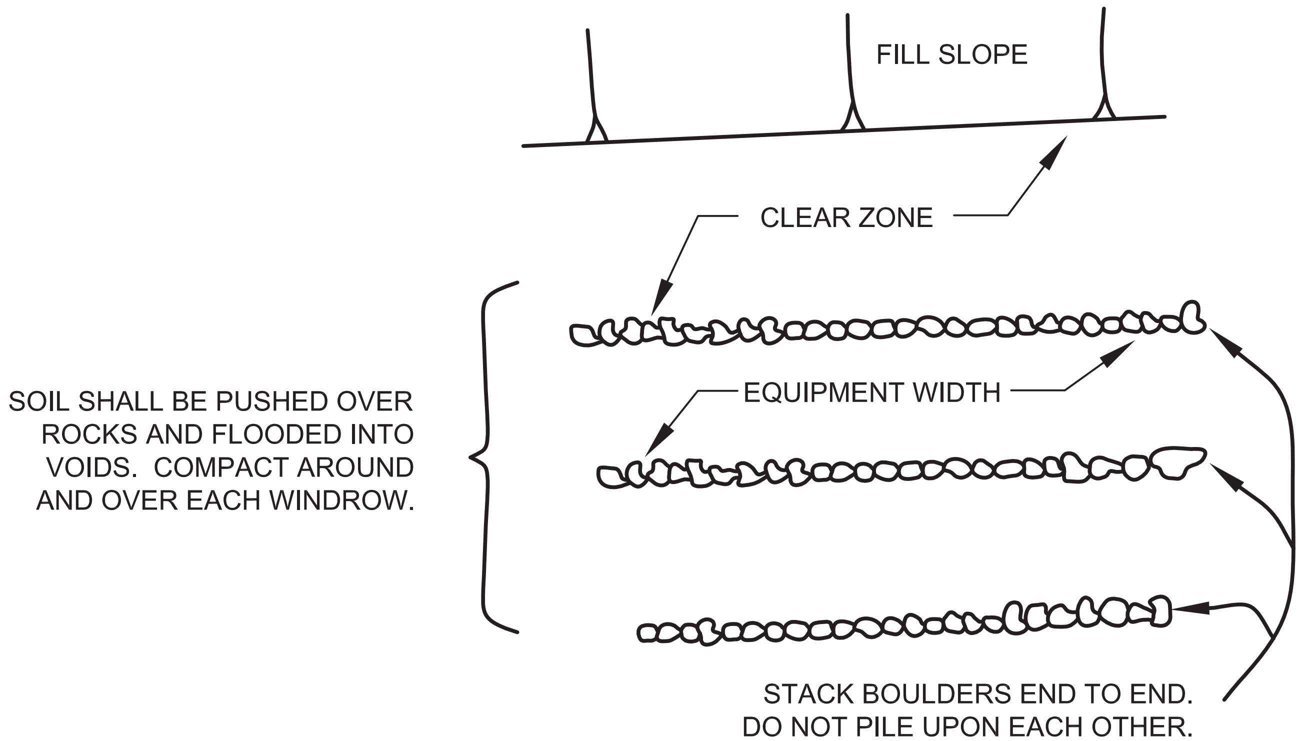


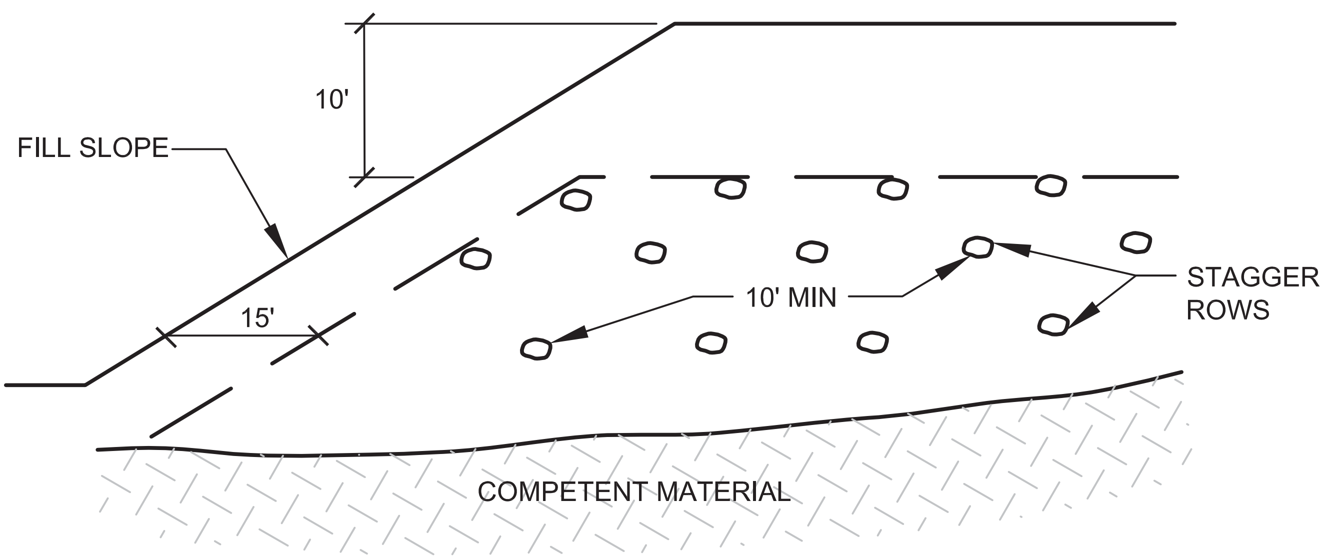
*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

