APPENDIX D-1
PRELIMINARY GEOTECHNICAL INVESTIGATION

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PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED CASA DE ORO LIBRARY
3838 CONRAD DRIVE
SPRING VALLEY, CALIFORNIA

Prepared for:

COUNTY OF SAN DIEGO DEPARTMENT OF GENERAL SERVICES
ATTENTION: MR. WAYNE YEAGER
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Prepared by:

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CTE JOB NO.: 10-15617G

September 30, 2020

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1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

Construction Testing and Engineering, Inc. (CTE) has completed a geotechnical investigation and report providing preliminary conclusions for the proposed Casa de Oro Library in Spring Valley, California. It is understood that the proposed development is to consist of a new 13,000 square foot Library Structure with parking, flatwork, utilities, and other associated improvements. CTE has performed this work in general accordance with the terms of proposal G-5002 dated June 23, 2020. Preliminary geotechnical recommendations for excavations, fill placement, and foundation design for the proposed improvements are presented herein.

1.2 Scope of Services

The scope of services provided included:

- Review of readily available geologic and geotechnical reports.
- Coordination of utility mark-out and location.
- Excavation of exploratory borings and soil sampling utilizing a truck-mounted drill rig and manual excavation equipment.
- Laboratory testing of selected soil samples.
- Percolation Testing
- Description of site geology and evaluation of potential geologic hazards.
- Preparation of this preliminary geotechnical investigation report.

2.0 SITE DESCRIPTION

The subject site is located north of Campo Road and West of Kenwood Drive in the southern portion of the Spring Valley Academy campus in Spring Valley, California (Figure 1). The site is bounded by a school bus parking lot to the east, Campo Road to the south, Spring Valley Academy to the north, and a soccer field to the west. Existing site conditions are illustrated on Figures 1 and 2. The site currently consists of a softball field with a small asphaltic area in the south where the proposed Casa de Oro Library will be constructed. Based on reconnaissance and review of site topography, the site generally descends gradually to the south with elevations ranging from approximately 440 feet above mean sea level (msl) in the north to 435 feet (msl) in the south.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Field Investigation

CTE conducted a field investigation on September 2, 2020 that included a visual reconnaissance and excavation of four exploratory borings. Borings B-1 through B-4 were excavated with a CME 75 track-mounted drill rig equipped with eight-inch-diameter, hollow-stem augers. The borings extended to a maximum depth of approximately 31.5 feet below the ground surface (bgs) in Boring B-2. Relatively undisturbed soil samples were collected by driving Standard Penetration Test (SPT) and Modified California samplers, and bulk samples were collected from the drill cuttings.

The soils from the exploratory borings were logged in the field by a CTE Geologist, and were classified in general accordance with the Unified Soil Classification System via visual and tactile methods. 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. The approximate locations of the borings are presented on Figure 2.

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 included: In-place Moisture and Density, Modified Proctor and Moisture Content, Expansion Index, Grain Size Analysis, Atterberg Limits, Consolidation, Chemical Characteristics, and R-Value. Test descriptions and laboratory test results are included in Appendix C.

4.0 PERCOLATION TESTING

Percolation Tests P-1 through P-4 were performed within the limits of the proposed improvement area, and were distributed for the purpose of a general site infiltration feasibility analysis. The percolation test holes were excavated to depths of approximately three to five feet bgs. The approximate locations of the percolation test holes are presented on Figure 2, Exploration Location Map. The evaluation was performed in general accordance with Appendix C of the BMP Design Manual for the City of San Diego "Geotechnical and Groundwater Investigation Requirements", dated February 2016.

4.1 Percolation Test Methods

The shallow borehole percolation methodology was used to establish percolation rates. This is considered an acceptable method of percolation testing, as stated in the Model BMP Design Manual, San Diego Region, Appendix D (February, 2016). The percolation test procedure was completed in general accordance with the County of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The percolation rates account for both lateral and vertical flow through the tested section.

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

Percolation test details are presented 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-9 of County of San Diego "Best Management Practice Design Manual", Appendix D or other approved methods.

TABLE 4.2
RESULTS OF PERCOLATION TESTING WITH FACTOR OF SAFETY APPLIED

Test Location	Test Depth (inches)	Case	Geologic Unit	Percolation Rate (inches per hour)	Infiltration Rate (inches per hour)	Infiltration Rate with FOS of 2 Applied (inches per hour)
P-1	60	Case III	Qudf/Qya	0.125	0.019	0.009
P-2	38	Case III	Qya	0.125	0.029	0.014
P-3	60	Case III	Qya	0.375	0.055	0.028
P-4	42	Case III	Qya	2.125	0.436	0.218

NOTES
Water level was measured from a fixed point at the top of the hole.
Weather was sunny and warm during percolation testing.
Qudf = Quaternary Undocumented Fill
Qya = Quaternary Young Alluvial Flood Plain Deposits
The test holes were eight inches in diameter.

5.0 GEOLOGY

5.1 General Setting

Spring Valley 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 greater San Diego Region can be further subdivided into the coastal plain area, central mountain–valley area and eastern mountain and valley area. The site is located within the central mountain–valley area that generally comprises the western edge of the Peninsular Range Batholith (PRB) and generally consists of Cretaceous igneous rocks and localized Jurassic igneous rocks. The PRB contains remnant blocks of pre-Cretaceous metamorphic rocks that are locally covered with post-Cretaceous volcanic rocks, and marine and non-marine deposits. Throughout the batholith, colluvium and alluvium are present on mountain slopes and intervening valleys.

5.2 Geologic Conditions

Based on the regional geologic map prepared by Todd (2004), the near surface geologic unit that underlies the site consists of Quaternary Young Alluvial Flood-Plain Deposits. Based on field observations, Quaternary Undocumented Fill was observed overlying Quaternary Young Alluvial Flood-Plain Deposits with Tertiary Mission Valley Formation encountered at depth. Descriptions of the geologic and soil units encountered during the investigation are presented below.

5.2.1 Quaternary Undocumented Fill

Where observed, the Previously Placed Fill generally consists of loose to medium dense, brown, clayey fine to medium grained sand with soft to medium stiff, dark brown fine to medium grained sandy clay. Exploratory excavations encountered the previously placed fill to a maximum observed depth of approximately 3.0 feet (bgs). Localized areas with deeper fill may be encountered during site excavations and grading.

5.2.2 Quaternary Young Alluvial Flood-Plain Deposits

The Quaternary Young Alluvial Flood-Plain Deposits generally consist of medium stiff to stiff, reddish brown, fine to medium grained sandy clay and loose to medium dense, brown silty fine to medium grained sand. This unit was observed to depths of approximately 21.0 to 26.0 feet below ground surface (bgs).

5.2.3 Tertiary Mission Valley Formation

Tertiary Mission Valley Formation was observed to the maximum explored depth in each of the exploratory borings. Where observed, these materials generally consist of very dense, pale gray sandstone that excavates to silty fine grained sand. This underlying geologic unit is anticipated at depth throughout the site.

5.3 Groundwater Conditions

Groundwater was observed in borings B-1, B-2, and B-3 at the time of drilling and was measured at depths ranging from approximately eight (8) to 10 feet bgs. Groundwater conditions are anticipated to vary, especially during and after periods of sustained precipitation or irrigation. Therefore, subsurface water could potentially impact site excavations. During earthwork for the proposed improvements, removal of collected water from excavations may be necessary.

Site drainage should be designed, installed, and maintained as per the recommendations of the project civil engineer.

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 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 Alquist-Priolo Earthquake Fault Zoning Act, (ACT), the State of California established Earthquake Fault Zones around known active faults. The purpose of the ACT is to regulate the development of 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 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 than 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 the site reconnaissance and review of referenced literature, the site is not located within a local or State-designated Earthquake Fault Zone, no known active fault traces underlie or project toward the site, and no known potentially active fault traces project toward the site. Therefore fault surface rupture potential is considered to be low at the subject 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 earthquake 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 indicates that a fault is not of tectonic origin it is considered to be a Class D structure. Such evidence includes joints, fractures, landslides, or erosional and fluvial scarps that resemble fault features, but demonstrate a non-tectonic origin.

The nearest known Class A fault is the La Nacion fault zone (<1.6 million years), which is approximately 9.0 kilometers west of the site. The attached Figure 4 shows regional faults and seismicity with respect to the subject site.

5.4.3 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake-induced shaking and behave like 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.

Based on the noted subsurface conditions, the site is located in an area of potential liquefaction susceptibility and, therefore, a quantitative evaluation of liquefaction and seismic settlement was performed as summarized herein. Input parameters for the liquefaction evaluation were based on the Maximum Considered Earthquake (MCE, 2% probability of exceedance with a 50-year period). A code-based acceleration value (PGA_M) was obtained in accordance with ASCE 7-16 Equation 11.8-1. In order to quantify site liquefaction susceptibility, the computer program SPTLIQ was utilized. The following data were also considered for the analysis:

- Based on direct measurement during the recent subsurface exploration, groundwater was encountered at a depth ranging from approximately 8 to 9 feet bgs. Given the available information, a conservative high groundwater depth of 5 feet bgs was modeled for the liquefaction analysis.
- As indicated, the code-based PGA_M value (0.427g) obtained using ASCE 7-16 Section 11.8.3 was used for the liquefaction evaluation.
- Based on the area tectonic framework and probable seismic hazard deaggregation for PGA (USGS Unified Hazard Tool), the modal contributing magnitude of 6.89 was used for the analysis.

Three borings were analyzed using the PGA and magnitude values obtained. The conservative results of the evaluation based on SPT methods indicate that potential dynamic settlement at the site could approach a total of up to approximately 4.5 inches. Based on the findings, potential differential dynamic settlements are anticipated to be on the order of 3.0 inches.

Surface effects associated with liquefaction-related settlement can consist of sand boils, soil strength loss, and associated phenomena. In general, the potential for surface manifestations is related to the continuity and thickness of liquefiable layers compared to depth of overlying non-liquefiable material (Ishihara, 1985). Given the depth and distribution of the potential liquefiable layers, significant surface effects are generally not anticipated but cannot be entirely precluded based on the current observed site conditions.

The potential hazard associated with lateral spreading is generally anticipated to be low, based on the lack of significant slopes or free faces adjacent to the site.

Structural design should accommodate the total and differential dynamic settlements provided above in addition to the anticipated static settlement. The preliminary liquefaction evaluation results are provided in Appendix F.

5.4.4 Tsunamis and Seiche Evaluation

According to http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation Maps/Pages/Statewide_Maps.aspx the site is not located within a tsunami inundation zone based on its elevation above sea level. Damage resulting from oscillatory waves (seiches) is considered unlikely due to the absence of large nearby confined bodies of water.

5.4.5 Landsliding

According to mapping by Tan (1995), the site is considered only "Marginally Susceptible" to landsliding. In addition, landslides are not mapped in the site area and were not encountered during the recent field exploration. Based on the preliminary investigation findings, landsliding is not considered to be a significant geologic hazard at the relatively flat-lying site.

5.4.6 Flooding

Based on Federal Emergency Management Agency mapping (FEMA 2012), site improvement areas are located within Zone X, which is defined as: "Areas determined to be outside the 0.2% annual chance floodplain". Therefore, subject to the review of the project civil engineer, the potential for flooding at the site is generally considered to be low.

5.4.7 Compressible and Expansive Soils

Based on observed site conditions and investigation findings, the loose alluvial deposits may be potentially compressible in their current condition.

Based on laboratory analysis, geologic observation, and the generally granular nature of site soils, the near-surface materials are generally anticipated to exhibit a low expansion potential (Expansion Index of 50 or less). However, clayey soils are present in the site area and verification of expansion potential should be performed during site excavations and grading.

5.4.8 Corrosive Soils

Testing of representative site soils is being performed to evaluate the 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. A minimum resistivity value 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 present a negligible corrosion potential for Portland cement concrete. Based on resistivity testing, we anticipate that the site soils will be interpreted to have a moderate corrosivity potential to buried metallic improvements. As such, it will likely be prudent for buried utilities to utilize plastic piping and/or conduits, where feasible. However, CTE does not practice corrosion engineering. Therefore, if corrosion of improvements is of more significant concern, a qualified corrosion engineer could be consulted.

6.0 SEISMIC DESIGN CRITERIA

The seismic ground motion values listed in the table below were derived in accordance with the ASCE 7-16 Standard that is incorporated into the 2019 California Building Code. This was accomplished by establishing the Site Class based on the soil properties at the site, and calculating site coefficients and parameters using the using the SEAOC-OSHPD U.S. Seismic Design Maps application. Seismic ground motion values are based on the approximate site coordinates of 32.74913° latitude and –117.98828° longitude and the understanding that the fundamental period for the proposed structure will be 0.5 seconds or less. These values are intended for the design of structures to resist the effects of earthquake ground motions.

TABLE 6.0
SEISMIC GROUND MOTION VALUES (CODE-BASED)
2019 CBC AND ASCE 7-16

PARAMETER	VALUE	2019 CBC/ASCE 7-16 REFERENCE
Site Class	D	ASCE 16, Chapter 20
Mapped Spectral Response Acceleration Parameter, S_S	0.785	Figure 1613.2.1 (1)
Mapped Spectral Response Acceleration Parameter, S_1	0.285	Figure 1613.2.1 (2)
Seismic Coefficient, F_a	1.186	Table 1613.2.3 (1)
Seismic Coefficient, F_v	N/A	Table 1613.2.3 (2)
MCE Spectral Response Acceleration Parameter, S_{MS}	0.931	Section 1613.2.3
MCE Spectral Response Acceleration Parameter, S_{M1}	N/A	Section 1613.2.3
Design Spectral Response Acceleration, Parameter S_{DS}	0.621	Section 1613.2.5(1)
Design Spectral Response Acceleration, Parameter S_{D1}	N/A	Section 1613.2.5 (2)
Peak Ground Acceleration PGA_M	0.427	ASCE 16, Section 11.8.3

7.0 CONCLUSIONS

Undocumented Fill was observed at the surface beneath the proposed improvement area to a depth of approximately 3.0 feet bgs. Alluvial soils were observed beneath the fill and extended to depths ranging from approximately 21 to 26 feet bgs. This alluvial unit was found to be potentially susceptible to liquefaction and seismic settlement. Very dense Mission Valley Formation was observed beneath the alluvial soils. Groundwater was encountered at depths ranging from approximately 8.0 to 10.0 feet bgs at the time of investigation.

The site may be subject to strong ground shaking in the event of an earthquake on a regional fault. As noted, the site is considered to be potentially susceptible to liquefaction and seismically induced settlement based on the presence of poorly consolidated soils and relatively shallow depth to groundwater.

Laboratory results indicate that the representative tested soils have a negligible corrosion potential for concrete improvements and moderate corrosion potential for buried metallic improvements.

Based on the investigation findings, the site is generally considered feasible for construction from a geotechnical standpoint, provided the design and construction are appropriate for the potential geological hazards. Remedial excavation, re-compaction, deep foundations, soil improvement, and/or specialized structural design may be required in order to mitigate potential effects associated with dynamic settlement at the site.

It is anticipated that additional field exploration, laboratory testing, quantitative liquefaction evaluation, and engineering analysis will be required by others for final project design and construction.

8.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing, and geotechnical analysis is presented in this preliminary report have been conducted according to current engineering practice and the standard of care exercised by the reputable geotechnical consultants performing similar tasks in the area. No other warranty, expressed or implied, is made regarding the conclusions and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during further investigation and/or construction.

The percolation test results were obtained in accordance with County standards. However, it should be noted that percolation test results can significantly vary laterally and vertically due to slight changes in soil type, degree of weathering, secondary mineralization, and other physical and chemical variabilities. As such, the test results are considered to be an estimate of percolation and converted infiltration rates for design purposes. No guarantee is made based on the percolation testing related to the actual functionality or longevity of associated infiltration basins or other BMP devices designed from the presented infiltration rates.

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 preliminary 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.

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

Respectfully submitted,

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AJB/JFL/DTM:ach

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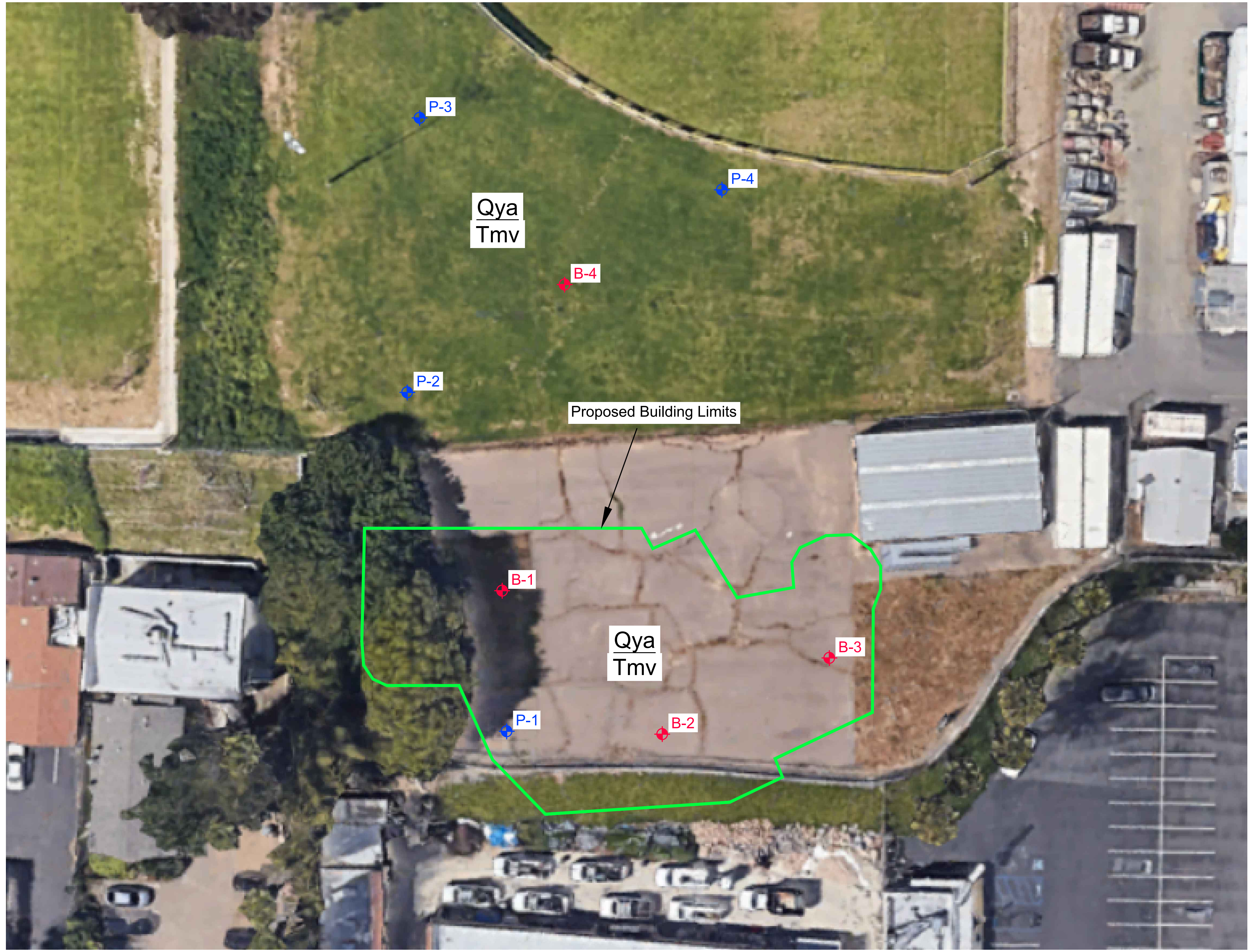
SITE INDEX MAP PROPOSED CASA DE ORO LIBRARY 3838 CONRAD DRIVE SPRING VALLEY, CALIFORNIA	SCALE: AS SHOWN	DATE: 9/20
	CTE JOB NO.: 10-15617G	FIGURE: 1



20' 0 10' 20'

EXPLANATION

B-4 APPROXIMATE BORING LOCATION

P-4 APPROXIMATE PERCOLATION TEST LOCATION

Qya/Tmv YOUNG ALLUVIAL FLOOD PLAIN DEPOSITS OVER MISSION VALLEY FORMATION

S:\Projects\10-15617G\DWG\Fig 2.dwg

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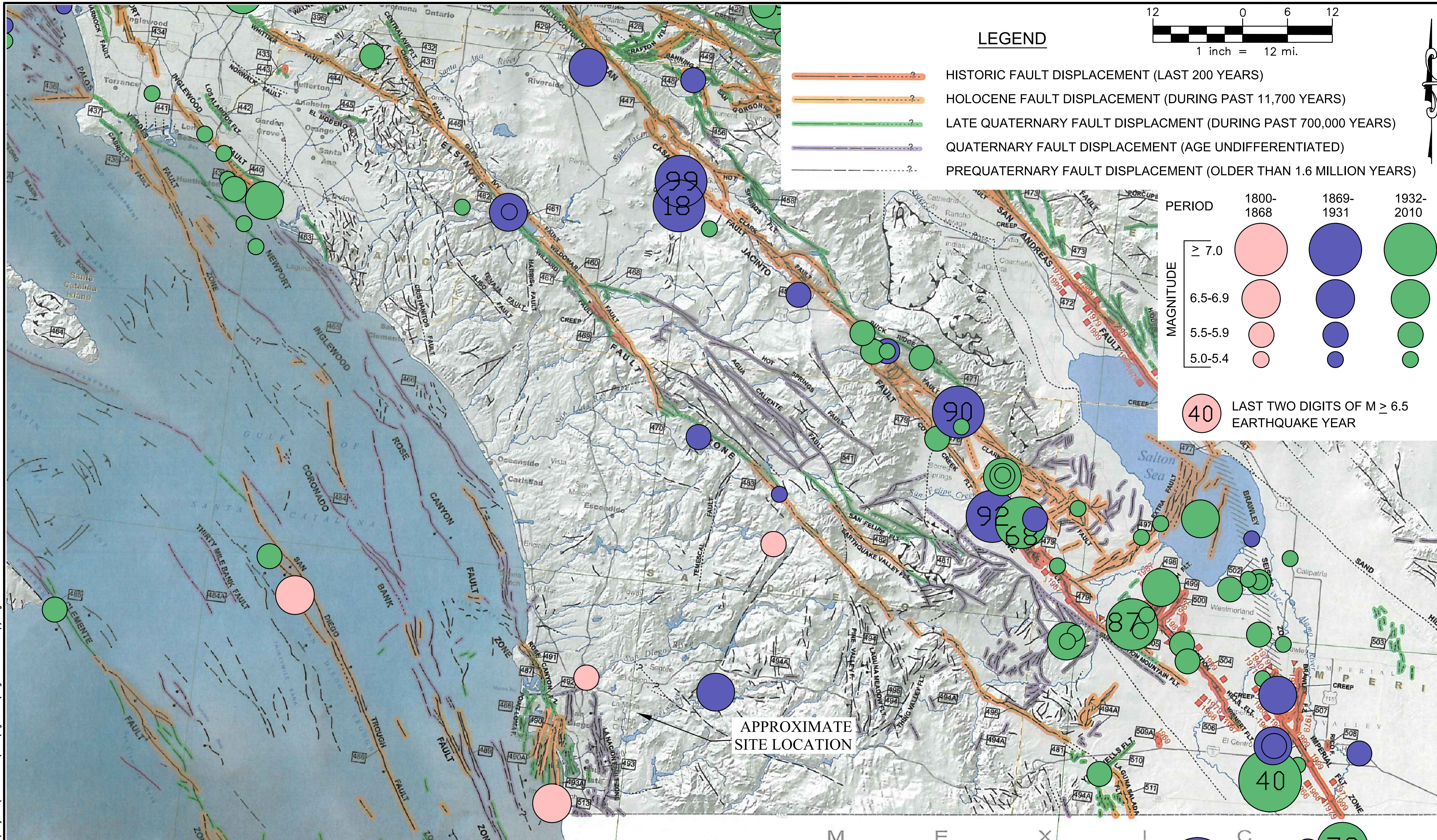
GEOLOGIC/EXPLORATION LOCATION MAP
PROPOSED CASA DE ORO LIBRARY
3838 CONRAD DRIVE
SPRING VALLEY, CALIFORNIA

CTE JOB NO: 10-15617G	
SCALE: 1" ~ 40'	
DATE: 9/20	FIGURE: 2



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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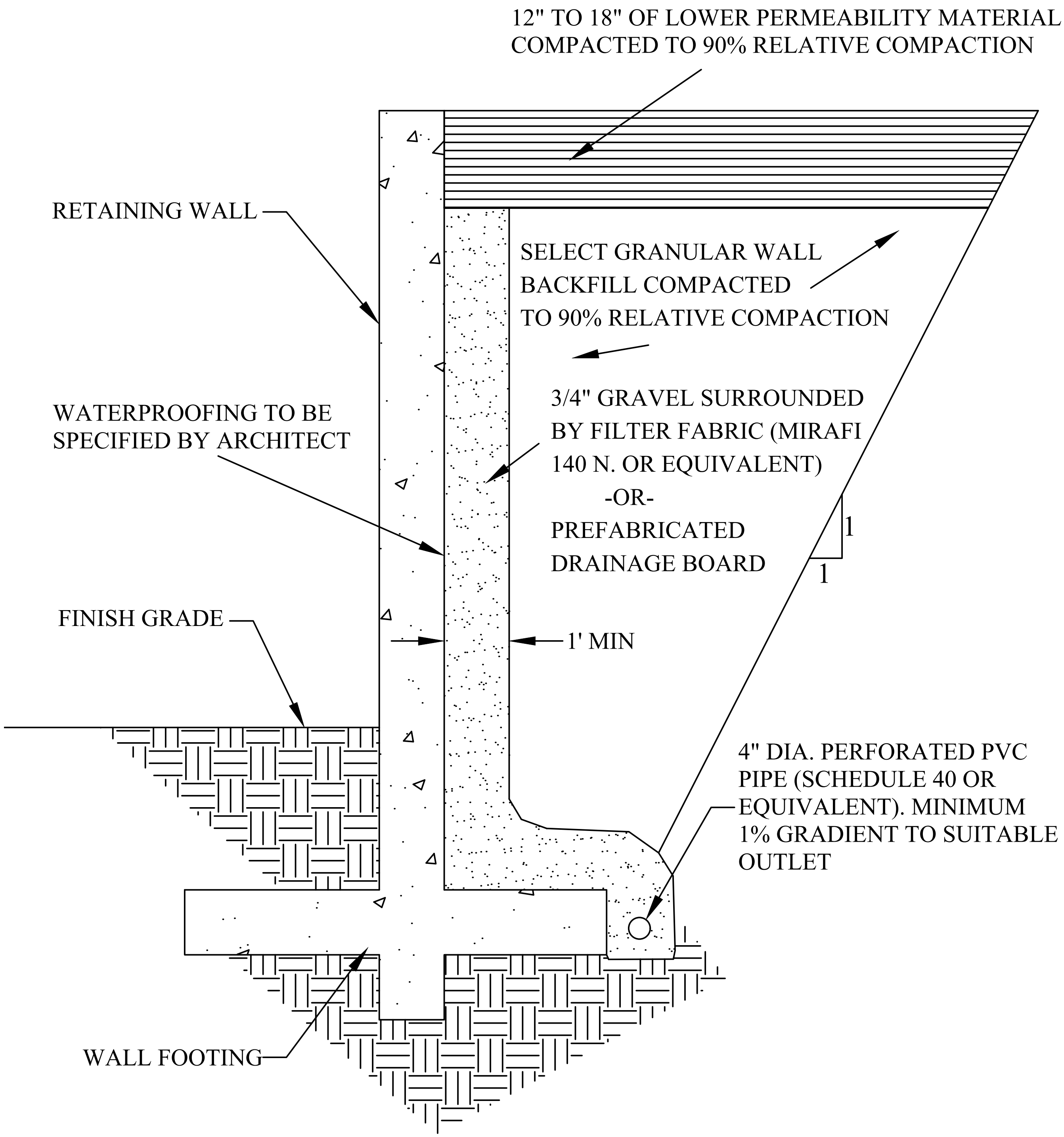
REGIONAL FAULT AND SEISMICITY MAP

PROPOSED CASA DE ORO LIBRARY
3838 CONRAD DRIVE
SPRING VALLEY, CALIFORNIA

CTE JOB NO:	10-15617G
SCALE:	1 inch = 12 miles
DATE: 9/20	FIGURE: 3

\\file01\CTE Share\Projects\10-15617G\DWG\Figure 3 (Regional Fault Map).dwg



*CONCEPTUAL DRAWING

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RETAINING WALL DRAINAGE DETAIL	SCALE: NO SCALE	DATE: 9/20
	CTE JOB NO.: 10-15617G	FIGURE: 4

APPENDIX A

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REFERENCES

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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

FIGURE: BL1

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

BORING LEGEND

Depth (Feet)	Sample: Bulk / 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:	CASA DE ORO LIBRARY (PW)	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-15617G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	9/2/2020
LOGGED BY:	DJT	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~438'

BORING: B-1

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-CL		**QUATERNARY UNDOCUMENTED FILL:** Loose to medium dense, slightly moist, brown, clayey fine to medium grained SAND with CLAY, trace gravel	
	X					SM		**QUATERNARY YOUNG ALLUVIUM:** Medium dense, slightly moist, tannish brown, silty fine to coarse grained SAND with dense cobbles and boulders.	
						CL/SC		Stiff, slightly moist, brown, fine to medium grained sandy CLAY with clayey SAND.	
5			17 15 17						
10			3 3 3		▼	SP		Loose, wet, brown, poorly-graded fine to coarse grained SAND.	
15			1 2 3			SM-CL		Loose, wet, brown, silty fine to medium grained SAND, with clay.	
20			1 3 5						
						SP		Loose, wet, brown, poorly-graded, fine to coarse grained SAND.	
25									

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PROJECT:	CASA DE ORO LIBRARY (PW)	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-15617G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	9/2/2020
LOGGED BY:	DJT	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~438'

BORING: B-1

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25			4 10 20			SP		Loose, wet, brown, poorly-graded, fine to coarse grained SAND.	
						SM/SC		**RESIDUAL SOIL:** Medium dense to dense, moist, yellowish-brown, silty to clayey fine to medium grained SAND, oxidized.	
								Total Depth: 26.5' Groundwater Encountered at Approximately 9' Backfilled with Bentonite/Concrete Mix	
30									
35									
40									
45									
50									

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PROJECT:	CASA DE ORO LIBRARY (PW)	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-15617G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	9/2/2020
LOGGED BY:	DJT	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~436'

BORING: B-2

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		AC = 0-2" **QUATERNARY UNDOCUMENTED FILL:** Loose to medium dense, slightly moist, tannish brown, silty fine to coarse grained SAND with trace gravel and clay. Gravel encountered at 2'	
						SC		**QUATERNARY YOUNG ALLUVIUM:** Loose to medium dense, slightly moist, reddish brown clayey fine to medium grained SAND.	
5		Ring	5 5 5						
					▼ (groundwater)	SM		Loose, wet, brown, sitly fine to medium grained SAND, trace gravel.	
10		SPT	3 5 8						
						SM/SC/CL		Loose to medium dense, wet, brown, clayey to silty fine to coarse grained SAND with interbedded stiff CLAY.	
15		Ring	2 3 7					Clay seam at 16.5'	
20		Ring	6 12 16					Clay seam at 21'	
25									

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PROJECT:	CASA DE ORO LIBRARY (PW)	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-15617G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	9/2/2020
LOGGED BY:	DJT	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~436'

BORING: B-2

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25		X	7 22 24			SM/SC/CL		Loose to medium dense, wet, brown, clayey to silty fine to coarse grained SAND with interbedded stiff CLAY.	
						CL		**RESIDUAL SOIL:** Very stiff, moist brown CLAY	
						"SM"		**TERTIARY MISSION VALLEY FORMATION:** Very dense, dry, pale blue, SANDSTONE, highly weathered. Excavates as silty fine grained SAND.	
30		X	6 50						
								Total Depth: 31.0' Groundwater Encountered at Approximately 8' Backfilled with Bentonite/Concrete Mix	
35									
40									
45									
50									

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PROJECT:	CASA DE ORO LIBRARY (PW)	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-15617G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	9/2/2020
LOGGED BY:	DJT	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~437'

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								AC = 0-2"	
						CL		**QUATERNARY UNDOCUMENTED FILL:** Soft to medium stiff, slgihtly moist, dark brown, fine to medium grained sandy CLAY.	
						CL		**QUATERNARY YOUNG ALLUVIUM:** Medium stiff, moist, reddish-brown, fine to medium grained sandy CLAY, trace cobble.	
5			3 3 3						
						SM		Loose to meidum dense, slightly moist, dark brown silty fine to meidum grained SAND.	
						SC-CL		Medium dense, wet, brown, clayey fine to medium grained SAND with interbedded CLAY.	
10			1 5 8						
						SM		Medium dense, wet, brown, sitly fine to medium grained SAND, trace clay.	
15			1 7 9						
						CL		Stiff, wet, reddish brown, CLAY.	
20			7 11 13						
						SM/SC		**RESIDUAL SOIL:** Medium dense, moist, pale brown to gray, silty to clayey SAND.	
						"SM"		**TERTIARY MISSION VALLEY FORMATION:** Very dense, dry, pale gray, silty fine to medium grained SANDSTONE.	
25									

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PROJECT:	CASA DE ORO LIBRARY (PW)	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-15617G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	9/2/2020
LOGGED BY:	DJT	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~437'

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
25			16 30 44			"SM"		Very dense, dry, pale gray, silty fine to medium grained SANDSTONE.	
								Total Depth: 26.5' Groundwater Encountered at Approximately 9' Backfilled with Bentonite/Concrete Mix	
30									
35									
40									
45									
50									

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PROJECT:	CASA DE ORO LIBRARY (PW)	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-15617G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	9/2/2020
LOGGED BY:	DJT	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~438.'

BORING: B-4

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		Topsoil: 0-6" **QUATERNARY YOUNG ALLUVIUM:** Soft to medium stiff, slgihtly moist, dark brown, fine to medium grained sandy CLAY.	
5		▯	4 3 2			SM		Loose, moist, brown silty fine to coarse grained SAND.	
								Total Depth: 6.5' No Groundwater Encountered Backfilled with Bentonite/Concrete Mix	
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.

In-Place Moisture/Density
The in-place moisture content and dry unit weight of selected samples were determined using relatively undisturbed chunk soil samples.

Modified Proctor
Laboratory maximum dry density and optimum moisture content were evaluated according to ASTM D 1557, Method A. A mechanically operated rammer was used during the compaction process.

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 measured by the California Test. 301. The graphically determined "R" value at an exudation pressure of 300 pounds per square inch 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.

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

EXPANSION INDEX TEST

ASTM D 4829

LOCATION	DEPTH (feet)	EXPANSION INDEX	EXPANSION POTENTIAL
B-3	0-5	38	Low

IN-PLACE MOISTURE AND DENSITY

LOCATION	DEPTH (feet)	% MOISTURE	DRY DENSITY
B-2	10	11.4	119.8

SULFATE

LOCATION	DEPTH (feet)	RESULTS ppm
B-2	0-5	28.9

CHLORIDE

LOCATION	DEPTH (feet)	RESULTS ppm
B-2	0-5	ND

p.H.

LOCATION	DEPTH (feet)	RESULTS
B-2	0-5	8.23

RESISTIVITY

CALIFORNIA TEST 424

LOCATION	DEPTH (feet)	RESULTS ohms-cm
B-2	0-5	7980

ATTERBERG LIMITS

LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-1	15	Non-Plastic	Non-Plastic	Non-Plastic
B-1	25	Non-Plastic	Non-Plastic	Non-Plastic
B-2	10	Non-Plastic	Non-Plastic	Non-Plastic
B-2	15	Non-Plastic	Non-Plastic	Non-Plastic
B-2	20	26	9	CL
B-2	25	28	13	CL
B-3	10	22	8	CL
B-3	20	39	21	CL