NOT TO SCALE

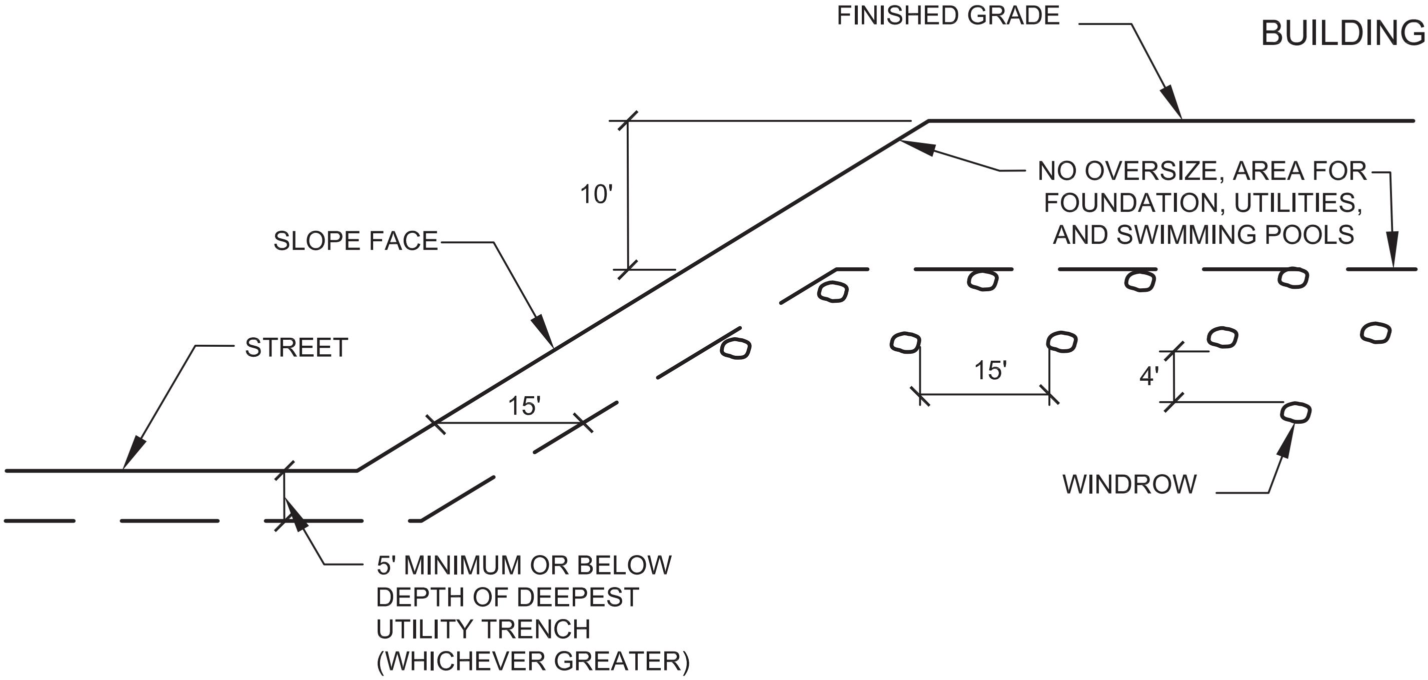
BACKDRAIN DETAIL (GEOFRABIC)