MODIFIED PROCTOR

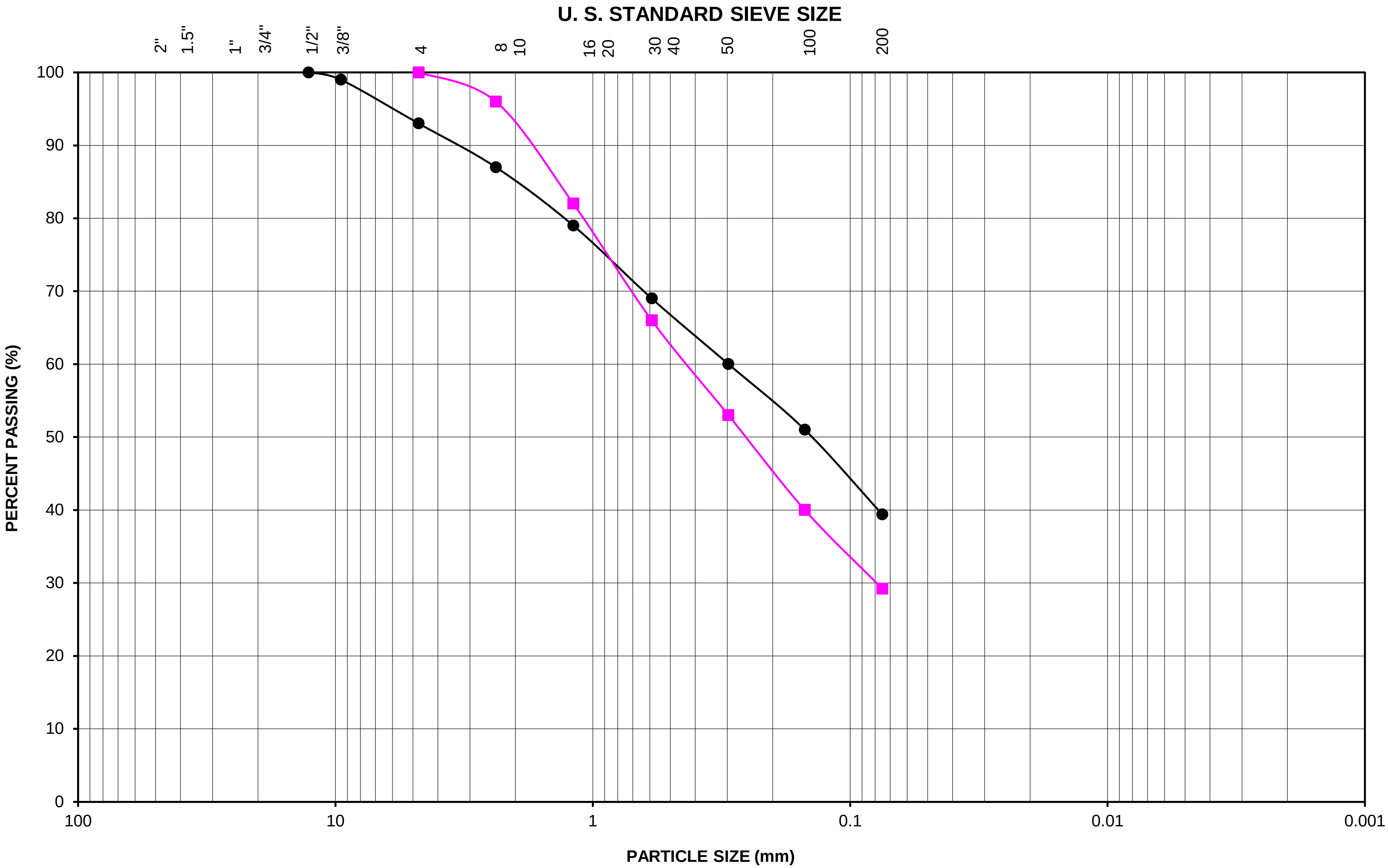
ASTM D 1557

LOCATION	DEPTH (feet)	MAXIUM DRY DENSITY (PCF)	OPTIMUM MOISTURE (%)
B-3	0-5	121.1	13.1

RESISTANCE "R"-VALUE

CALTEST 301

LOCATION	DEPTH (feet)	R-VALUE
B-4	0-5	12



PARTICLE SIZE ANALYSIS

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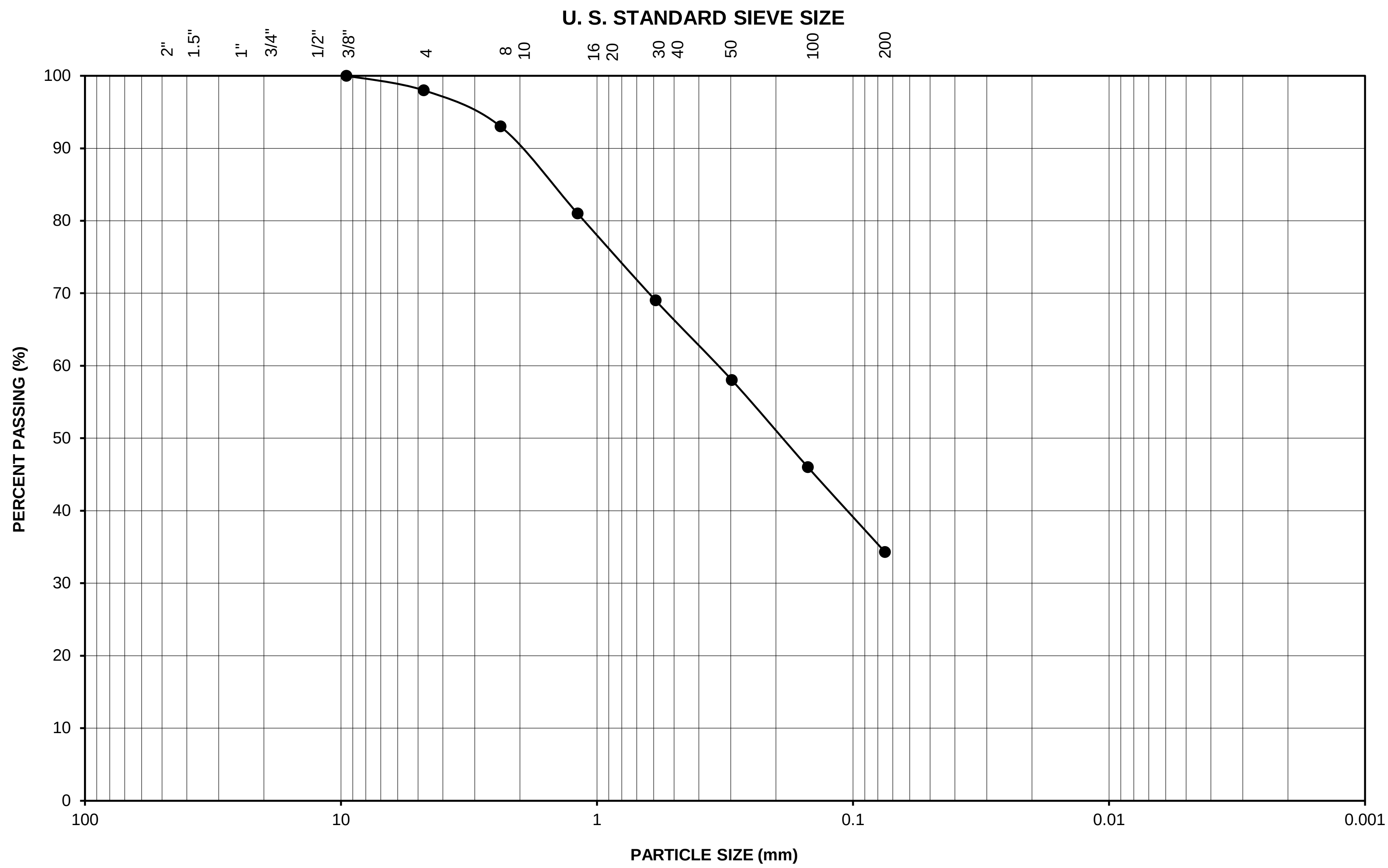
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-2	5	●			SC
B-2	15	■			SM/SC
CTE JOB NUMBER:		10-15617G	FIGURE:		C-1



PARTICLE SIZE ANALYSIS

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Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-2	25	●			SM/SC

CTE JOB NUMBER: 10-15617G FIGURE: C-2

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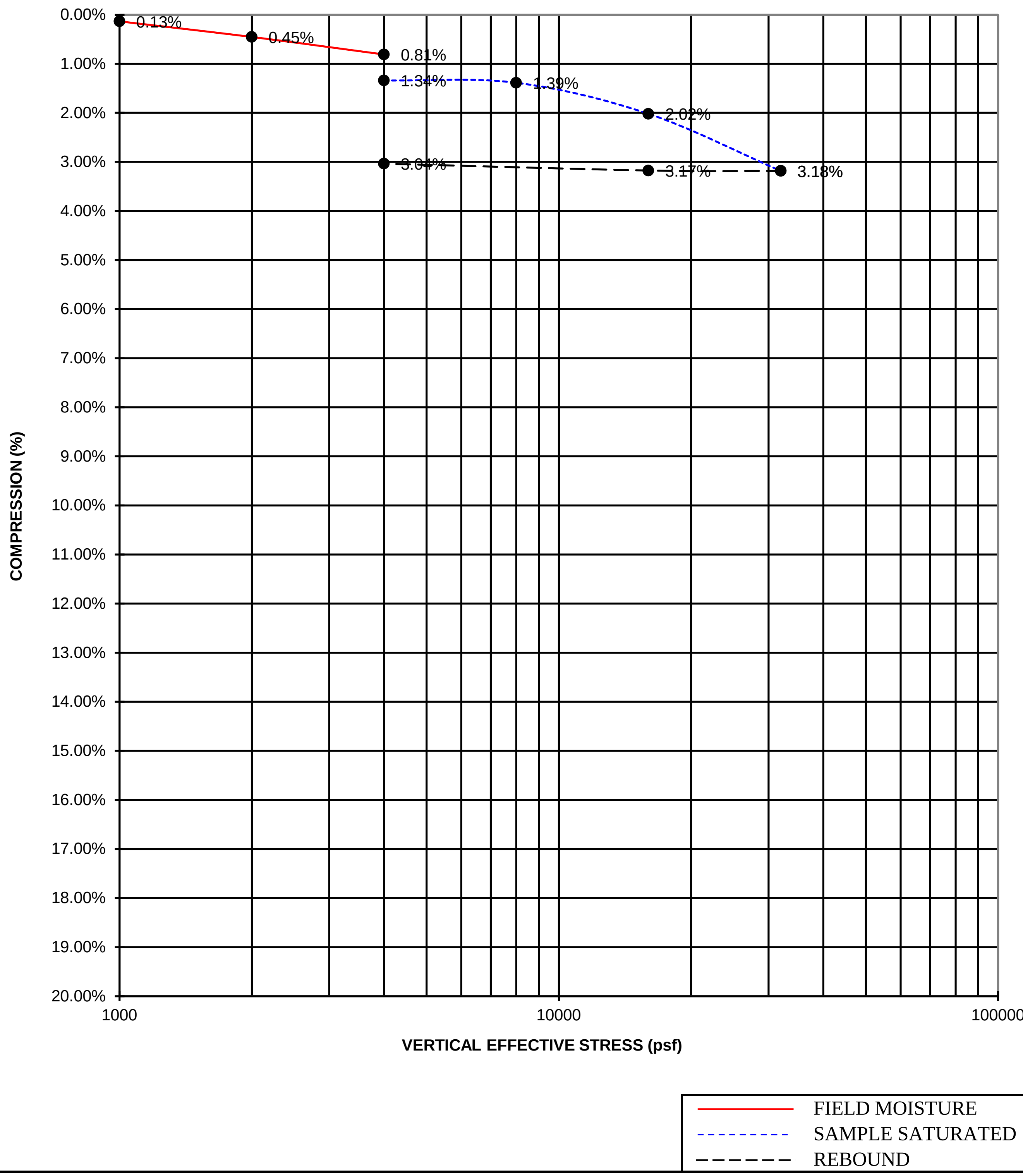
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Consolidation Test ASTM D2435

Project Name:	Casa De Oro Library				
Project Number:	10-15617G	Sample Date:	9/2/2020	Initial Moisture (%):	11.4
Lab Number:	31213	Test Date:	9/10/2020	Final Moisture (%):	9.6
Sample Location:	B-2 @ 10'	Tested By:	JH	Initial Dry Density (PCF):	119.8
Sample Description:	Moderate Brown (SM)			Final Dry Density (PCF):	123.6

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.

<u>Section 5 - Site Protection</u>

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

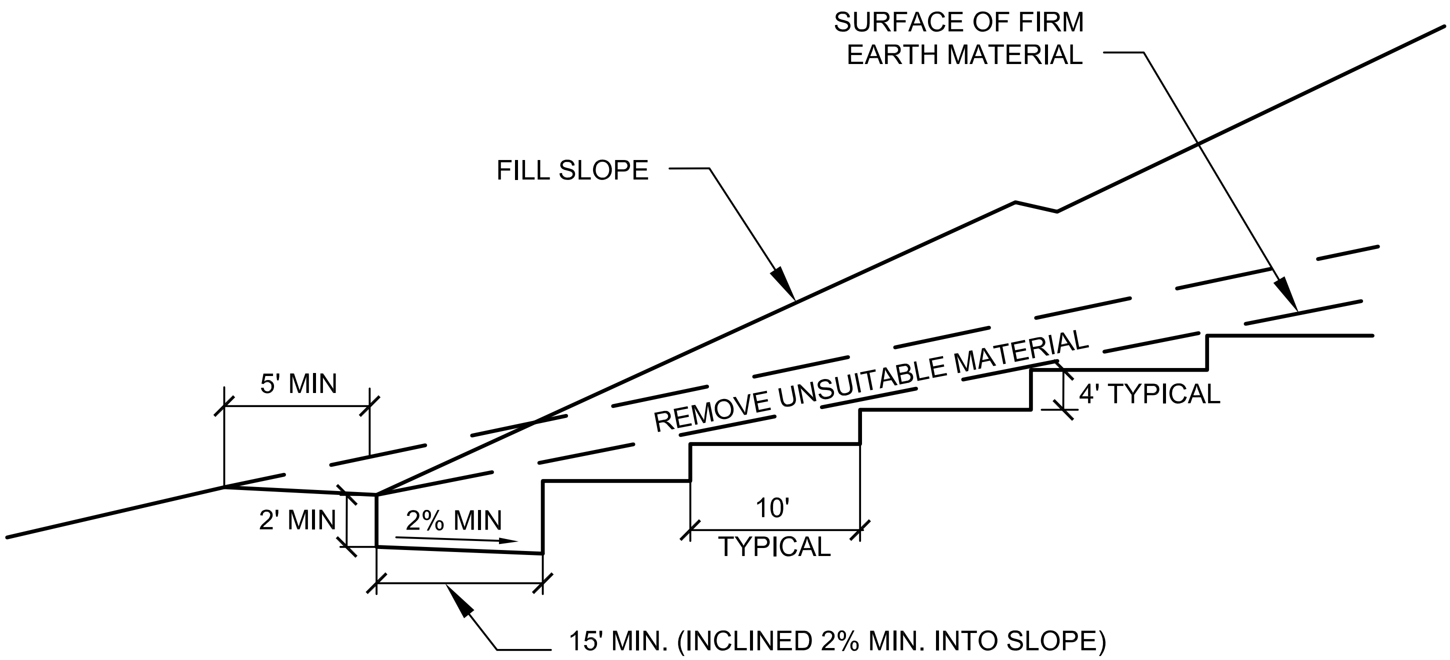
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

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.

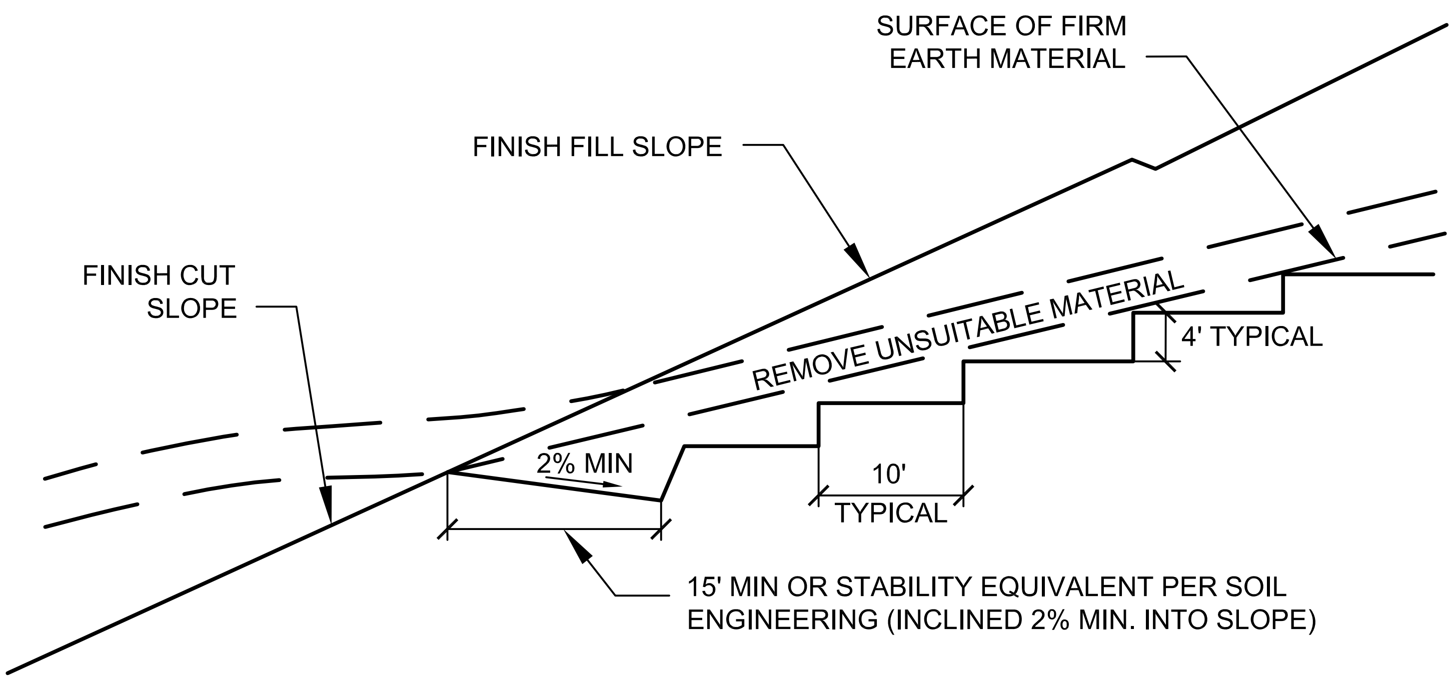
If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

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).

BENCHING FILL OVER NATURAL

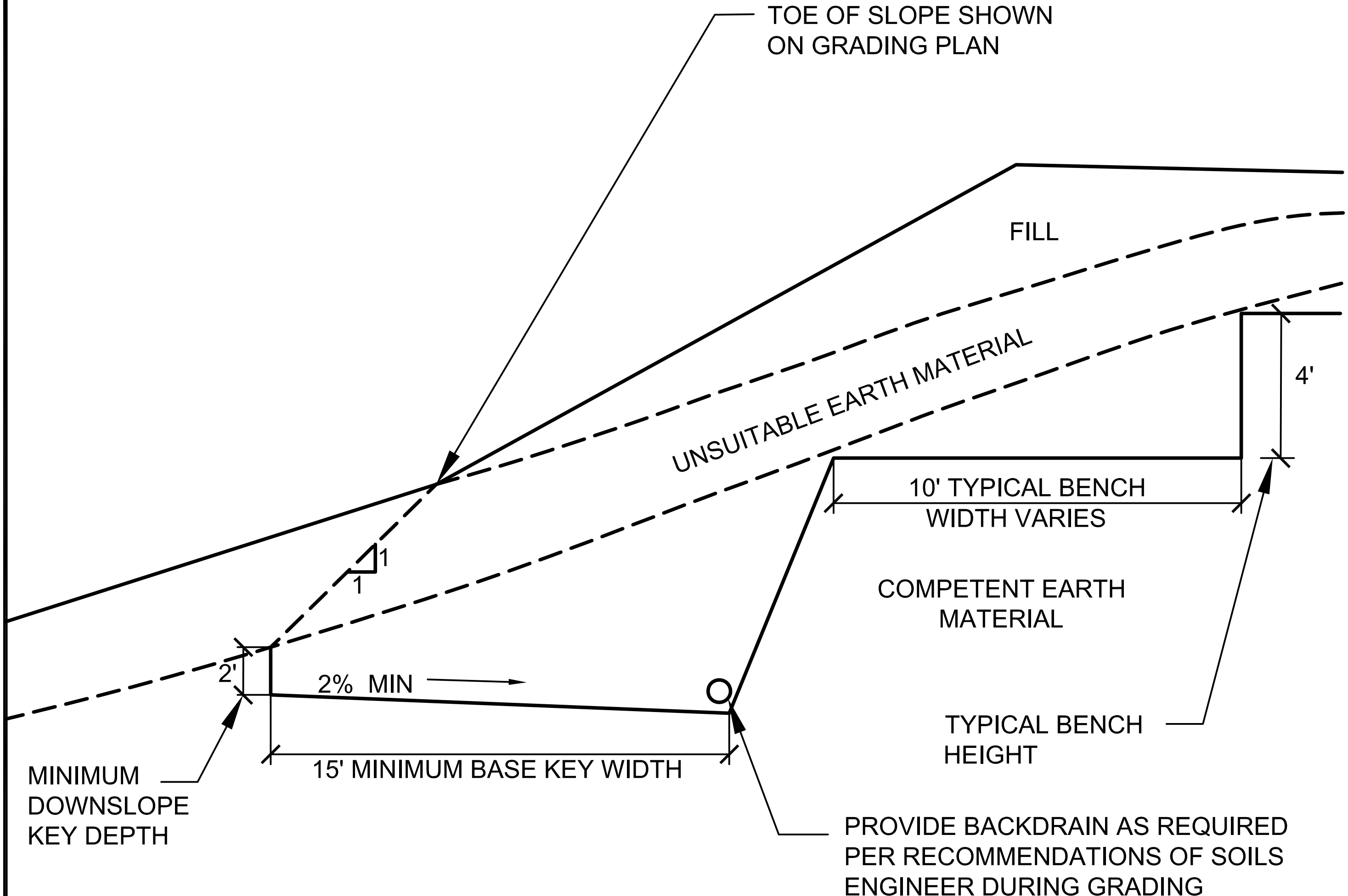


BENCHING FILL OVER CUT



NOT TO SCALE

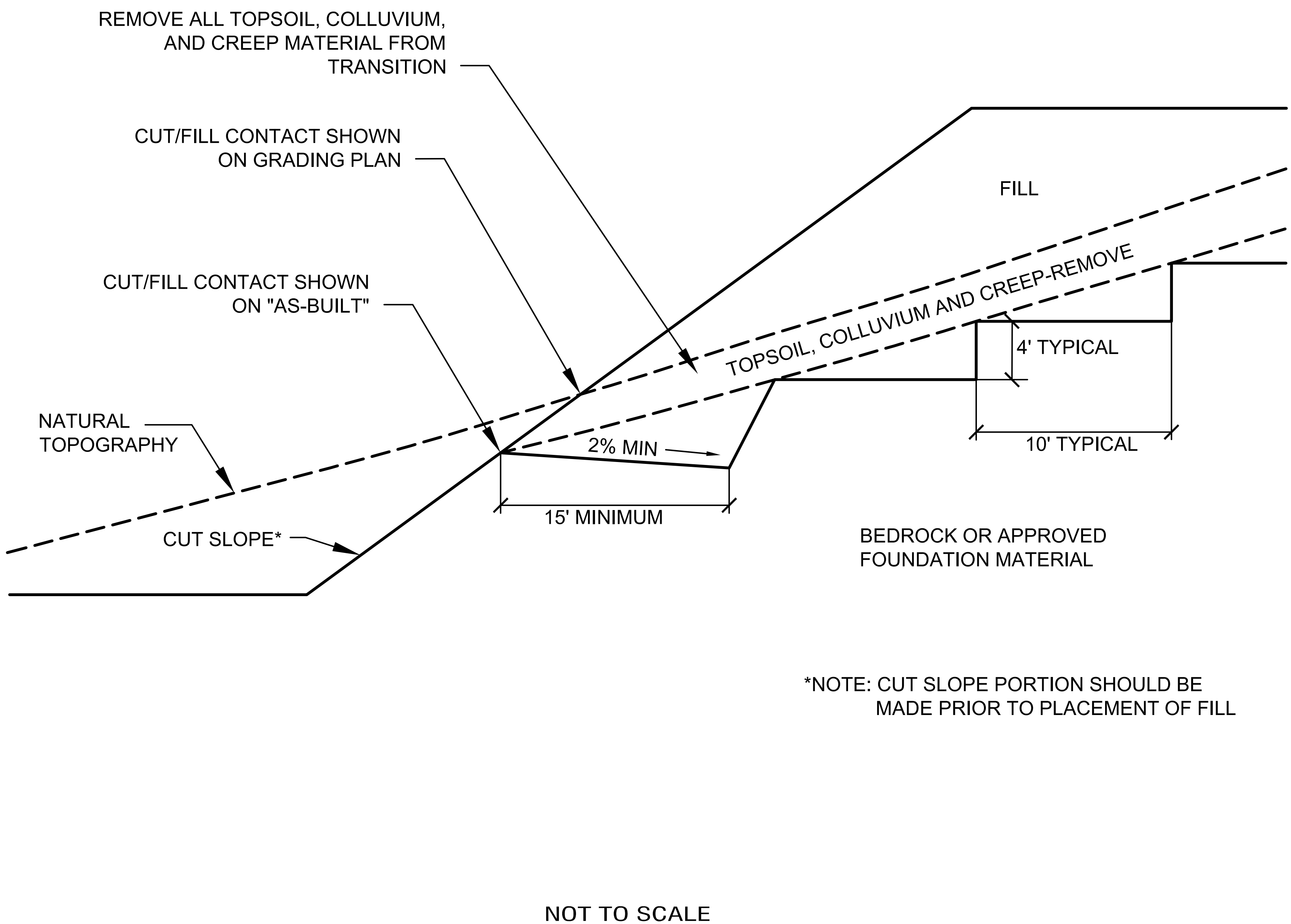
BENCHING FOR COMPACTED FILL DETAIL



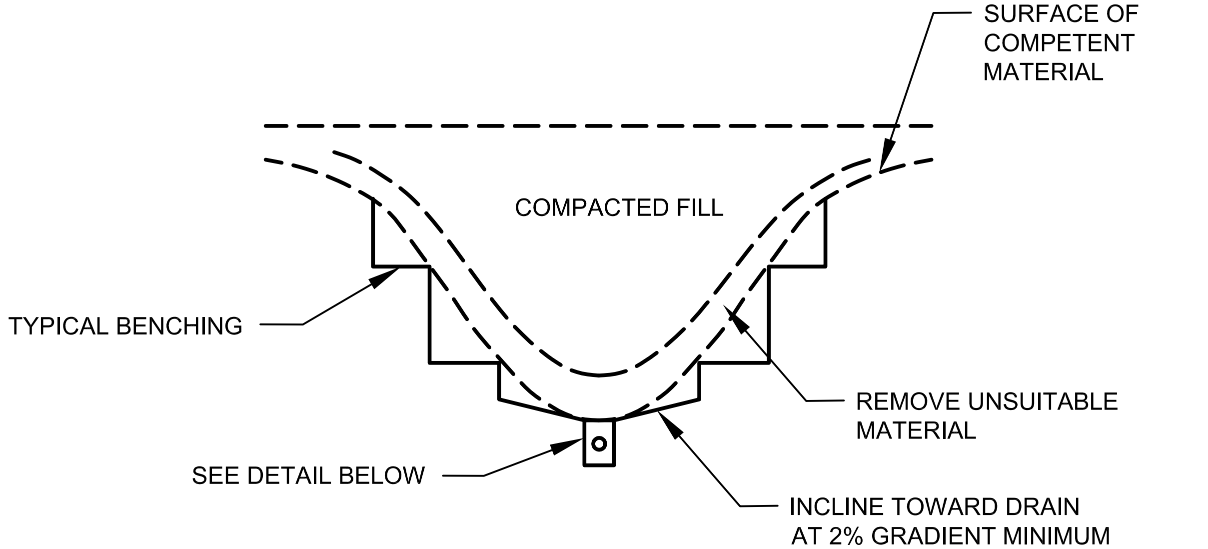
WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

NOT TO SCALE

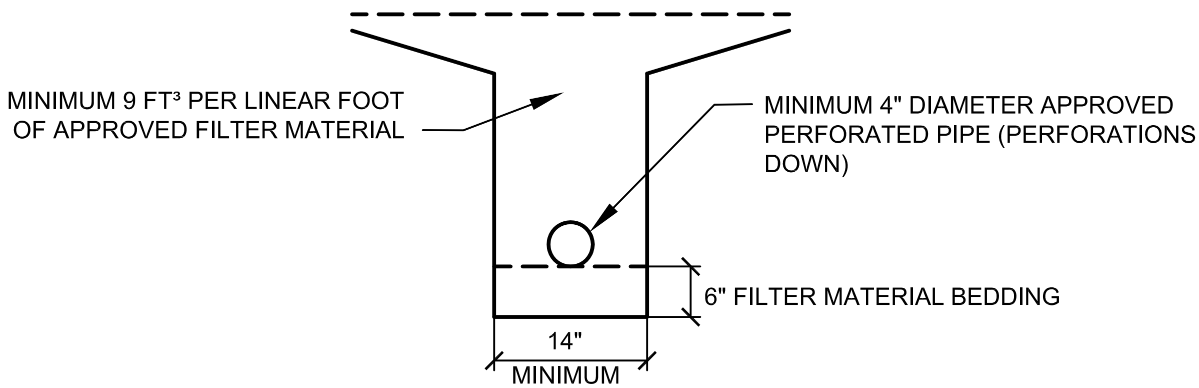
FILL SLOPE ABOVE NATURAL GROUND DETAIL



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

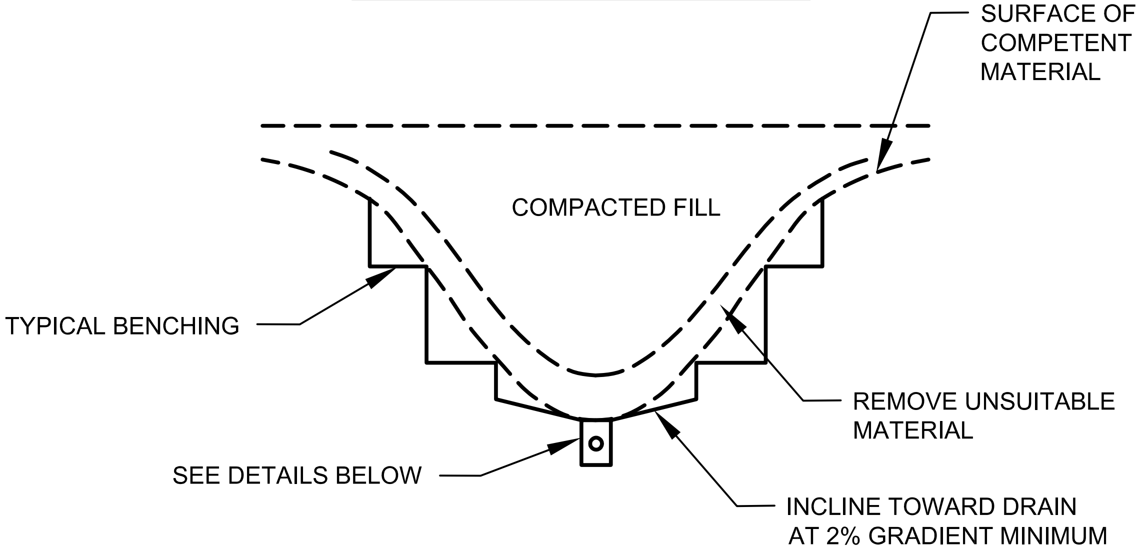
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

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

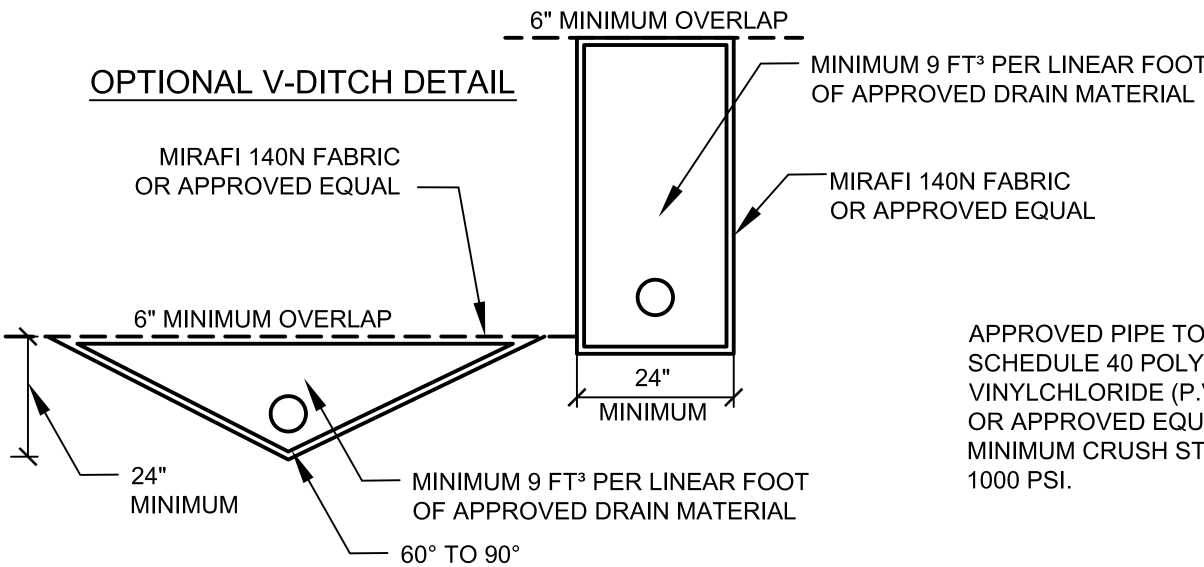
NOT TO SCALE

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

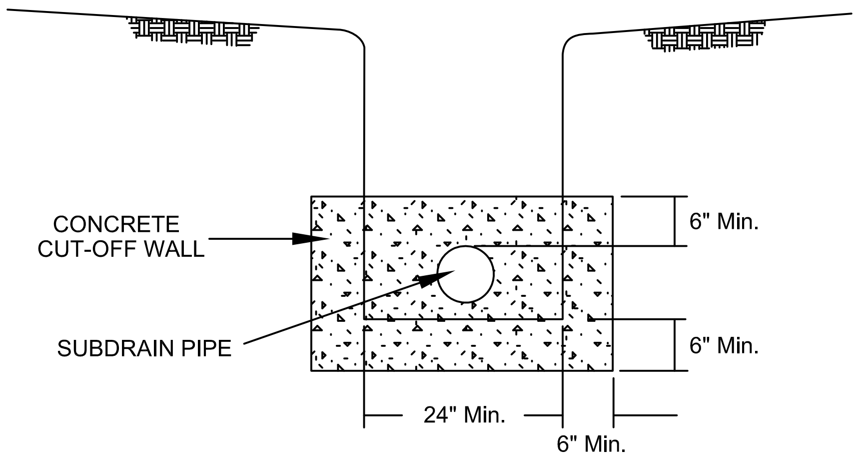
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

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

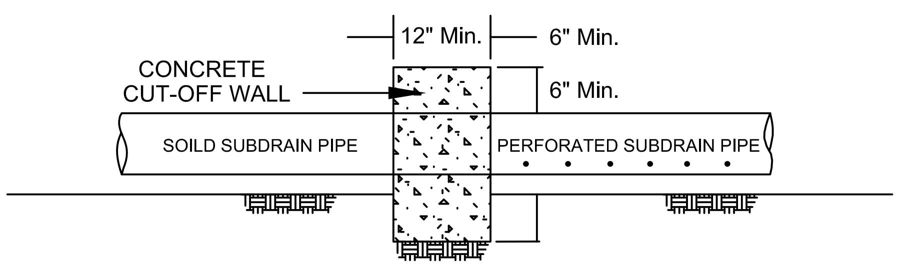
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



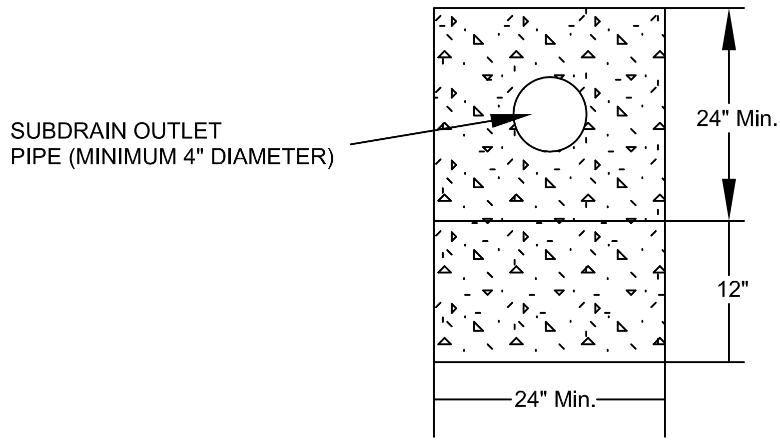
SIDE VIEW



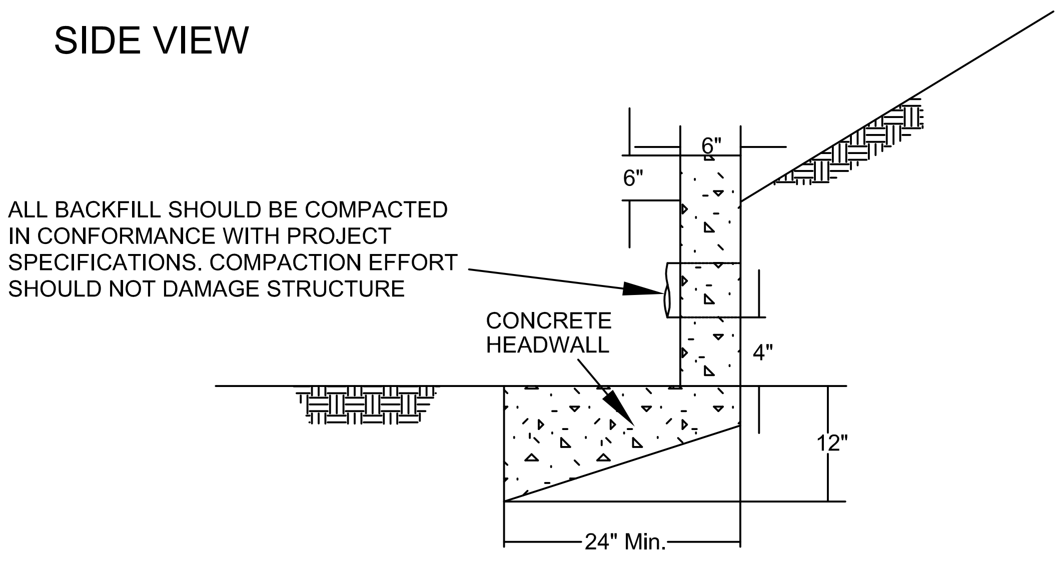
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



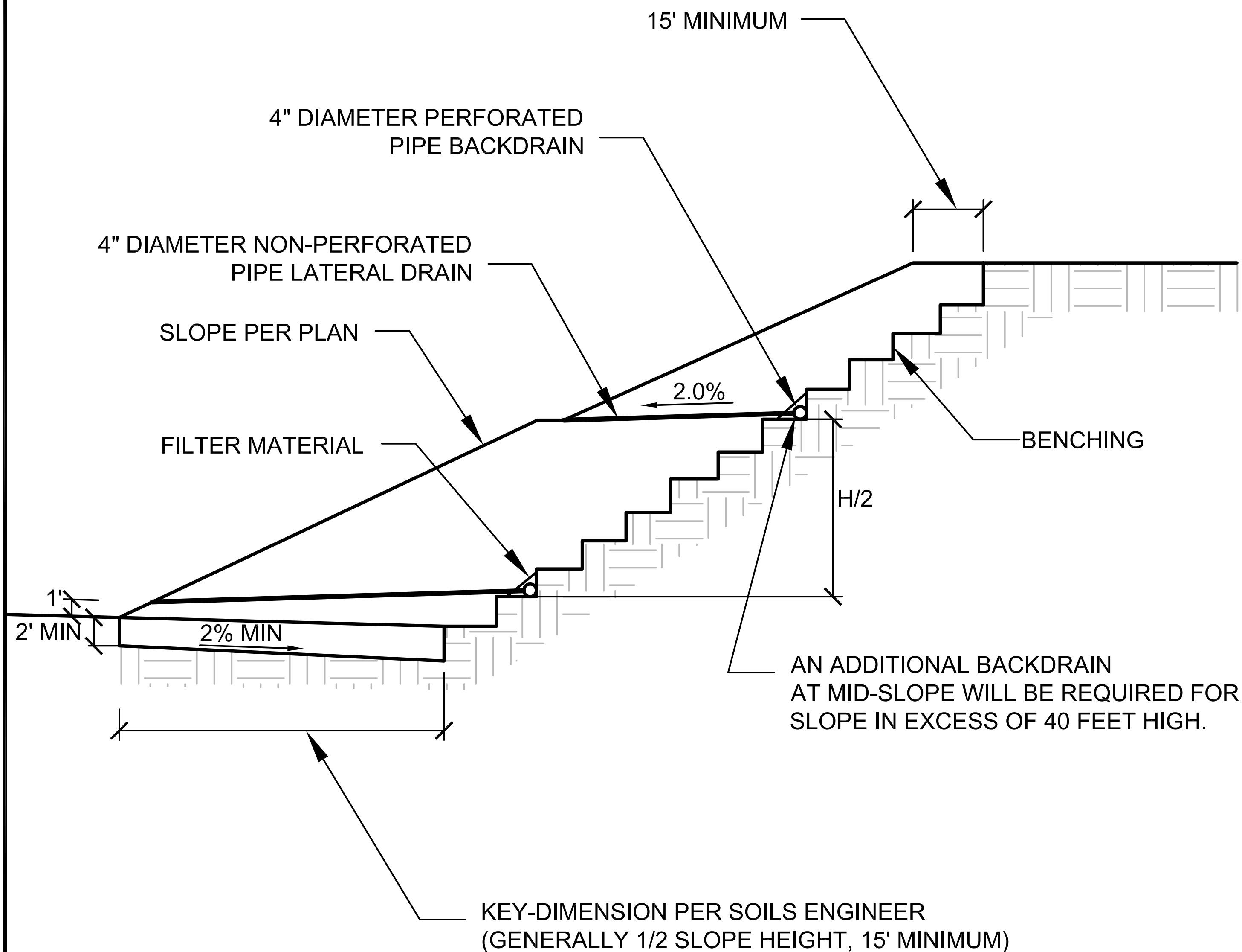
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

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

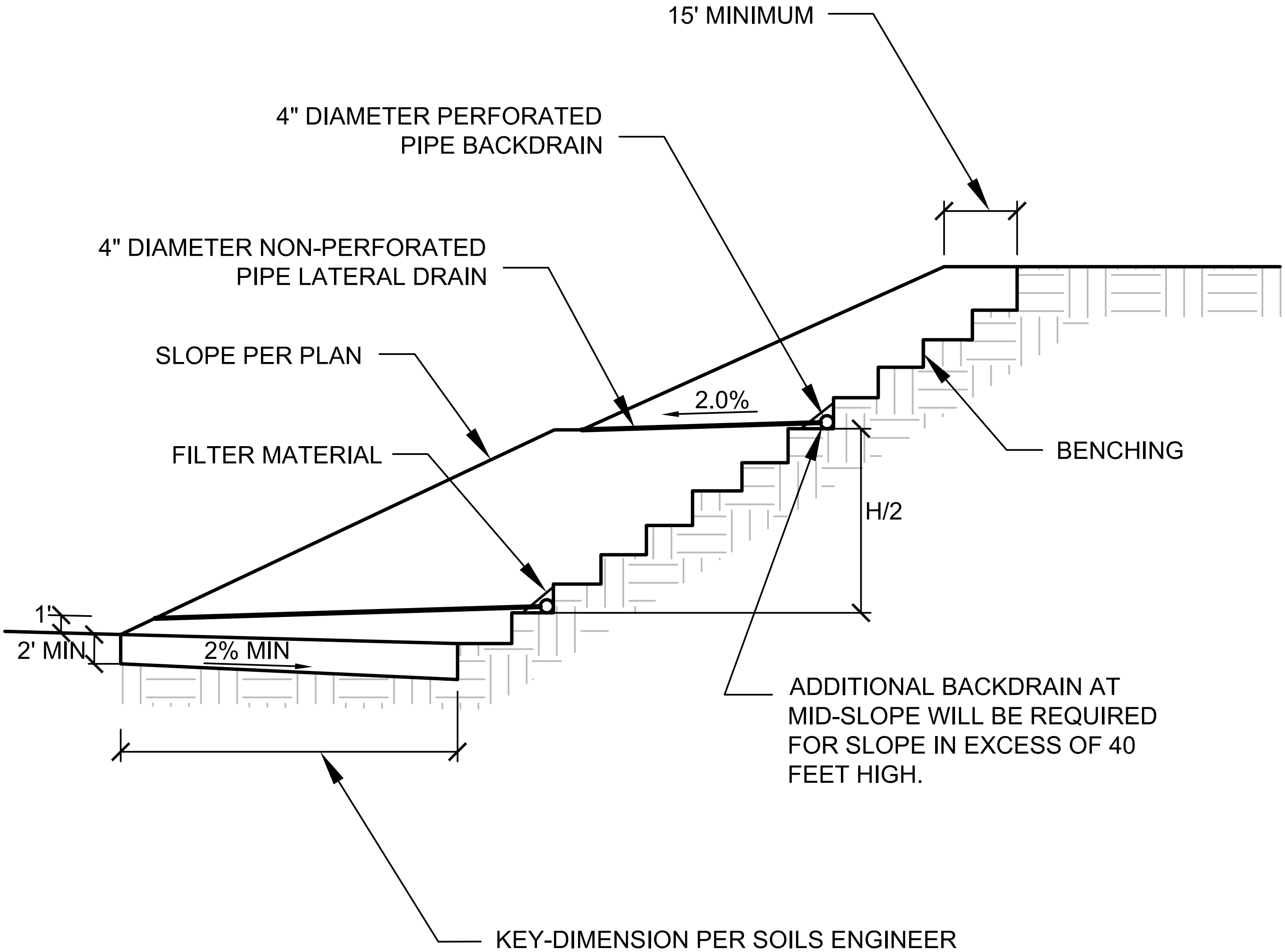
TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

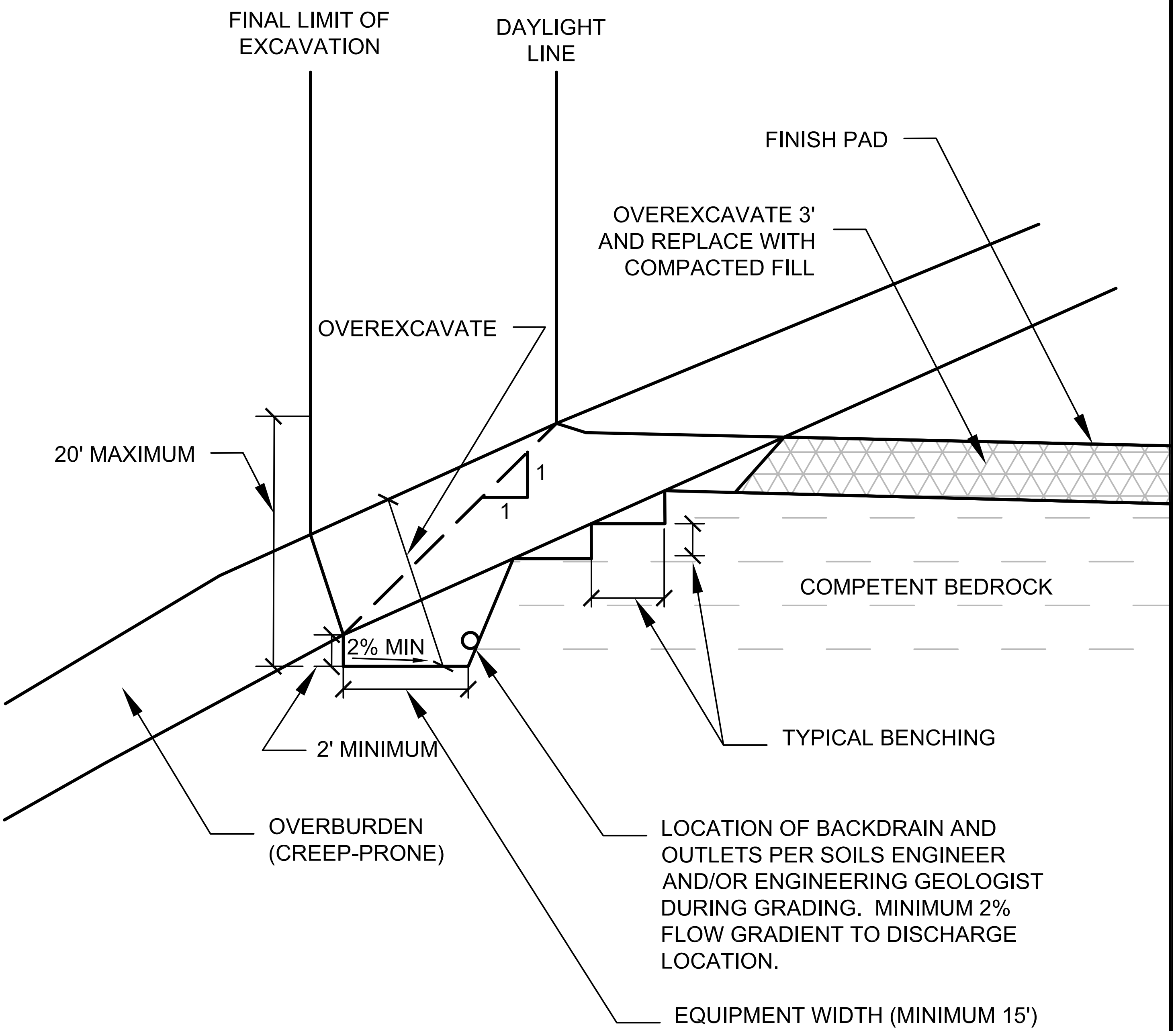
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

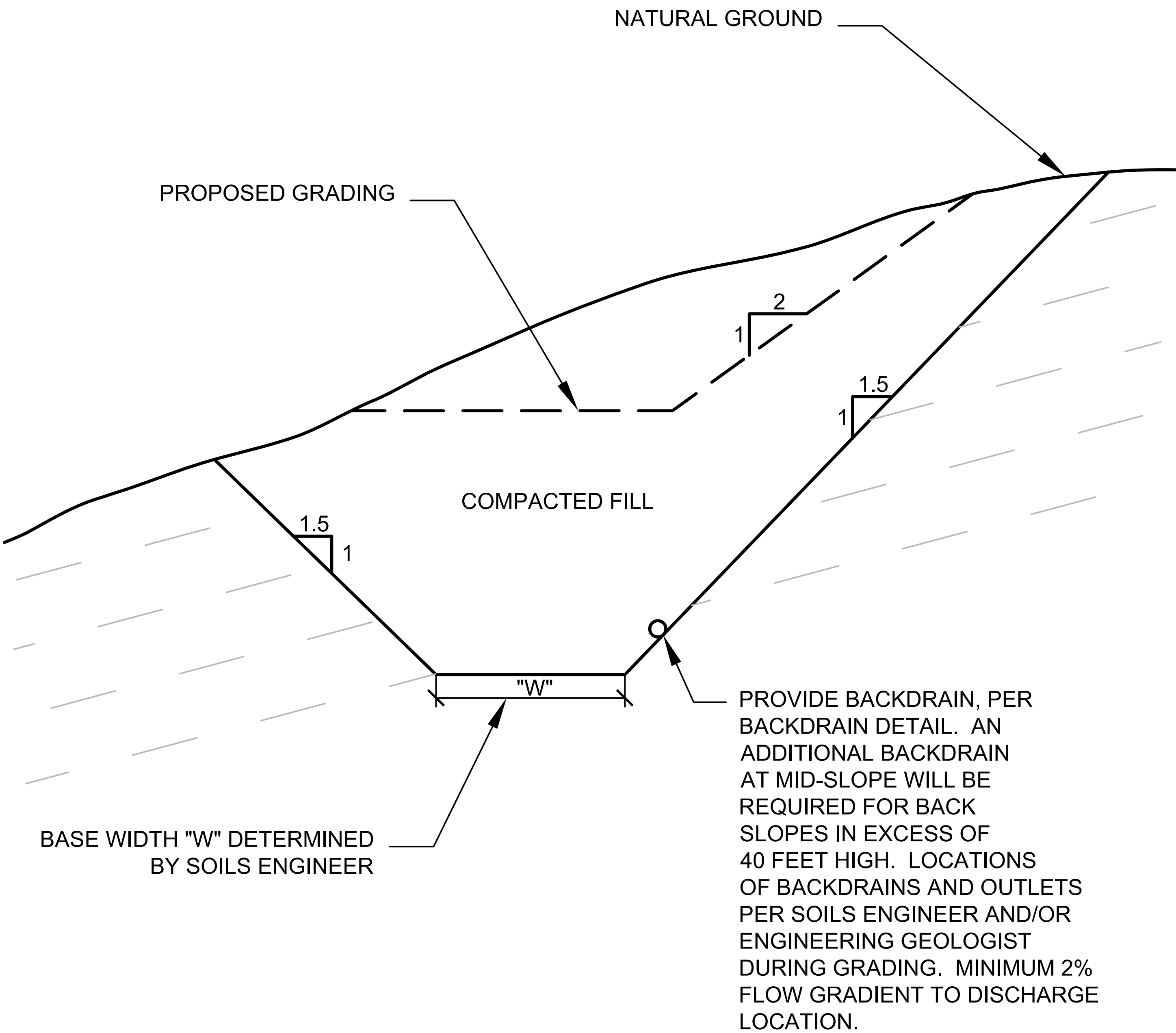
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL



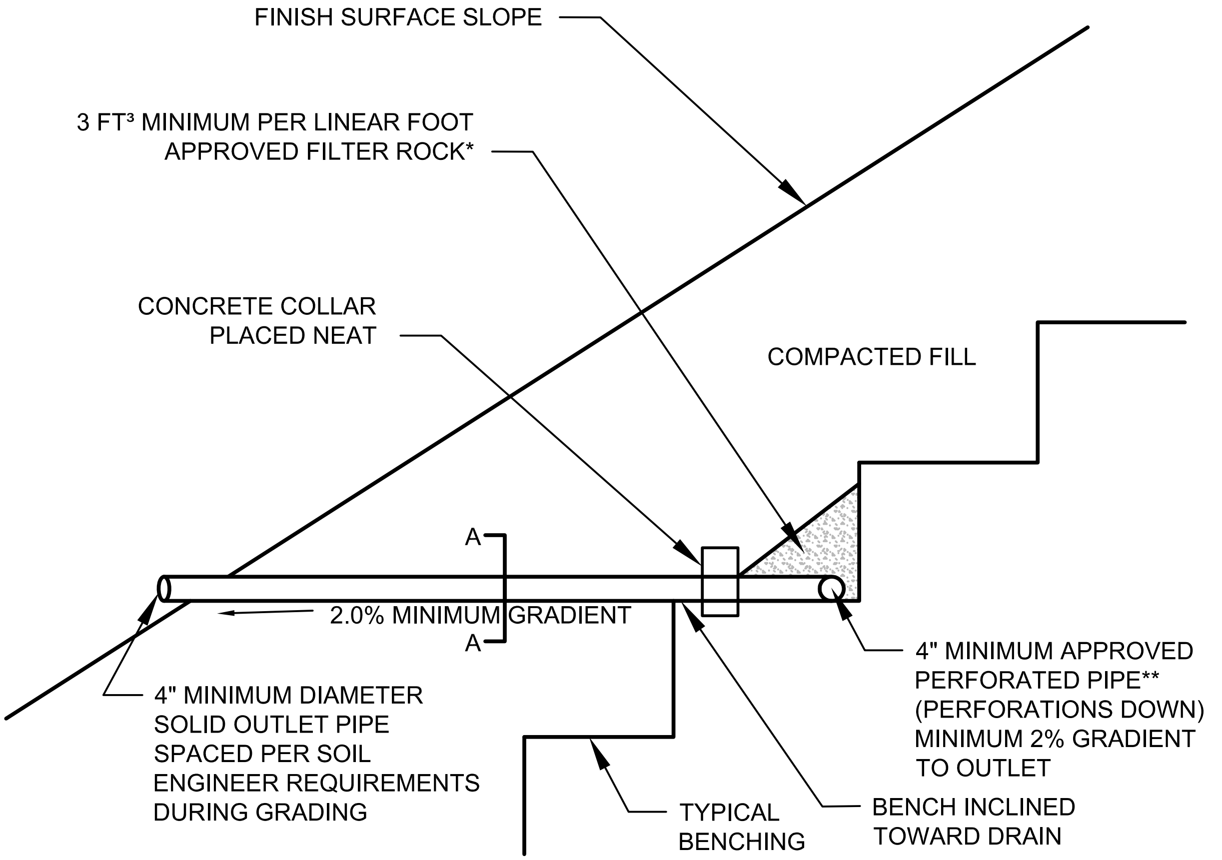
NOT TO SCALE

DAYLIGHT SHEAR KEY DETAIL

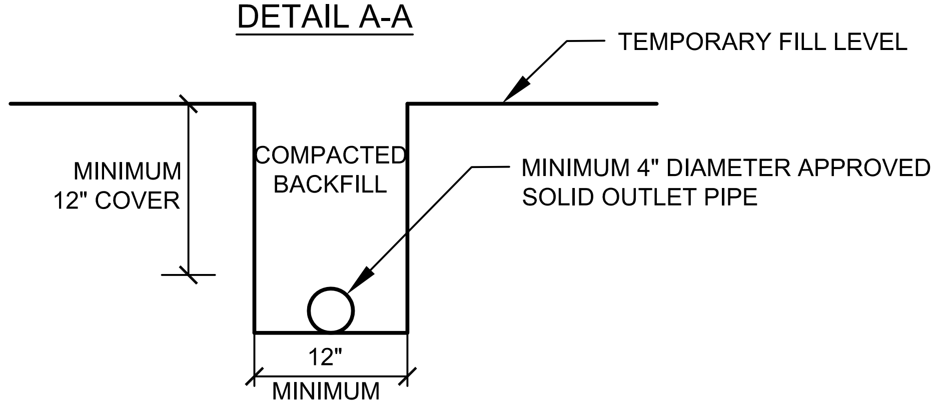


NOT TO SCALE

TYPICAL SHEAR KEY DETAIL



DETAIL A-A



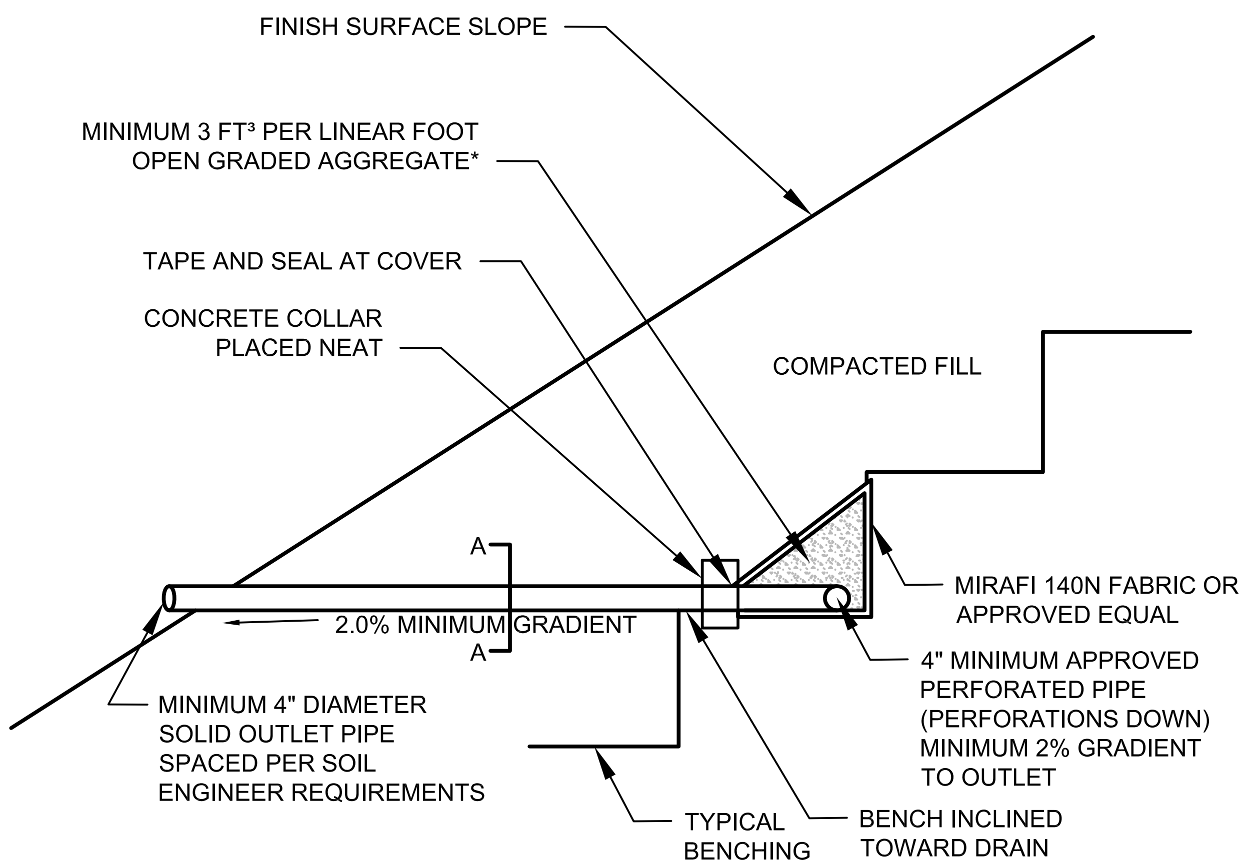
*FILTER ROCK TO MEET FOLLOWING
SPECIFICATIONS OR APPROVED EQUAL:

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

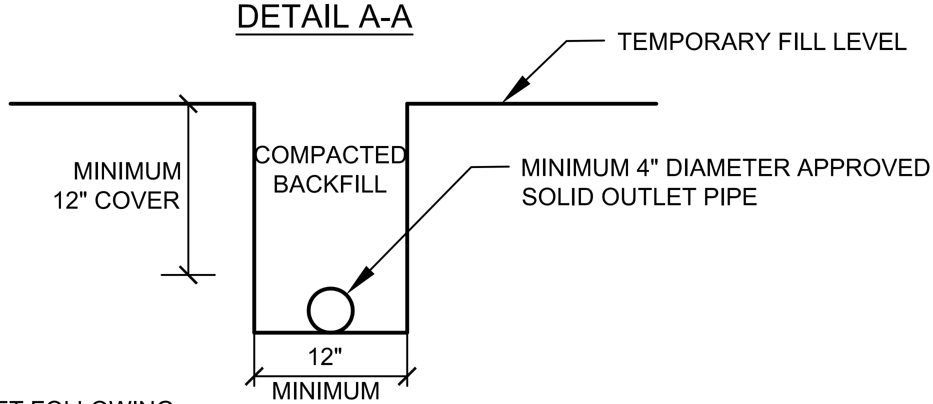
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE
(P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

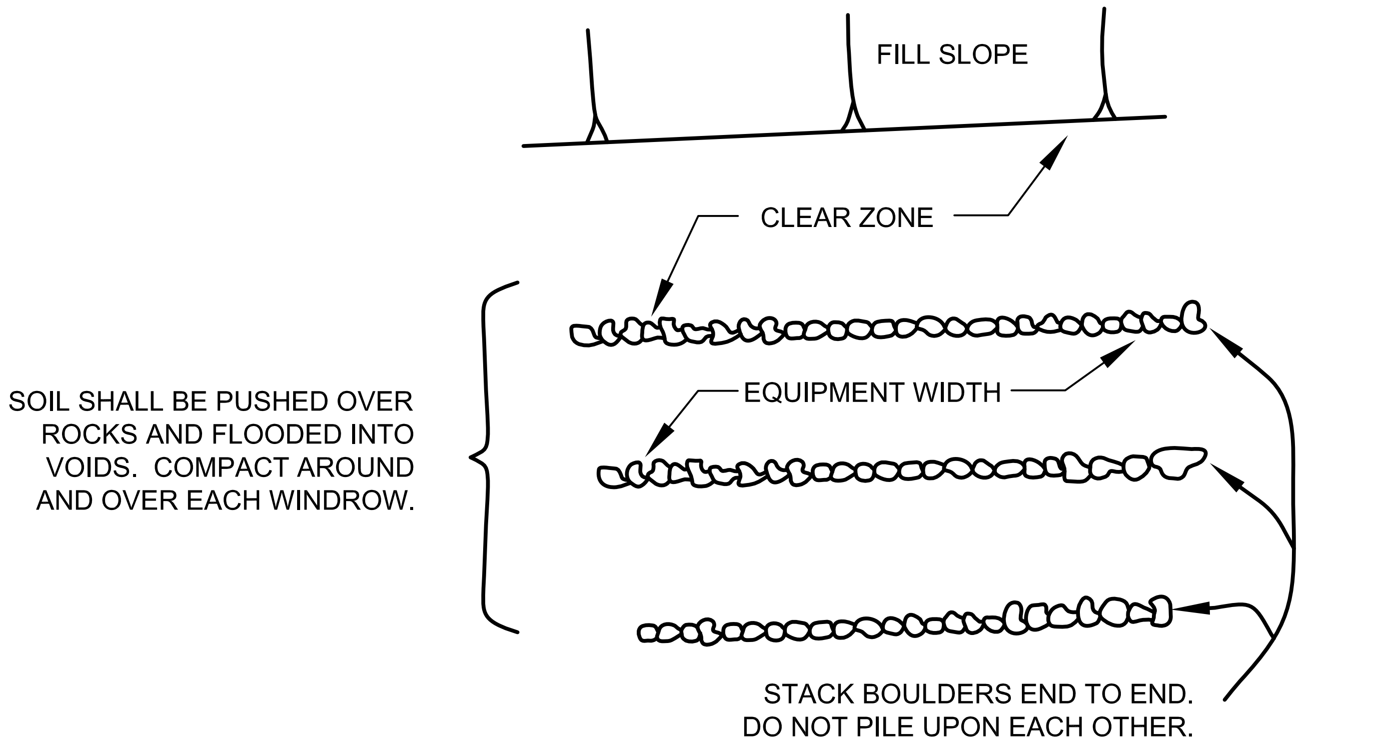


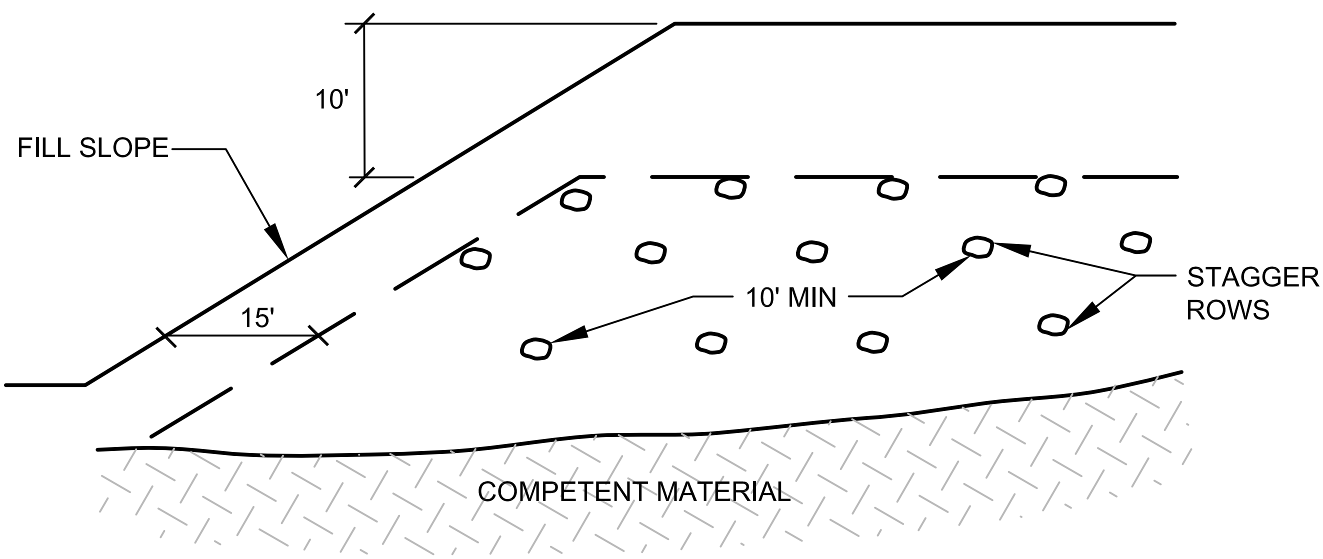
*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

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

NOT TO SCALE

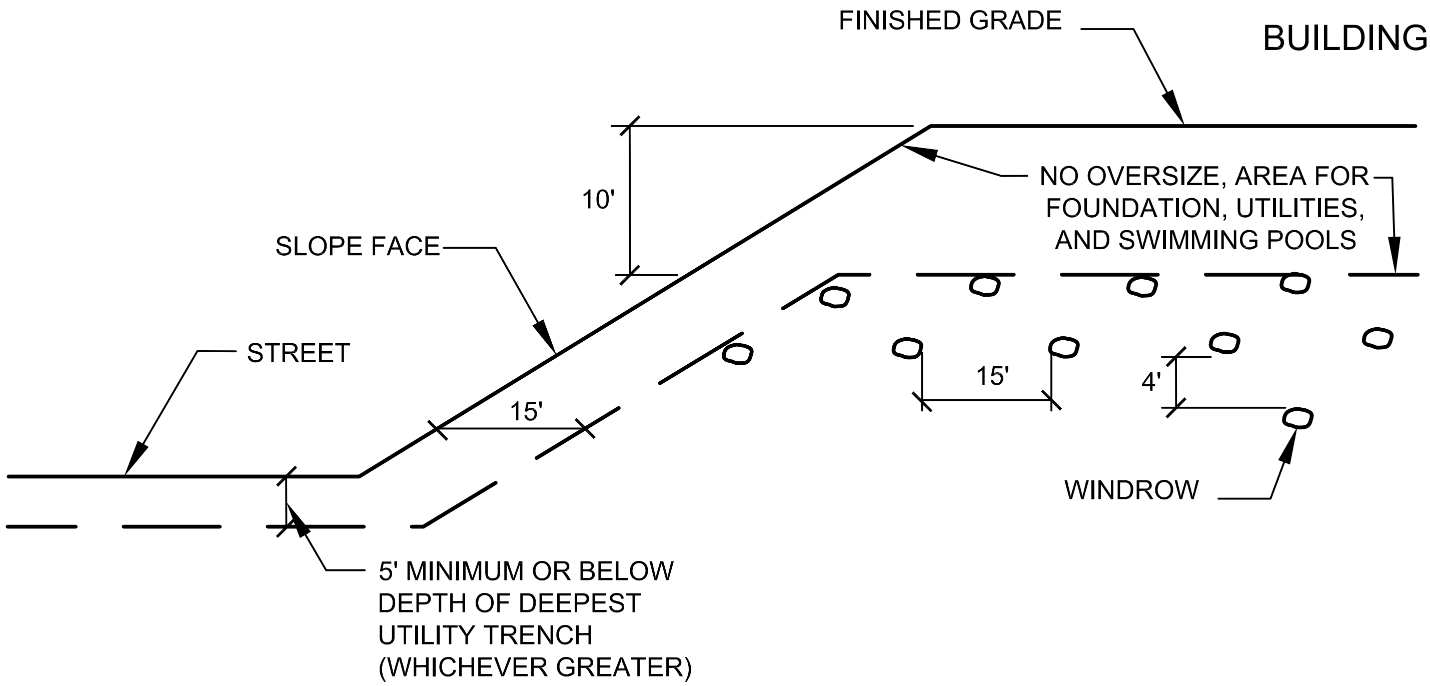
BACKDRAIN DETAIL (GEOFRABIC)



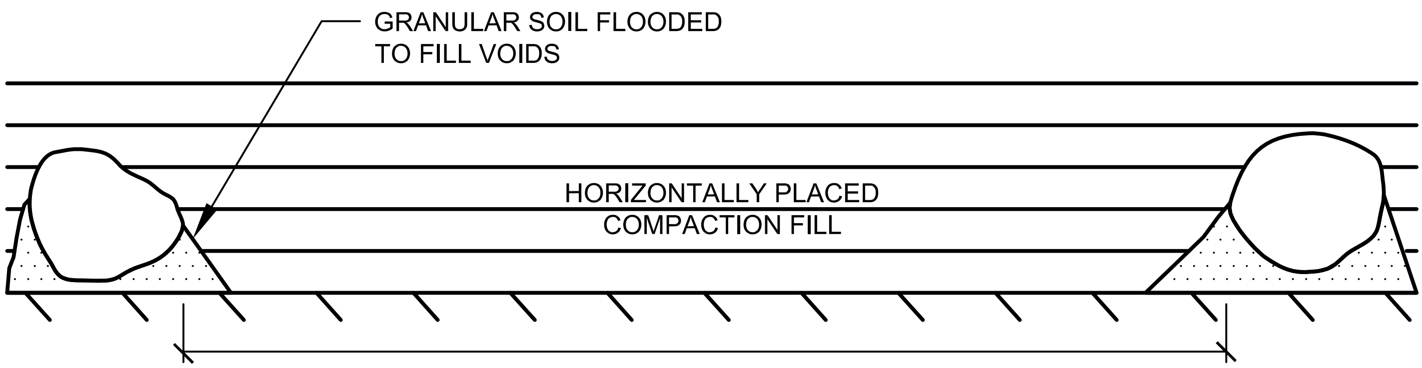


NOT TO SCALE

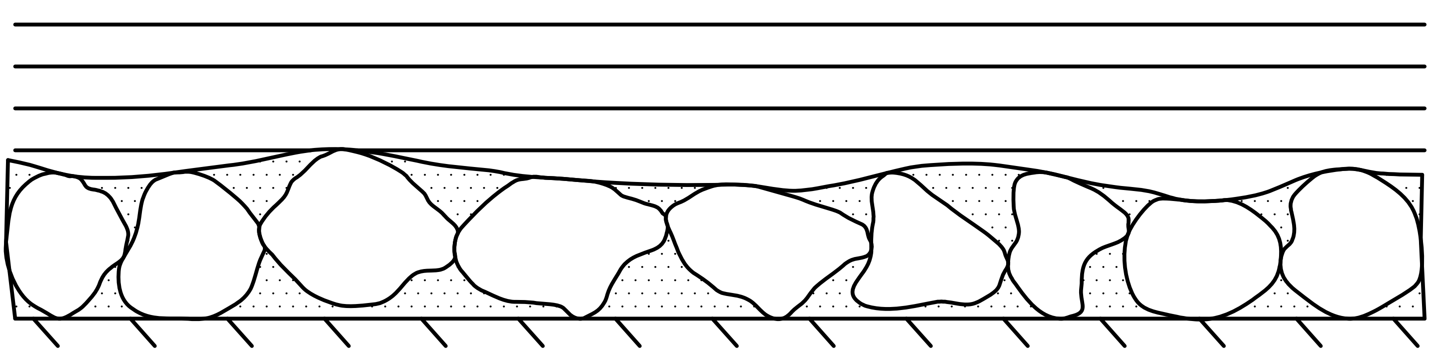
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

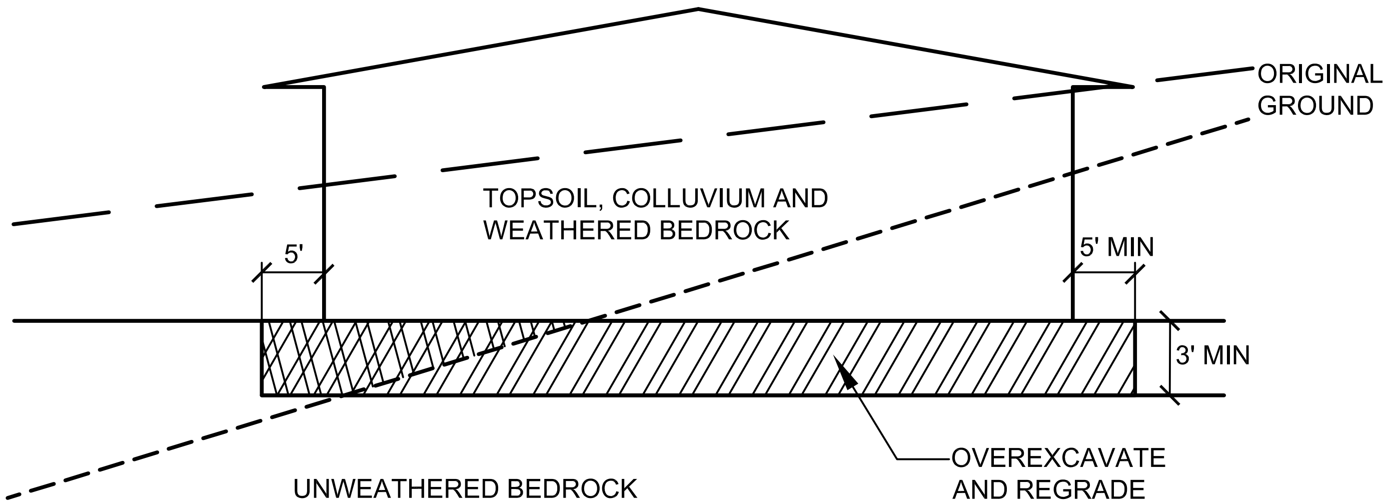


NOT TO SCALE

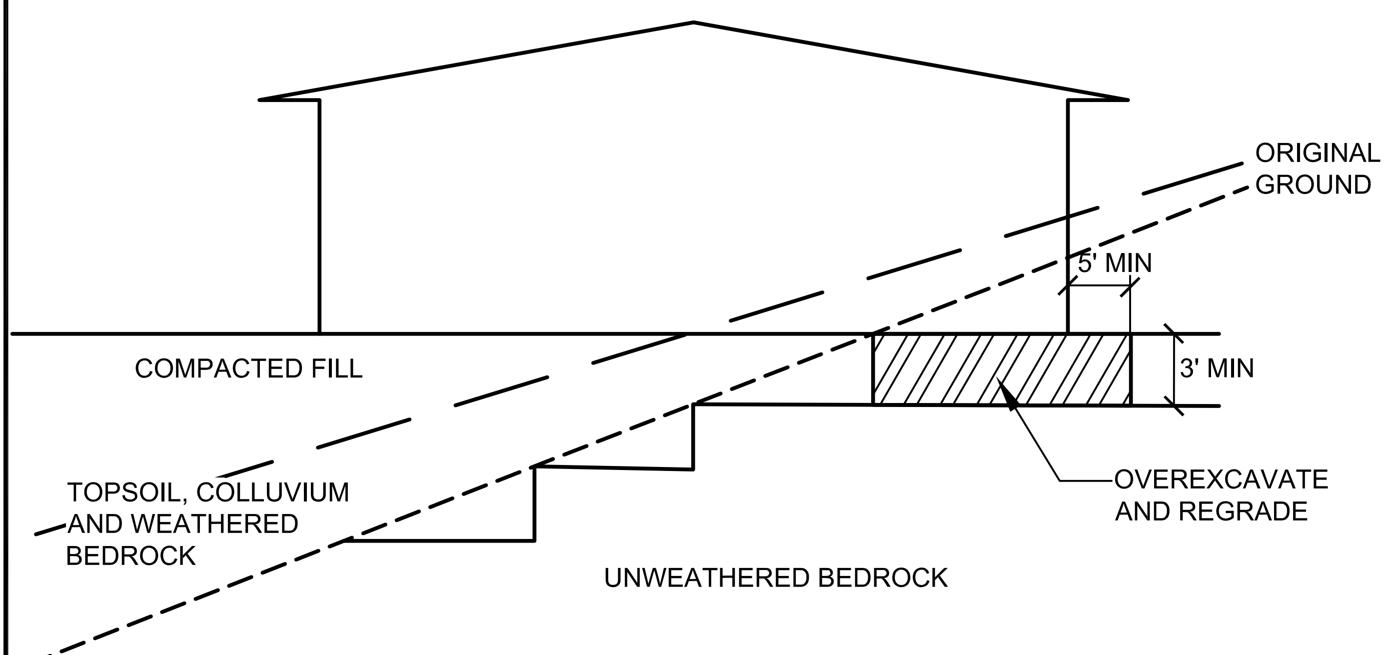
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL

APPENDIX E

RESULTS OF PERCOLATION TESTING

Project:	Casa de Oro Library						
Project No.:	10-15617G						Tables E-1 to E-4

Percolation Field Data and Calculated Rates

P-1 — **Total Depth: 60 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/minute	Percolation Rate inches/hour
7:10:00	Initial	None	48.19	initial	-		
7:40:00	30	NO	48.19	48.19	0.00	0.000	0.000
8:10:00	30	NO	48.19	48.25	0.06	0.002	0.125
8:40:00	30	NO	48.25	48.31	0.06	0.002	0.125
9:10:00	30	NO	48.31	48.38	0.06	0.002	0.125
9:40:00	30	NO	48.38	48.44	0.06	0.002	0.125
10:10:00	30	NO	48.44	48.44	0.00	0.000	0.000
10:40:00	30	NO	48.44	48.50	0.06	0.002	0.125
11:10:00	30	NO	48.50	48.56	0.06	0.002	0.125

P-2 — **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/minute	Percolation Rate inches/hour
7:15:00	Initial	None	30.50	initial	-		
7:45:00	30	NO	30.50	30.69	0.188	0.006	0.375
8:15:00	30	NO	30.69	30.88	0.188	0.006	0.375
8:45:00	30	NO	30.88	31.00	0.125	0.004	0.250
9:15:00	30	NO	31.00	31.13	0.125	0.004	0.250
9:45:00	30	NO	31.13	31.19	0.063	0.002	0.125
10:15:00	30	NO	31.19	31.25	0.063	0.002	0.125
10:45:00	30	NO	31.25	31.31	0.063	0.002	0.125
11:15:00	30	NO	31.31	31.38	0.063	0.002	0.125

P-3 — **Total Depth: 60 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/minute	Percolation Rate inches/hour
7:20:00	Initial	None	47.81	initial	-		
7:50:00	30	NO	47.81	48.38	0.56	0.019	1.125
8:20:00	30	48.0625	48.38	48.88	0.50	0.017	1.000
8:50:00	30	NO	48.06	48.50	0.44	0.015	0.875
9:20:00	30	47.6875	48.50	49.00	0.50	0.017	1.000
9:50:00	30	NO	47.69	47.94	0.25	0.008	0.500
10:20:00	30	NO	47.94	48.13	0.19	0.006	0.375
10:50:00	30	NO	48.13	48.31	0.19	0.006	0.375
11:20:00	30	NO	48.31	48.50	0.19	0.006	0.375

P-4 — **Total Depth: 42 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/minute	Percolation Rate inches/hour
7:25:00	Initial	None	35.25	initial	-		
7:55:00	30	NO	35.25	36.19	0.94	0.031	1.875
8:25:00	30	35.25	36.19	38.25	2.06	0.069	4.125
8:55:00	30	NO	35.25	36.25	1.00	0.033	2.000
9:25:00	30	34.25	36.25	37.38	1.13	0.038	2.250
9:55:00	30	NO	34.25	35.25	1.00	0.033	2.000
10:25:00	30	34.4375	35.25	36.31	1.06	0.035	2.125
10:55:00	30	33.75	34.44	35.50	1.06	0.035	2.125
11:25:00	30	NO	33.75	34.81	1.06	0.035	2.125

Percolation Rate Conversion P-1

		Inches
Time Interval,	Δt =	30
Final Depth of Water,	D_f =	48.56
Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	48.50
Total Depth of Test Hole,	D_T =	60

H_o =	11.5	in
H_f =	11.4375	in
$\Delta H = \Delta D$ =	0.0625	in
H_{avg} =	11.46875	in
I_t =	0.019	in/hr

Percolation Rate Conversion P-2

		Inches
Time Interval,	Δt =	30
Final Depth of Water,	D_f =	31.38
Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	31.31
Total Depth of Test Hole,	D_T =	38

H_o =	6.6875	in
H_f =	6.625	in
$\Delta H = \Delta D$ =	0.0625	in
H_{avg} =	6.65625	in
I_t =	0.029	in/hr

Percolation Rate Conversion P-3

		Inches
Time Interval,	Δt =	30
Final Depth of Water,	D_f =	48.50
Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	48.31
Total Depth of Test Hole,	D_T =	60

H_o =	11.6875	in
H_f =	11.5	in
$\Delta H = \Delta D$ =	0.1875	in
H_{avg} =	11.59375	in
I_t =	0.055	in/hr

Percolation Rate Conversion P-4

		Inches
Time Interval,	Δt =	30
Final Depth of Water,	D_f =	34.81
Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	33.75
Total Depth of Test Hole,	D_T =	42

H_o =	8.25	in
H_f =	7.19	in
$\Delta H = \Delta D$ =	1.06	in
H_{avg} =	7.72	in
I_t =	0.436	in/hr

TABLE

RESULTS OF PERCOLATION TESTING WITH FACTOR OF SAFETY APPLIED

Test Location	Test Depth (inches)	Case	Soil Type* (USCS Classification)	Percolation Rate (inches per hour)	Infiltration Rate (inches per hour)	Infiltration Rate with FOS of 2 Applied (inches per hour)
P-1	60	III	CL/SM	0.125	0.019	0.009
P-2	38	III	SC/CL	0.125	0.029	0.014
P-3	60	III	CL/SM	0.375	0.055	0.028
P-4	42	III	SC/CL	2.125	0.436	0.218

APPENDIX F

LIQUEFACTION EVALATION

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

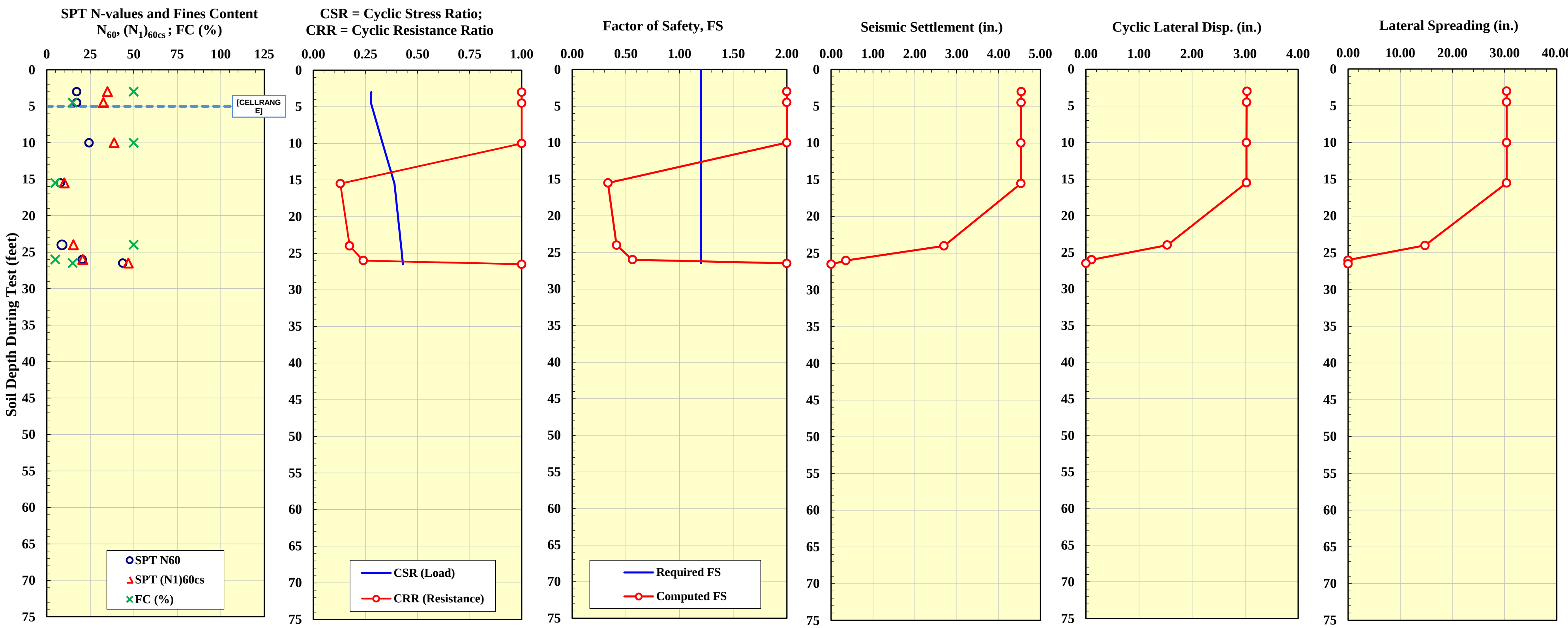
PROJECT INFORMATION	
Project Name	CASA DE ORO LIBRARY (PW)
Project No.	10-15617G
Project Location	3838 CONRAD DRIVE, SPRING VALLEY, CA
Analyzed By	DJT
Reviewed By	

TOPOGRAPHIC CONDITIONS		
Ground Slope, S	N/A	
Free Face (L/H) Ratio	6.60	H = 10.00 feet

GROUNDWATER LEVEL DATA	
GWL Depth Measured During Test	8.00 feet
GWL Depth Used in Design	5.00 feet

BORING DATA	
Boring No.	B-1
Ground Surface Elevation	438.00 feet
Proposed Grade Elevation	438.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	80.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	6.89
Peak Ground Acceleration, A_{max}	0.43 g
Required Factor of Safety, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

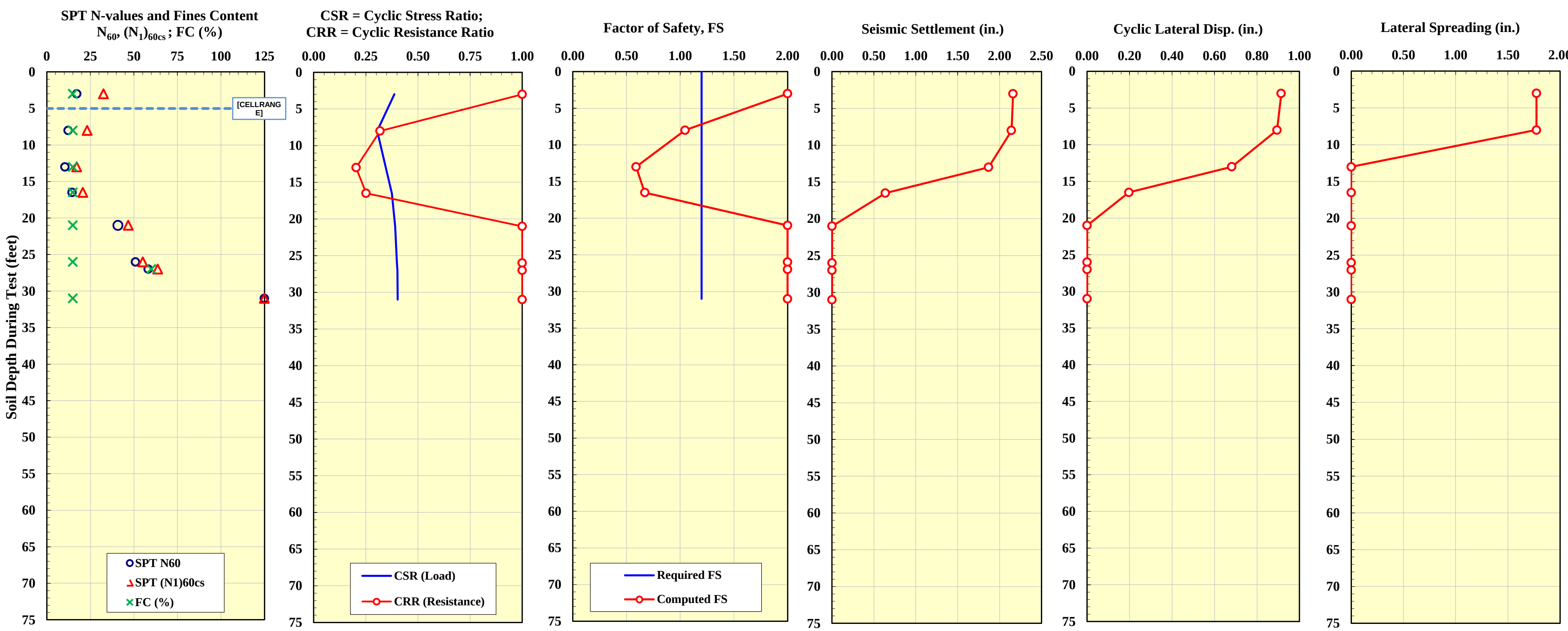
PROJECT INFORMATION	
Project Name	CASA DE ORO LIBRARY (PW)
Project No.	10-15617G
Project Location	3838 CONRAD DRIVE, SPRING VALLEY, CA
Analyzed By	DJT
Reviewed By	

TOPOGRAPHIC CONDITIONS		
Ground Slope, S	N/A	
Free Face (L/H) Ratio	8.00	H = 5.00 feet

GROUNDWATER LEVEL DATA	
GWL Depth Measured During Test	8.00 feet
GWL Depth Used in Design	5.00 feet

BORING DATA	
Boring No.	B-2
Ground Surface Elevation	436.00 feet
Proposed Grade Elevation	438.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	80.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	6.89
Peak Ground Acceleration, A_{max}	0.43 g
Required Factor of Safety, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

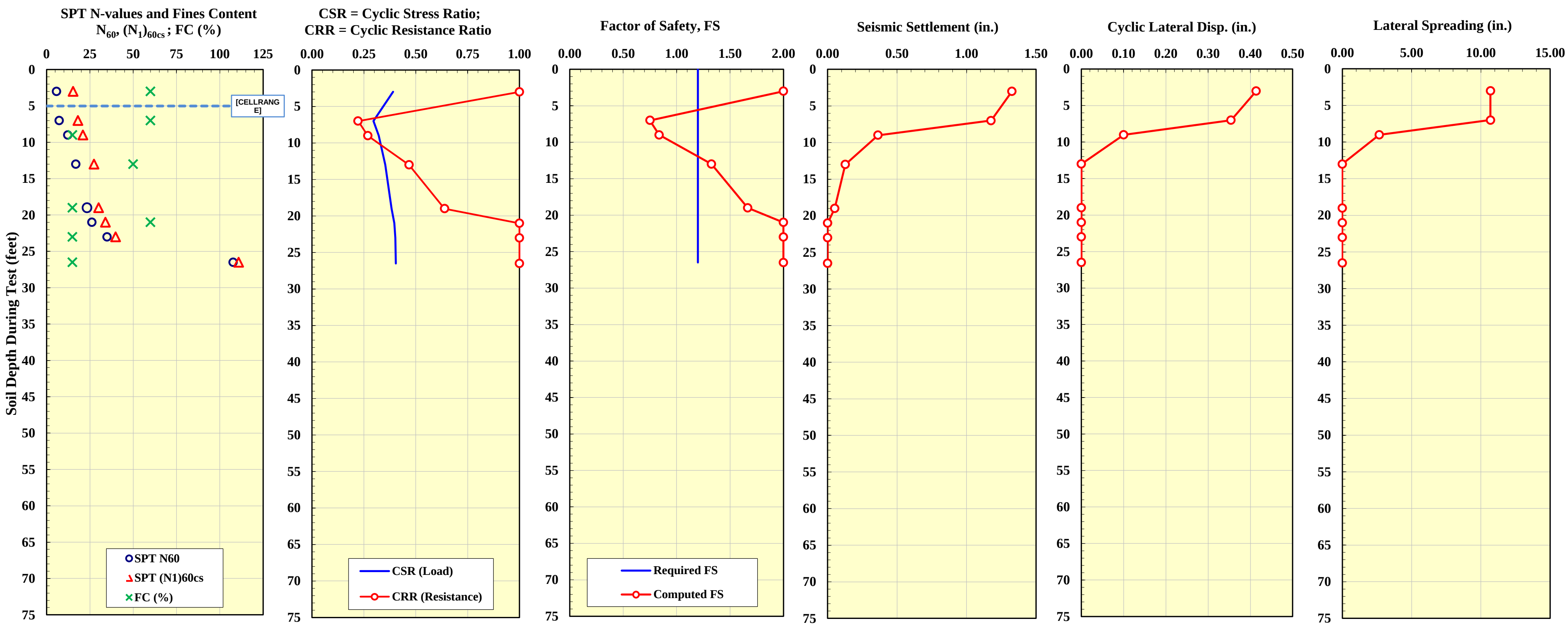
PROJECT INFORMATION	
Project Name	CASA DE ORO LIBRARY (PW)
Project No.	10-15617G
Project Location	3838 CONRAD DRIVE, SPRING VALLEY, CA
Analyzed By	DJT
Reviewed By	

TOPOGRAPHIC CONDITIONS		
Ground Slope, S	N/A	
Free Face (L/H) Ratio	2.50	H = 6.00 feet

GROUNDWATER LEVEL DATA	
GWL Depth Measured During Test	8.00 feet
GWL Depth Used in Design	5.00 feet

BORING DATA	
Boring No.	B-3
Ground Surface Elevation	436.00 feet
Proposed Grade Elevation	438.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	80.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	6.89
Peak Ground Acceleration, A_{max}	0.43 g
Required Factor of Safety, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

APPENDIX D-2
PALEONTOLOGICAL RESOURCES TECHNICAL REPORT

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PALEOSERVICES
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Paleontological Resources Technical Report

Casa de Oro Branch Library
Spring Valley
San Diego County, California

October 23, 2020

Prepared for:

Michael Baker International
9755 Clairemont Mesa Boulevard
San Diego, CA 92124

Prepared by:

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Thomas A. Deméré, Ph.D., Principal Paleontologist

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Executive Summary

This technical report provides an assessment of paleontological resources at the proposed Casa de Oro Branch Library project (Proposed Project) site in the community of Spring Valley in southeastern unincorporated San Diego County, California. The purpose of this report is to identify and summarize paleontological resources that occur in the vicinity of the Proposed Project site, identify Proposed Project elements (if any) that may negatively impact paleontological resources, and provide, if necessary, recommendations to reduce any potential negative impacts to less than significant levels. The report includes the results of a review of the relevant paleontological and geological literature and an institutional records search conducted at the San Diego Natural History Museum (SDNHM).

The Proposed Project site lies within the Valle de Oro Community Plan Area, and is comprised of portions of Assessor's Parcel Numbers 500-170-10, -11, and -41. The Proposed Project site is bordered to the south by Campo Road and existing commercial and residential development, to the north and west by sports fields of the Spring Valley Academy middle school, and to the east by the La Mesa Spring Valley School District maintenance yard. The Proposed Project would construct a new approximately 13,000 square-foot (SF) library facility with access off Campo Road, 52 surface parking spaces, landscaping, and fencing. Anticipated earthwork would include preparation of and/or back filling of the site's retaining walls and ADA and driveway ramping, removal and recompaction (to 12 inches) of foundation and parking areas, vegetation removal, and excavation for subgrade utilities and storm drains.

Published geologic mapping for the Project site indicates the site is underlain at the surface by Holocene-age (less than approximately 11,700 years old) young alluvium, which typically transitions downward in the subsurface into older, Pleistocene-age alluvium. The preliminary site-specific geotechnical investigation report prepared for the Project indicates that these deposits are present to depths of 21 to 26 feet below ground surface (bgs), where they are underlain by strata of the middle Eocene-age Mission Valley Formation. Undocumented artificial fill measuring up to 3 feet thick is also locally present overlying the Holocene alluvium.

The results of the paleontological records search and literature review indicate that fossils have not been documented from Holocene-age or Pleistocene-age sedimentary deposits within a 5-mile radius of the Proposed Project site. However, fossils are known from Pleistocene-age sedimentary deposits at numerous locations in coastal San Diego County, and have yielded impressive collections of terrestrial vertebrates including pond turtle, passenger pigeon, hawk, mole, rabbit, gopher, squirrel, capybara, wolf, horse, camel, deer, bison, mastodon, mammoth, and ground sloth. Fluvial deposits of the Mission Valley Formation, meanwhile, have produced a diverse assemblage of terrestrial mammals, as well as fossilized wood, while the marine deposits have yielded a diverse fossil assemblage consisting of marine microfossils (e.g., foraminifers), invertebrates (e.g., clams, snails, crustaceans, sand dollars, sea urchins), and vertebrates (e.g., sharks, rays, bony fishes).

Following the County of San Diego paleontological sensitivity guidelines, the sedimentary deposits that occur within the Proposed Project site are assigned a low paleontological sensitivity at depths of less than 10 feet bgs (where they are assumed to be Holocene in age), a moderate paleontological sensitivity at depths greater than 10 feet bgs (where the strata may have been deposited during the Pleistocene), and a high paleontological sensitivity at depths greater than 21 feet bgs (where strata of the Mission Valley Formation are present). As such, Project-related earthwork that would extend greater than 10 feet bgs has the potential to impact paleontological resources. However, as currently proposed, earthwork is anticipated to extend to depths of only 5 feet bgs. Therefore, construction of the Proposed Project is not anticipated to result in impacts to paleontological resources and implementation of a paleontological mitigation program is not recommended. In the unlikely event that fossils are unearthed during construction (i.e., an inadvertent discovery), mitigation measures are provided to ensure proper collection and treatment of the fossils.

Contents

1.0 Introduction

1.1 Project Description

This technical report provides an assessment of paleontological resources for the proposed Casa de Oro Branch Library project (Proposed Project) site, located in the community of Spring Valley in southeastern unincorporated San Diego County, California (Figure 1). The Proposed Project site lies within the Valle de Oro Community Plan Area, and is comprised of portions of Assessor's Parcel Numbers 500-170-10, -11, and -41. The Proposed Project site is bordered to the south by Campo Road and existing commercial and residential development, to the north and west by sports fields of the Spring Valley Academy middle school, and to the east by the La Mesa Spring Valley School District maintenance yard. The Proposed Project would construct a new approximately 13,000 square-foot (SF) library facility with access off Campo Road, 52 surface parking spaces, landscaping, and fencing. Anticipated earthwork would include preparation of and/or back filling of the site's retaining walls and ADA and driveway ramping, removal and recompaction (to 12 inches) of foundation and parking areas, vegetation removal, and excavation for subgrade utilities and storm drains, with excavation anticipated to extend to maximum depths of 5 feet below ground surface (bgs).

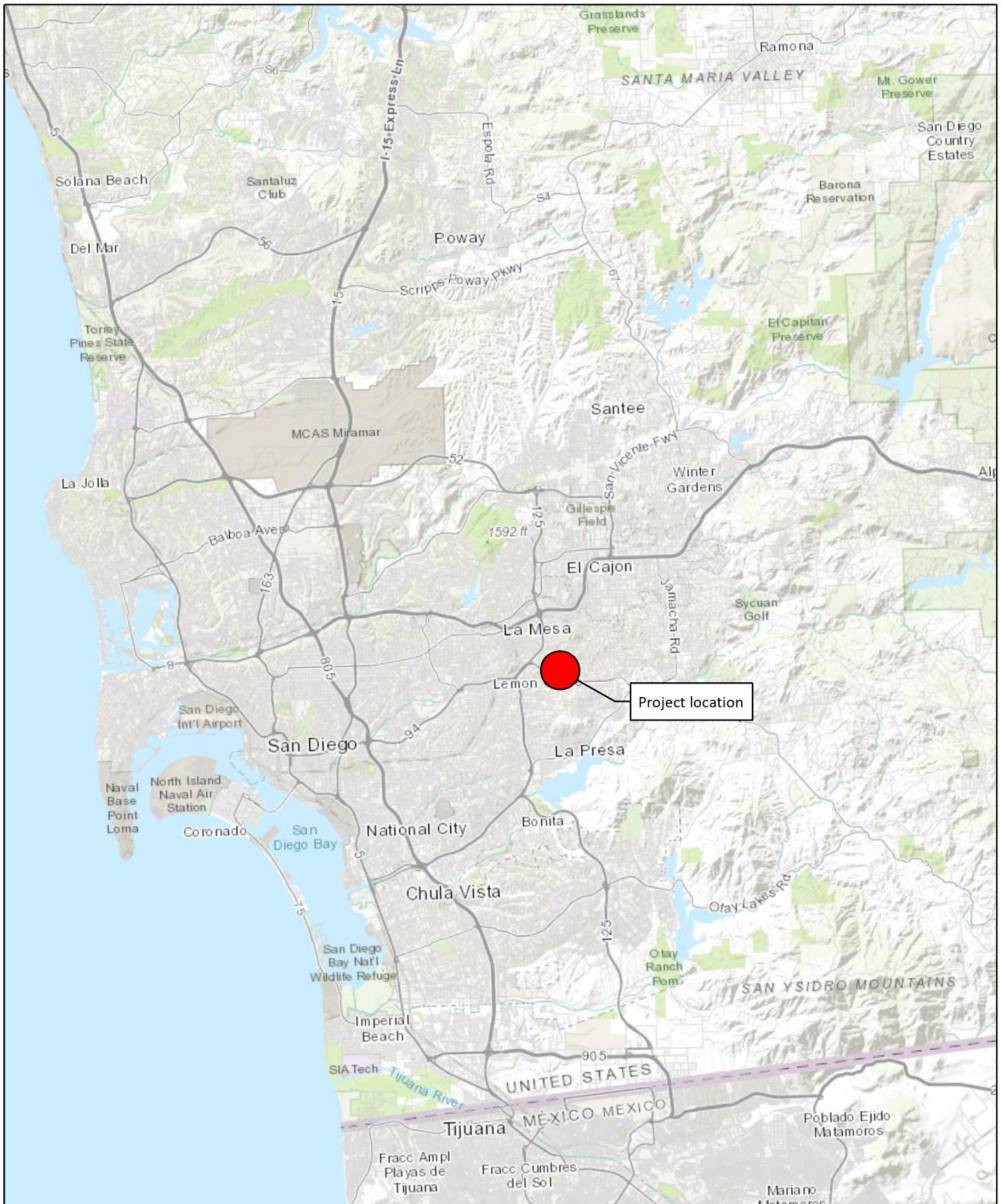
1.2 Scope of Work

Because the Proposed Project site occurs in an area partially underlain by native sedimentary deposits, a paleontological resource assessment was conducted in order to evaluate whether the proposed Project has the potential to negatively impact paleontological resources. It addresses potential impacts to paleontological resources that may occur during construction of the Proposed Project by summarizing existing paleontological resource data at the Project site, discussing the significance of these resources, examining potential Project-related impacts to paleontological resources, and, if necessary, suggesting mitigation measures to reduce impacts to paleontological resources to less than significant levels. The report includes the results of a literature review of relevant geological and paleontological reports and an institutional records search of the paleontological collections at the San Diego Natural History Museum (SDNHM). This report was prepared by Katie M. McComas and Thomas A. Deméré of the Department of PaleoServices, SDNHM.

1.3 Definition of Paleontological Resources

As defined here, paleontological resources (i.e., fossils) are the buried remains and/or traces of prehistoric organisms (i.e., animals, plants, and microbes). Body fossils such as bones, teeth, shells, leaves, and wood, as well as trace fossils such as tracks, trails, burrows, and footprints, are found in the geologic units/formations within which they were originally buried. The primary factor determining whether an object is a fossil or not is not how the organic remain or trace is preserved (e.g., "petrified"), but rather the age of the organic remain or trace. Although typically it is assumed that fossils must be older than ~11,700 years (i.e., the generally accepted end of the last glacial period of the Pleistocene

Epoch), organic remains older than recorded human history and/or older than middle Holocene (about 5,000 radiocarbon years) can also be considered to represent fossils (SVP, 2010).



Sources: World Topographic Map, Esri et al., 2020

Figure 1: Overview Map, Casa de Oro Branch Library
San Diego County, California

0 5
scale in miles

PALEOSERVICES
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Fossils are considered important scientific and educational resources because they serve as direct and indirect evidence of prehistoric life and are used to understand the history of life on Earth, the nature of past environments and climates, the membership and structure of ancient ecosystems, and the pattern and process of organic evolution and extinction. In addition, fossils are considered to be non-renewable resources because typically the organisms they represent no longer exist. Thus, once destroyed, a particular fossil can never be replaced.

Finally, paleontological resources can be thought of as including not only the actual fossil remains and traces, but also the fossil collecting localities and the geologic units containing those localities. The locality includes both the geographic and stratigraphic context of fossils—the place on the earth and stratum (deposited during a particular time in earth's history) from which the fossils were collected. Localities themselves may persist for decades, in the case of a fossil-bearing outcrop that is protected from natural or human impacts, or may be temporarily exposed and ultimately destroyed, as is the case for fossil-bearing strata uncovered by erosion or construction. Localities are documented with a set of coordinates and a measured stratigraphic section tied to elevation detailing the lithology of the fossil-bearing stratum as well as overlying and underlying strata. This information provides essential context for any future scientific study of the recovered fossils.

1.3.1 Definition of Significant Paleontological Resources

The California Environmental Quality Act (CEQA, Public Resources Code Section 21000 et seq.) dictates that a paleontological resource is considered significant if it "has yielded, or may be likely to yield, information important in prehistory or history" (Section 15064.5, [a][3][D]). The Society of Vertebrate Paleontology (SVP) has further defined significant paleontological resources as consisting of "fossils and fossiliferous deposits[…]consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information" (SVP, 2010).

1.4 Regulatory Framework

Paleontological resources are considered scientifically and educationally significant nonrenewable resources; they are protected under a variety of laws, regulations, and ordinances. The Project site is located in an unincorporated area of San Diego County, California. As such, state and local regulations are applicable to the Project.

1.4.1 State

The California Environmental Quality Act (CEQA, Public Resources Code Section 21000 *et seq.*) protects paleontological resources on both state and private lands in California. This act requires the identification of environmental impacts of a proposed project, the determination of significance of the impacts, and the identification of alternative and/or mitigation measures to reduce adverse environmental impacts. The Guidelines for the Implementation of CEQA (Title 14, Chapter 3, California Code of Regulations: 15000 *et seq*.) outlines these necessary procedures for complying with CEQA. Paleontological resources are specifically included as a question in the CEQA Environmental Checklist (Section 15023, Appendix G): "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature." Also applicable to paleontological resources is the checklist question: "Does the project have the potential to… eliminate important examples of major periods of California history or pre-history." If significant paleontological resources may be impacted within a given project site, CEQA provides that "a lead agency shall identify potentially feasible measures to mitigate significant adverse changes in the significance of an historical resource. The lead agency shall ensure that any adopted measures to mitigate or avoid significant adverse changes are fully enforceable through permit conditions, agreements, or other measures" (Section 15064.5, [b][4]).

Other state requirements for paleontological resource management are included in the Public Resources Code (Chapter 1.7), Section 5097.5 and 30244. These statutes prohibit the removal of any paleontological site or feature on public lands without permission of the jurisdictional agency, defines the removal of paleontological sites or features as a misdemeanor, and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state) lands.

1.4.3 Local

The County of San Diego primarily addresses management of paleontological resources through CEQA. In addition, Section 87.430 of the County's Grading Ordinance specifically establishes procedures for the mitigation of potential impacts to paleontological resources during earthwork operations. Detailed guidelines for determining significance and mitigation procedures for paleontological resources are provided by the County's Department of Public Works (Stephenson et al., 2009).

2.0 Methods

2.1 Paleontological Records Search and Literature Review

A paleontological records search was conducted at the SDNHM in order to determine if any documented fossil collection localities occur within the Proposed Project site or immediate surrounding area. The SDNHM records search involved examination of the paleontological database for any records of known fossil collection localities from sedimentary deposits similar to those underlying the Proposed Project site within an approximately 1-mile radius.

Additionally, a review was conducted of relevant published geologic maps (e.g., Todd, 2004), published geological and paleontological reports (e.g., Deméré et al., 2013; Golz and Lillegraven, 1977; Jefferson, 1991), and other relevant literature (e.g., unpublished paleontological mitigation reports). This approach was followed in recognition of the direct relationship between paleontological resources and the geologic units within which they are entombed. Knowing the geologic history of a particular area and the fossil productivity of geologic units that occur in that area, makes it is possible to predict where fossils may, or may not, be encountered.

2.2 Paleontological Resource Assessment Criteria

Impacts to paleontological resources are typically assigned a paleontological sensitivity rating based on the resource potential of an impacted geologic unit. The County of San Diego has developed their own guidelines for assigning paleontological sensitivity (Stephenson et al., 2009), which includes a five-tiered scale of High Sensitivity, Moderate Sensitivity, Low Sensitivity, Marginal Sensitivity, or Zero Sensitivity ratings. An expanded description of each paleontological sensitivity rating, as outlined by the County (Stephenson et al., 2009) is provided below.

2.2.1 High Sensitivity

Geologic units with high sensitivity have produced, or are likely to produce, significant vertebrate, invertebrate, or paleobotanical remains. High sensitivity geologic units may contain fossil materials that are rare, well-preserved, critical for stratigraphic or paleoenvironmental interpretation, and/or provide important information about the paleobiology and evolutionary history (phylogeny) of animal and plant groups.

2.2.2 Moderate Sensitivity

Moderate sensitivity is assigned to geologic units known to contain paleontological localities with fossil material that is poorly preserved, common elsewhere, or stratigraphically unimportant.

2.2.3 Low Sensitivity

Low sensitivity is assigned to geologic units that, based on their relatively young age and/or high-energy depositional history, are judged unlikely to produce important fossil remains. Typically, low sensitivity units produce fossil remains in low abundance, or only produce common/widespread invertebrate fossils whose taphonomy, phylogeny, and ecology is already well understood.

2.2.4 Marginal Sensitivity

Marginal sensitivity is assigned to geologic units that are composed either of volcaniclastic (derived from volcanic sources) or metasedimentary rocks, but that nevertheless have a limited probability for producing fossils from certain formations at localized outcrops.

2.2.5 Zero Sensitivity

Geologic units with no sensitivity are either entirely igneous in origin and therefore do not contain fossil remains, or are moderately to highly metamorphosed and thus any contained fossil remains have been destroyed. Artificial fill materials also have no sensitivity, because the stratigraphic and geologic context of any contained organic remains (i.e., fossils) has been lost.

2.3 Paleontological Impact Analysis

Direct impacts to paleontological resources occur when earthwork activities (e.g., mass grading, trenching), cut into the geologic units within which fossils are buried, and physically destroy the fossil remains. As such, only earthwork activities that will disturb potentially fossil-bearing sedimentary deposits (i.e., those rated with a high or moderate paleontological sensitivity) have the potential to significantly impact paleontological resources. Paleontological mitigation typically is recommended to reduce any negative impacts to paleontological resources to less than significant levels.

The purpose of the impact analysis is to determine which (if any) of the proposed Project-related earthwork activities may disturb potentially fossil-bearing geologic units, and where and at what depths this earthwork will occur. The paleontological impact analysis involved analysis of available project documents, and comparison with geological and paleontological data gathered during the records search and literature review.

3.0 Results

3.1 Results of the Records Search and Literature Review

The Proposed Project site lies within the San Diego Coastal Plain, a local geomorphic region lying west of the Peninsular Ranges that is characterized by elevated Quaternary marine and fluvial terraces that have been dissected by modern, generally west-flowing streams and rivers. Along the coastal plain, the Mesozoic basement rocks of the Jurassic-Cretaceous Santiago Peak Volcanics and the Cretaceous Peninsular Ranges Batholith are nonconformably overlain by a “layer cake” sequence of sedimentary rocks of late Cretaceous, Eocene, Oligocene, Miocene, Pliocene, and Pleistocene age (Givens and Kennedy, 1976; Hanna, 1926; Kennedy, 1975; Kennedy and Moore, 1971; Kennedy and Peterson, 1975; Peterson and Kennedy, 1974; Walsh and Deméré, 1991). More recently, alluvial sediments of Pleistocene and Holocene age filled in the ancient river valleys with alluvium transported from the east by local rivers and streams.

3.1.1 Project Geology

As mapped by Todd (2004), young alluvium underlies the entire Proposed Project site at the surface (Figure 2). These deposits are generally considered to be Holocene in age (less than about 11,700 years old), but presumably transition downsection (i.e., at depth) into older, Pleistocene-age deposits. The depth of this temporal transition is conservatively estimated to occur at 10 feet or more bgs. The site-specific geotechnical investigation report indicates that these deposits consist of fine- to medium-grained sandy clay and silty fine- to medium-grained sand, and are present to depths of 21 to 26 feet bgs, where they are underlain by silty fine-grained sandstone strata of the middle Eocene-age (approximately 43 million years old) Mission Valley Formation (CTE, 2020). Also present within the Proposed Project site are previously placed undocumented fill deposits, locally measuring up to 3 feet thick (CTE, 2020).

3.1.2 Project Paleontology

No fossils are currently documented within a one-mile radius of the Proposed Project site. The lack of recorded fossil collection localities from Holocene alluvial deposits is primarily due to their relatively young geologic age and the recognition that organic remains preserved in such deposits are conspecific with organisms living in the area today.

Fossils have been collected from older, Pleistocene-age alluvial sediments at numerous locations in coastal San Diego County, and have yielded impressive collections of terrestrial vertebrates including pond turtle, passenger pigeon, hawk, mole, rabbit, gopher, squirrel, capybara, wolf, horse, camel, deer, bison, mastodon, mammoth, and ground sloth (Chandler, 1982; Deméré et al., 2013; Guthrie, 2012; Jefferson, 1991; Majors, 1993; SDNHM unpublished paleontological collections data).

Fluvial deposits of the Mission Valley Formation have yielded a diverse assemblage of terrestrial mammals, including opossums, insectivores, bats, rodents, primates, artiodactyls, and perissodactyls

(Golz and Lillegraven, 1977; Walsh, 1996), as well as fossilized wood (SDNHM unpublished paleontological collections data), while the marine deposits have yielded a diverse fossil assemblage consisting of marine microfossils (e.g., foraminifers), invertebrates (e.g., clams, snails, crustaceans, sand dollars, sea urchins), and vertebrates (e.g., sharks, rays, bony fishes) (Deméré and Walsh, 1993).

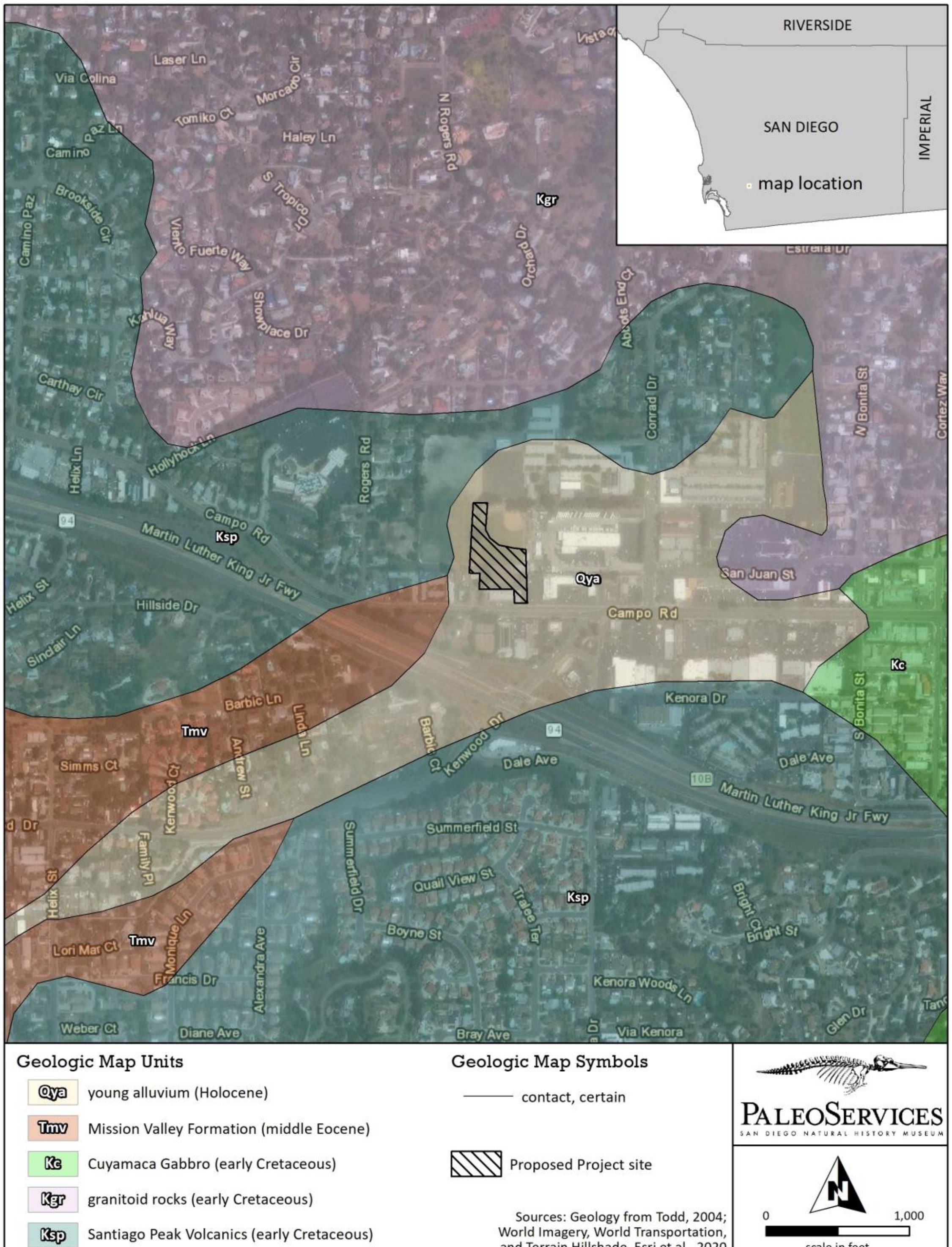

Figure 2: Geologic Map, Casa de Oro Branch Library, San Diego County, California

3.2 Results of the Paleontological Resource Assessment

Following the County of San Diego paleontological sensitivity guidelines, as outlined in Section 2.2, Holocene-age young alluvium underlying the Project site is assigned a low paleontological sensitivity. This rating is based on the relatively young age of these deposits and the recognition that organic remains preserved in such deposits are conspecific with organisms living in the area today. However, as mentioned above, the Holocene-age sediments likely transition in the subsurface into older, Pleistocene-age deposits, at depths that may be as shallow as 10 feet bgs (see Section 3.1.1). Pleistocene sedimentary deposits located at depth within the Proposed Project site are assigned a moderate paleontological sensitivity based on the occurrence of scientifically significant vertebrate fossils in similar deposits in western San Diego County. The Mission Valley Formation, meanwhile, is assigned a high paleontological sensitivity based on the recovery of diverse and scientifically significant assemblages of terrestrial vertebrates and marine organisms from this geologic unit.

Because the contact between Holocene-age deposits and older, Pleistocene-age deposits may be as shallow as 10 feet bgs, the alluvial deposits underlying the Proposed Project site are specifically assigned a low paleontological sensitivity from 0–10 feet bgs, where they are assumed to be Holocene in age, a moderate paleontological sensitivity at depths greater than 10 feet bgs, where they may be Pleistocene in age, and a high paleontological sensitivity at depths greater than 21 feet bgs, where the Mission Valley Formation is present (Figure 3).

3.3 Results of the Paleontological Impact Analysis

While the specific locations and dimensions of earthwork for the Proposed Project are currently undefined, construction of the library building, which will be located in the southern portion of the Proposed Project site, is anticipated to require excavations extending to a maximum depth of 5 feet bgs. Based on the above assessment (Section 3.2), only Project-related earthwork that would extend greater than 10 feet bgs has the potential to impact paleontological resources. Therefore, construction of the Proposed Project is not anticipated to result in impacts to paleontological resources.

Figure 3: Paleontological Sensitivity Map, Casa de Oro Branch Library, San Diego County, California

4.0 Recommendations & Conclusions

Implementation of a paleontological mitigation program is not recommended for the Proposed Project because Proposed Project-related earthwork, as currently outlined, is not anticipated to negatively impact paleontological resources (i.e., earthwork will not extend deep enough to impact geologic units with moderate or high paleontological sensitivity). However, in the unlikely event that fossils are unearthed during earthwork activities (i.e., an inadvertent discovery), the following measures should be implemented.

> **MM PALEO-1:** Upon discovery of an unearthed fossil, earthwork in the vicinity of the discovery shall immediately halt, and a qualified paleontologist should evaluate the discovery. Earthwork shall be diverted until the significance of the fossil discovery can be assessed by the qualified paleontologist. If the fossil discovery is deemed significant, the fossil shall be recovered using appropriate recovery techniques based on the type, size, and mode of preservation of the unearthed fossil. Earthwork may resume in the area of the fossil discovery once the fossil has been recovered, and the qualified paleontologist deems the site has been mitigated to the extent necessary. Additional earthwork following the fossil discovery may be monitored for paleontological resources on an as-needed basis, at the discretion of the qualified paleontologist.
>
> **MM PALEO-2:** Recovered fossils shall be prepared, identified, catalogued, and stored in a recognized professional repository along with associated field notes, photographs, and compiled fossil locality data. For projects in San Diego County, the recommended designated repository is the San Diego Natural History Museum. Donation of the fossils should be accompanied by financial support for specimen storage. A final summary report should be completed that outlines the results of the mitigation program. This report should include discussions of the methods used, stratigraphic section(s) exposed, fossils collected, and significance of recovered fossils. This report shall be submitted to appropriate agencies, as well as to the designated repository.

5.0 References

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