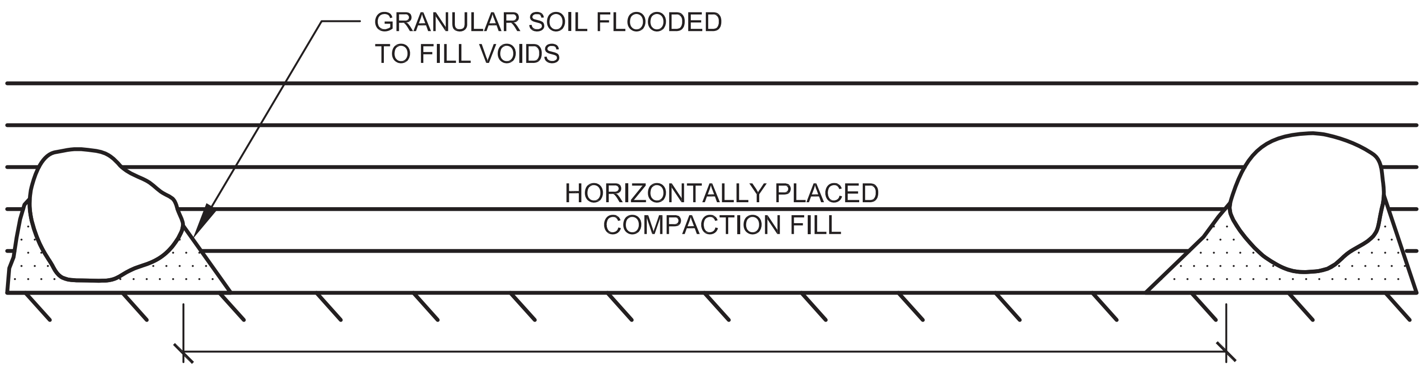


NOT TO SCALE

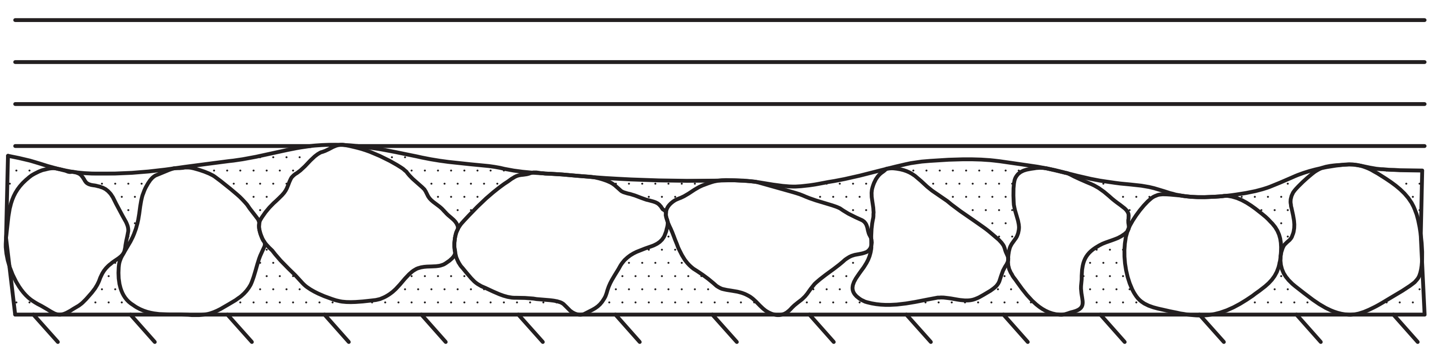
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

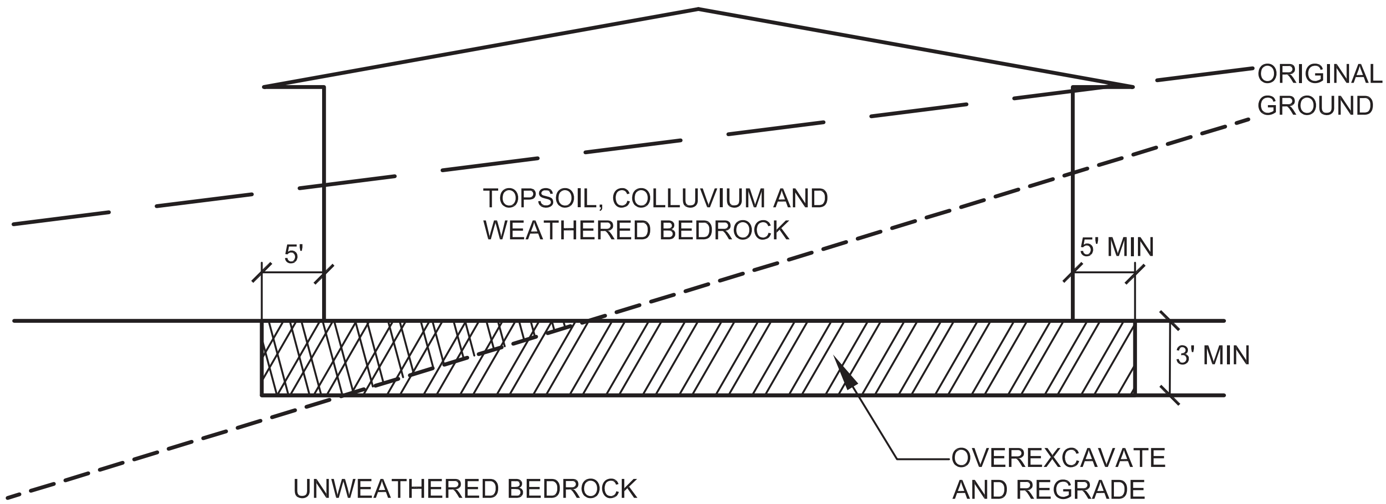


NOT TO SCALE

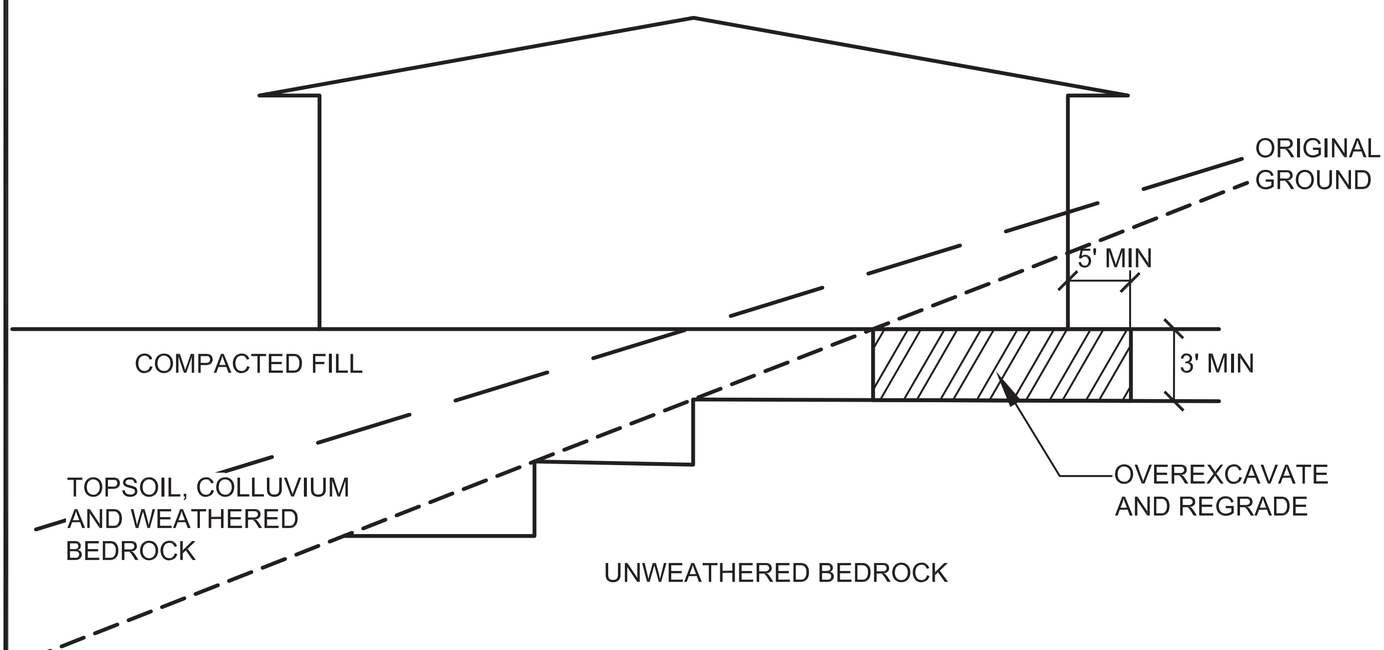
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL

APPENDIX E

PERCOLATION TO INFILTRATION CALCULATIONS AND FIELD DATA

Percolation Rate Conversion P-1

		Inches
Time Interval,	Δt =	30
Final Depth of Water,	D_f =	23.56
Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	23.44
Total Depth of Test Hole,	D_T =	36

H_o =	12.5625	in
H_f =	12.4375	in
$\Delta H = \Delta D$ =	0.125	in
H_{avg} =	12.5	in
I_t =	0.034	in/hr

Percolation Rate Conversion P-2

		Inches
Time Interval,	Δt =	30
Final Depth of Water,	D_f =	30.50
Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	30.31
Total Depth of Test Hole,	D_T =	50

H_o =	19.6875	in
H_f =	19.5	in
$\Delta H = \Delta D$ =	0.1875	in
H_{avg} =	19.59375	in
I_t =	0.035	in/hr

Percolation Rate Conversion P-3

		Inches
Time Interval,	Δt =	30
Final Depth of Water,	D_f =	20.81
Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	20.63
Total Depth of Test Hole,	D_T =	38

H_o =	17.375	in
H_f =	17.1875	in
$\Delta H = \Delta D$ =	0.1875	in
H_{avg} =	17.28125	in
I_t =	0.039	in/hr

TABLE 3.3
PERCOLATION TEST DATA

P-1 **Total Depth: 36 inches**

Time	Test Interval Time (minutes)	Test Refill Depth /Inches	Water Level Initial/Start Depth /Inches	Water Level End/Final Depth /Inches	Incremental Water Level Change (inches)	Percolation Rate inches/minutes	Percolation Rate inches/hour
7:50:00	Initial	None	23.25	initial	-		
8:20:00	30	NO	23.25	23.44	0.188	0.006	0.375
8:50:00	30	NO	23.44	23.56	0.125	0.004	0.250

P-2 **Total Depth: 50 inches**

Time	Test Interval Time (minutes)	Test Refill Depth /Inches	Water Level Initial/Start Depth /Inches	Water Level End/Final Depth /Inches	Incremental Water Level Change (inches)	Percolation Rate inches/minutes	Percolation Rate inches/hour
7:45:00	Initial	None	30.19	initial	-		
8:15:00	30	NO	30.19	30.31	0.125	0.004	0.250
8:45:00	30	NO	30.31	30.50	0.188	0.006	0.375

P-3 **Total Depth: 38 inches**

Time	Test Interval Time (minutes)	Test Refill Depth /Inches	Water Level Initial/Start Depth /Inches	Water Level End/Final Depth /Inches	Incremental Water Level Change (inches)	Percolation Rate inches/minutes	Percolation Rate inches/hour
7:55:00	Initial	None	20.38	initial	-		
8:25:00	30	NO	20.38	20.63	0.250	0.008	0.500
8:55:00	30	NO	20.63	20.81	0.188	0.006	0.375

APPENDIX F

I-8 WORKSHEET

Worksheet I-8 : Categorization of Infiltration Feasibility Condition

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition</th><th colspan="2">Worksheet I-8</th></tr>
<tr><td colspan="4">Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>1</td><td>Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis: The NRCS soils across the site are all Type B and D soils with low to very high surface runoff. However, in the areas tested site soils infiltration rates were slower than the NRCS mapped soil types based on percolation testing. Three soil types were present in the area of the proposed development, Quaternary Previously Placed Fill, Residual Soil, and Tertiary Torrey Sandstone.

Three percolation tests were completed within the Tertiary Torrey Sandstone (the primary geologic unit underlying the site). The calculated infiltration rates (with an applied factor of safety of 2) ranged from approximately to 0.017 to 0.19 inch per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>2</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: Provided the basins are constructed in the areas with adequate set back from proposed structural improvements, risk of geotechnical hazards will not be significantly increased.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

<table>
<tr><th colspan="4">Worksheet I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: According to Geotracker, the nearest known "Open" LUST cleanup site is 2,500 feet away from the site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: The nearest down gradient surface waters consist of a pond at Lomas Santa Fe golf course which is over 1,300 feet from the proposed improvement area. Due to the distance and topography to the pond it is unlikely to be impacted by infiltrating site water.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td>No Full</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Worksheet I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: The site is adequate to support partial infiltration, and BMP's should be designed based on rates determined during recent testing. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: Provided the basins are constructed in the areas with adequate set back from proposed structural improvements, risk of geotechnical hazards will not be significantly increased. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

<table>
<tr><th colspan="4">Worksheet I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: According to Geotracker, the nearest known "Open" LUST cleanup site is 2,500 feet away from the site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: The nearest down gradient surface waters consist of a pond at Lomas Santa Fe golf course which is over 1,300 feet from the proposed improvement area. Due to the distance and topography to the pond it is unlikely to be impacted by infiltrating site water.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td>Partial</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings