

A.M. BAIRD

ENGINEERING & SURVEYING, INC.

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CONSULTING

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LAND DEVELOPMENT

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DESIGN

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SURVEYING

ENGINEERING GEOLOGIC SOILS REPORT

GEOLOGIC HAZARDS AND DEVELOPMENT CLASS R2

RESIDENTIAL DEVELOPMENT

PREPARED FOR:

Randal Rand
Site APN: 111-211-023
Site Address: 62 Cove View Drive,
Whitethorn CA 95589
Humboldt County

PREPARED BY:

ALLAN M. BAIRD, RCE 23681



July 31, 2024
Job# 24-6073-2



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Building Official
County of Humboldt Building Department
3015 H Street, Eureka, California 95501

RE: Humboldt County Engineering Geologic Soils Report, R-2
Client: Randal Rand
Site Address: 62 Cove View Drive, Whitethorn CA 95589
Site APN: 111-211-023
Site Coordinates (WGS84): 40.0292 (latitude) , -124.0623 (longitude)

Introduction

Representatives from A.M. Baird Engineering performed a site investigation on July 16, 2024 at the above-referenced parcel in Shelter Cove, California to collect requisite data for a soils suitability report pertaining to proposed residential construction. This report is furnished to satisfy criteria required by the County of Humboldt for a Preliminary Engineering Geologic Report as outlined by Title III, Division 3, Chapter 6, Section 336-5 of the Humboldt County Code.

Site Description

The adjacent subject parcels are in a high-instability area within the Coastal Zone in Shelter Cove, California. Access to the aggregate property is provided via Cove View Drive. A mapped Alquist-Priolo fault trace runs along the rear property boundary of both parcels. The property is thoroughly vegetated with an average slope of 14% from east to west.

Site Investigation

A test hole was excavated to a depth of approximately 2 feet near the proposed building site on the southern-most parcel (see Site Plan, attached). A soil sample was taken from the bottom of the test hole. Field texturing and laboratory analyses were performed on the sample.

Soil Conditions

Soil sampling revealed dark brown zone 2 sandy clay loam (Munsell Color 10 YR 3/3) to a depth of approximately 24 inches below grade with approximately 15% small gravel. A soil profile, textual analysis, and soil chart are appended.

Groundwater

No groundwater, soil mottling or redoximorphic features were observed during the site investigation.



Slope Stability and Drainage Hazards

Although the property is within a mapped high-instability area, the nature of the entire property appears to be stable and should remain stable provided the recommendations given in this report are followed, with special consideration to the Alquist-Priolo fault trace that runs along the rear property boundary of both parcels. Impermeable surfaces such as driveways and rooftops should be designed to uniformly diffuse runoff away from structures, and significant quantities of concentrated runoff should not be discharged over slopes greater than 20%.

Geological Hazards

This area of California is very seismically active and is subject to earthquakes of large magnitude, which can produce significant ground shaking. In general, there are many sources of large magnitude earthquakes that could potentially affect this project area. These sources include but are not limited to the Mendocino *Fault Zone located some 20 miles northeast of Shelter Cove, the San Andreas Fault which leads out to sea at Point Delgada, the subducted Gorda Oceanic Crustal Plate North of Shelter Cove*, the complex northwesterly oriented fault systems surrounding the Humboldt Bay area (including the Little Salmon, Mad River, Freshwater, and Gorda Fault Zones), and the Cascadia Subduction Zone near Cape Mendocino.

According to the California Department of Conservation and the Humboldt County General Plan, this parcel is located in a special studies earthquake zone within 2 kilometers of the active Class A San Andreas Fault (North Coast), and within 25 kilometers of the Type B Garberville Fault. Recent research conducted by the USGS has concluded that the San Andreas Fault is not exclusively located offshore of Shelter Cove but that "... a significant Quaternary fault is located onshore ...", actually running through the residential areas of Shelter Cove and extending past Kaluna Cliff (Prentice, et. al., 1999). The proposed building site is located approximately 60 feet east of this fault trace indicated in the Geological Society of America article, which runs nearly adjacent to Shelter Cove Road and out to the ocean. A map of this trace showing the property location is enclosed for reference (see Fault Activity Map).

The San Andreas Fault has produced major earthquakes in this area at intervals of approximately 75-150 years. Earthquakes with average magnitudes of 5.8 occur on average every 2 years at varying locations in or near Humboldt County, and geological evidence suggests that the San Andreas Fault is capable of generating magnitudes much higher (greater than 7.0). This high to very high level of risk of seismic hazard is typical for Northern California, and residents assume this risk when they choose to build in this area.

Earthquakes capable of causing intense ground shaking and structural damage can be expected to occur within the design life of the proposed structure (40+ years). Residents should be aware of this inherent risk and should understand that these risks cannot be fully eliminated with engineered design. As required, all structural design should be in conformance with the 2022 California Building Code (CBC) Seismic Design Category (SDC) E (Section 1613A, 2022 CBC).



Site coordinates were taken from the Humboldt County Web GIS website (County of Humboldt, 2024). Site-specific soil parameters shown in Table 1 were calculated using the online Hazard Tool supplied by The American Society of Civil Engineering (ASCE, 2024).

Table 1: USGS Ground Motion Parameters.

Latitude	40.0292
Longitude	-124.0263
Occupancy Category	II (normal buildings)
Importance Factor, I	1.0
Site Class	D (stiff soil)
Site Coefficients	$F_a=1.2$
	$F_v=\text{null}$
Mapped Spectral Response Acceleration Parameters	$S_s=2.83$ g (0.2-second spectral response)
	$S_1=0.91$ g (1-second spectral response)
Design Spectral Response Acceleration Parameters	$S_{MS}=2.64$ g (0.2-second period)
	$S_{M1}=2.27$ (1-second period)
Design Spectral Response Acceleration Parameters (five-percent damped design spectral response)	$S_{DS}=1.76$ g (0.2-second period)
	$S_{D1}=1.52$ (1-second period)
Seismic Design Category (SDC)	E ($S_1>0.75g$)
Peak Ground Acceleration ($S_s/2.5$)	1.132 g

Flood Hazards

The site is not located within the 100-yr flood zone (see Flood Map, attached).

Existing Grade (Cut/Fill)

Neither parcel has been graded in the past.

Earthquake Motion Hazards

Slope instability and liquefaction are not considered consequential as to require a specific analysis. According to California regulations, specifically the Alquist-Priolo Earthquake Fault Zoning Act, structures for human occupancy are prohibited from being built directly across the trace of an active fault unless an investigation by a geologists is conducted. The act defines an active fault as one that has experienced surface rupture within the last 11,000 years. The area within 50 feet of such active faults is presumed to be underlain by active branches of that fault. Therefore, the structure has been placed a minimum of 50 feet setback from 2 mapped faults described by the US Geological Survey/ USGS as required by code for the location, and shown on



the enclosed site map detail. As within any high seismic zone such as the subject property, residents in California inherently accept these risks. Real estate law may also require that the proximity to fault zones be disclosed to any buyer.

Recommendations

The soil on site is capable of supporting a load of 1,500 pounds per square foot (psf). No expansive soils were encountered during this investigation that require specific recommendations. Multi-level structures are suitable uses for this property, provided they are a minimum of 50 feet away from the mapped fault trace that runs along the rear property boundary of the aggregate property. Settlement is not anticipated to be detrimental provided considerations are given to the recommendations presented herein:

Preparation of the building area for grading should include stripping and removal of all vegetation and debris to 5 feet outside the building area. The top 3-6 inches (minimum) of all soil supporting pavement, slab or sidewalks shall be stripped of vegetation/debris and scarified. At times deeper removal may be necessary to remove isolated organic material or roots.

Foundations for any commercial project should be reinforced and be contained in firm, undisturbed native soil. The foundation should be extended a minimum of 12 inches *past any topsoil or fill* and into natural undisturbed ground for single-story structures, a minimum of 18 inches for two-story structures and a minimum of 24 inches for three-story and four-story structures. Spread footings and foundation walls should be reinforced and be at minimum 15 inches wide for single-story structures, a minimum of 18 inches wide for two-story structures, a minimum of 24 inches wide for three-story structures and a minimum of 32 inches wide for four-story structures. Foundation walls should be a minimum of 7.5 inches thick for single-story structures, a minimum of 8 inches thick for two-story structures, a minimum of 10 inches thick for three-story structures and four-story structures. Foundation footings shall be setback a minimum distance of 4 feet from bottom of footing as measured horizontally to daylight from slopes dropping over 30%. Foundation footing setbacks to slope breaks shall comply with specifications in Section 1808.7 and Figure 1808.7.1 of the 2022 CBC. Additionally, footings shall also comply with the following maximum loads:

<u>Loading Condition</u>	<u>Allowable Bearing Pressure</u>
Dead plus long-term live load	1000 psf *
Dead plus all live loads	1500 psf
Total design loads including wind/seismic	2000 psf

This load may be increased to 1500 psf if design criteria warrant, in which case expected settlement will be 1/2" to 1" total over the length of the structure.

All surface runoff from developed or paved areas of the lot should be controlled to flow and drain away or be routed in such a manner as to not affect slope stability or the integrity of foundation



soil. Erosion control dissipation devices shall be installed at all locations where water is discharged over slopes greater than 20%.

All excavation shall be completed in conformance with Section 1804 of the 2022 CBC. Additionally, earthwork grading/excavation shall be conducted during the dry season, unless constructed in conformance with a grading and erosion control plan, Humboldt County codes, and the recommendations in this report.

All existing and proposed fill and cut slopes are to be re-vegetated to prevent erosion. This is to be done to the satisfaction of local building officials. Existing vegetation beyond the construction area should be left undisturbed if feasible.

If cutting or grading is to be done at a depth greater than 5 feet, it is recommended that this office be contacted for specific comments and recommendations. Cut and fill under 5 feet should be limited to 2:1 maximum slope.

Gutters are to extend along all rooflines and lead to down spouts. In turn, down spouts should lead to pipes carrying roof runoff away from the building site, as well as any fill or foundations that may adversely affect the site soil or adjacent slopes.

Floor slabs should be reinforced by #4 reinforcing bars at 18" o.c. each way and be underlain by at least 4" of class 2 aggregate bases with limited fines to act as a capillary moisture break and a vapor barrier. The vapor barrier shall be in direct contact with concrete. Contractor and owner are responsible for determining the extent of waterproofing methods necessary and implementing the appropriate measures as described in recommendation #10 and apply current recommendations and guidelines for slabs below grade according to the American Concrete Institute.

All foundation design and construction shall be in conformance with Chapter 18 of the 2022 CBC. All footings are to meet local requirements for seismic criteria, as required by the 2022 CBC. Seismic design parameters included in this report are based on latitude and longitude values for the subject parcel's centroid taken from the Humboldt County Web GIS website (County of Humboldt, 2022).

Due to the close proximity of this parcel to the Special Studies Earthquake Zone, it is recommended that this office be contacted for footing inspections.

Any floor space at or below existing grade level that will be used as inhabitable areas or for storage shall be appropriately damp-proof or water-proof as described in Section 1805 of the 2022 CBC. These appropriate measures at minimum will constitute installation of 6-mil vapor barrier or equivalent against the foundation or retaining wall, along with drain rock a minimum of 12" thick to the bottom of the footing and made to drain by 4" perforated pipe tight-lines to daylight away from the foundation soils. It is recommended that slabs below grade used for living space be underlain with a minimum of 6" of open graded aggregate instead of 4" as described in recommendation #7 for an increased protection from capillary water infiltration. Additional or



superior measures may include installation of sub-slab drainage pipes or geo-textile membranes and should be installed according to current standards of practice.

Additional fill material and paving recommendations (as applicable):

Suitable building area fill can be any soils and aggregate void of debris and organic material with particulates less than 3" in diameter and maintains an expansion index less than or equal to 20. All fills placed on natural subgrade should be compacted to 95% relative compaction (ASTM-D 1557) and placed in lifts of 6" to 8".

Building area fill and trench backfill soils need to meet gradation and quality requirements for "Structural Backfill" according to Caltrans Standard Specifications.

For sub-slab sand, a sieve size #4 needs to have a 90-100% pass rate, and a sieve size #200 needs to have a 1-5% pass rate. Sub-slab aggregate should have a sieve size of 3/4" with 100% passage and a 0% pass rate through a #4 sieve. All aggregate base shall meet the gradation and quality requirements for Class 2 aggregate base according to Caltrans Standard Specifications.

Based upon the review conducted by this office of the site and surrounding terrain no further geological evaluation is required; therefore, no geotechnical engineer consultation is warranted. This office shall be contacted if subsurface conditions differ significantly from those stated in this report, or if further investigation or inspection is requested by involved agencies.

It has been assumed that observed soils are representative of the entire subsurface conditions on the property in question. If it is found during construction that subsoil conditions differ from those described, the conclusions and recommendations of this report should be considered invalid unless the changes are reviewed, and the conclusions and recommendations are modified or approved in writing.

This analysis was conducted in accordance with the standards maintained by professionals in the engineering field, and the findings presented herein are reasonably representative of site conditions and probable site behavior based on this investigation. Due to the inexact nature of many engineering analyses, including those employed during the preparation of this report, there is no guarantee or warranty expressed or implied. Enclosed in this report are site maps, Assessor's Parcel Maps, and geologic maps as referenced.

If you have any questions regarding this report, or to schedule an inspection, please feel free to contact this office at (707) 725-5182.



References

American Society of Civil Engineering (ASCE). (2022 errata). Minimum Design Loads for Buildings and Other Structures. ASCE/SEI 7-22.

American Society of Civil Engineering (ASCE). (2024). Hazard Tool Online.
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California Department of Conservation, Division of Mines and Geology. (1998). Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada. International Conference of Building Officials. Whittier, CA.

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<http://gis.co.humboldt.ca.us/Freeance/Client/PublicAccess1/index.html?appconfig=podgis>

International Code Council. (2022). 2022 California Building Code. International Code Council, Inc.

Jennings, Charles W., and William A. Bryant. "ArcGIS Web Application." ArcGIS Web Application. The State of California and the Department of Conservation, 2010. (Accessed 2024).
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United States Geological Survey Store (The USGS Store). (2024). Map Locator & Downloader Online <https://store.usgs.gov/map-locator>

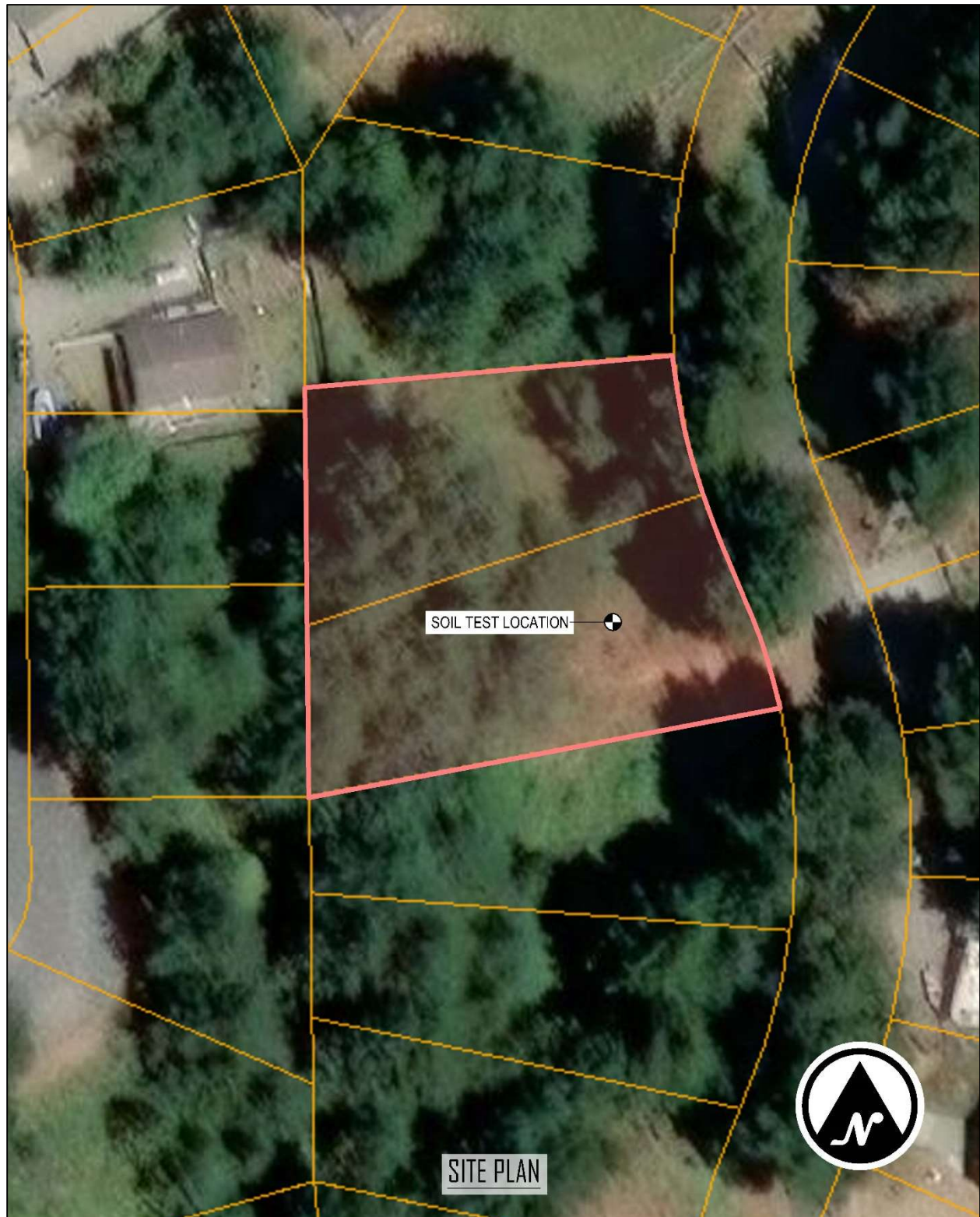


Appendix

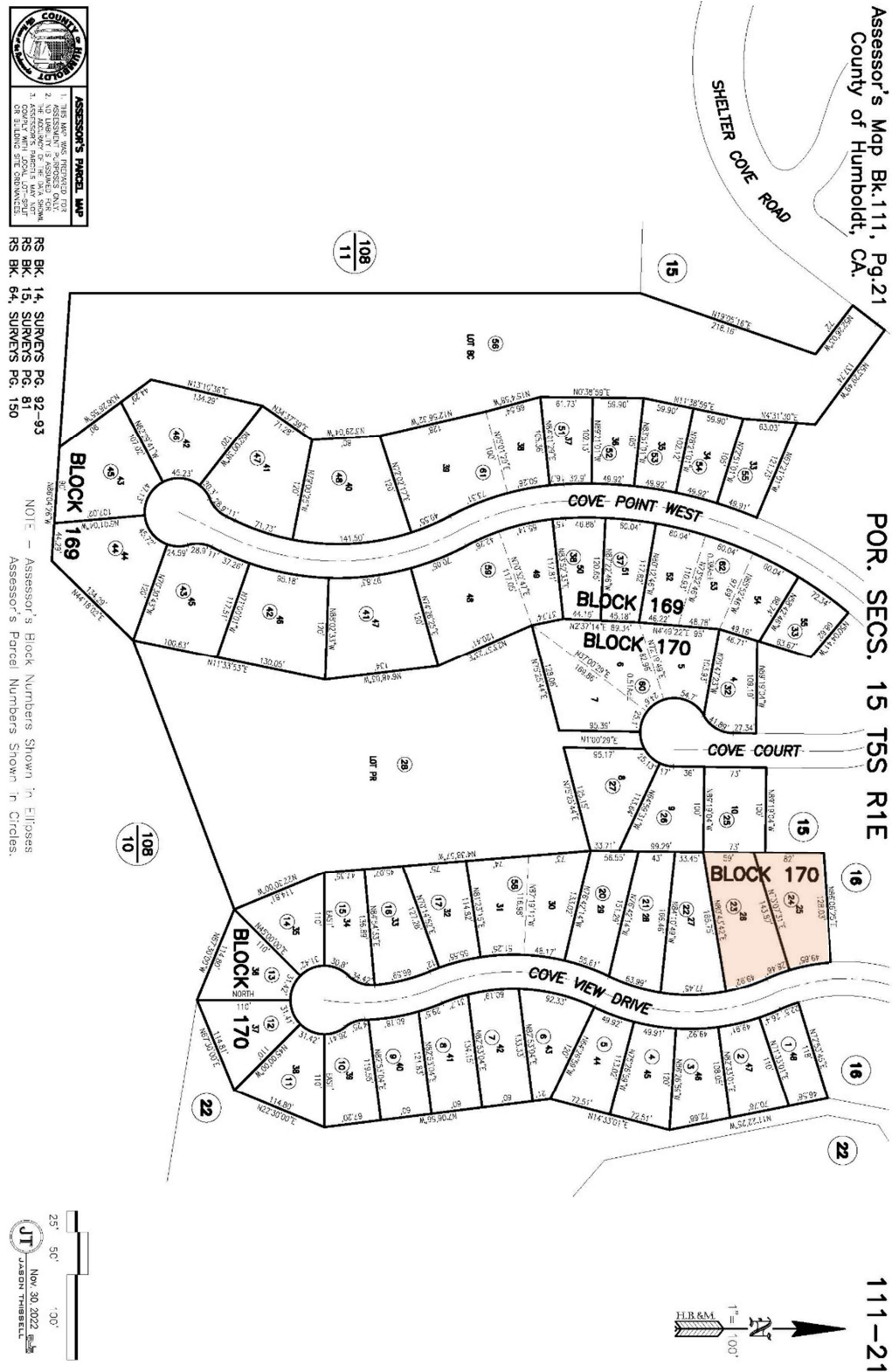
Site Plan
Assessor's Parcel Map
Topographic Map
Flood Map, 100-year
Fault Activity Map
Seismic Design Parameters
Soil Profile
Soil Texture
Soil Chart



Site Plan

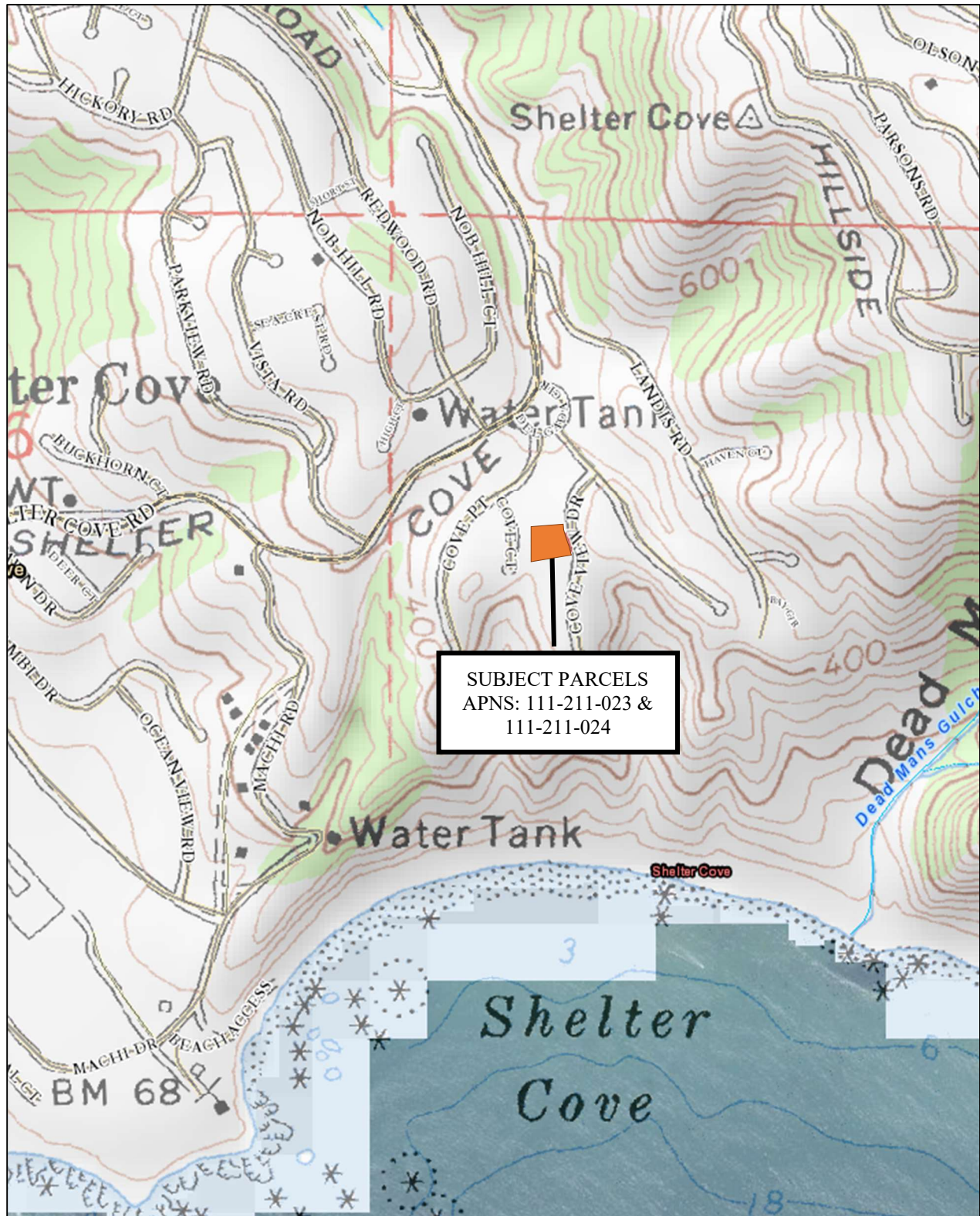


Assessor's Parcel Map





Topographic Map



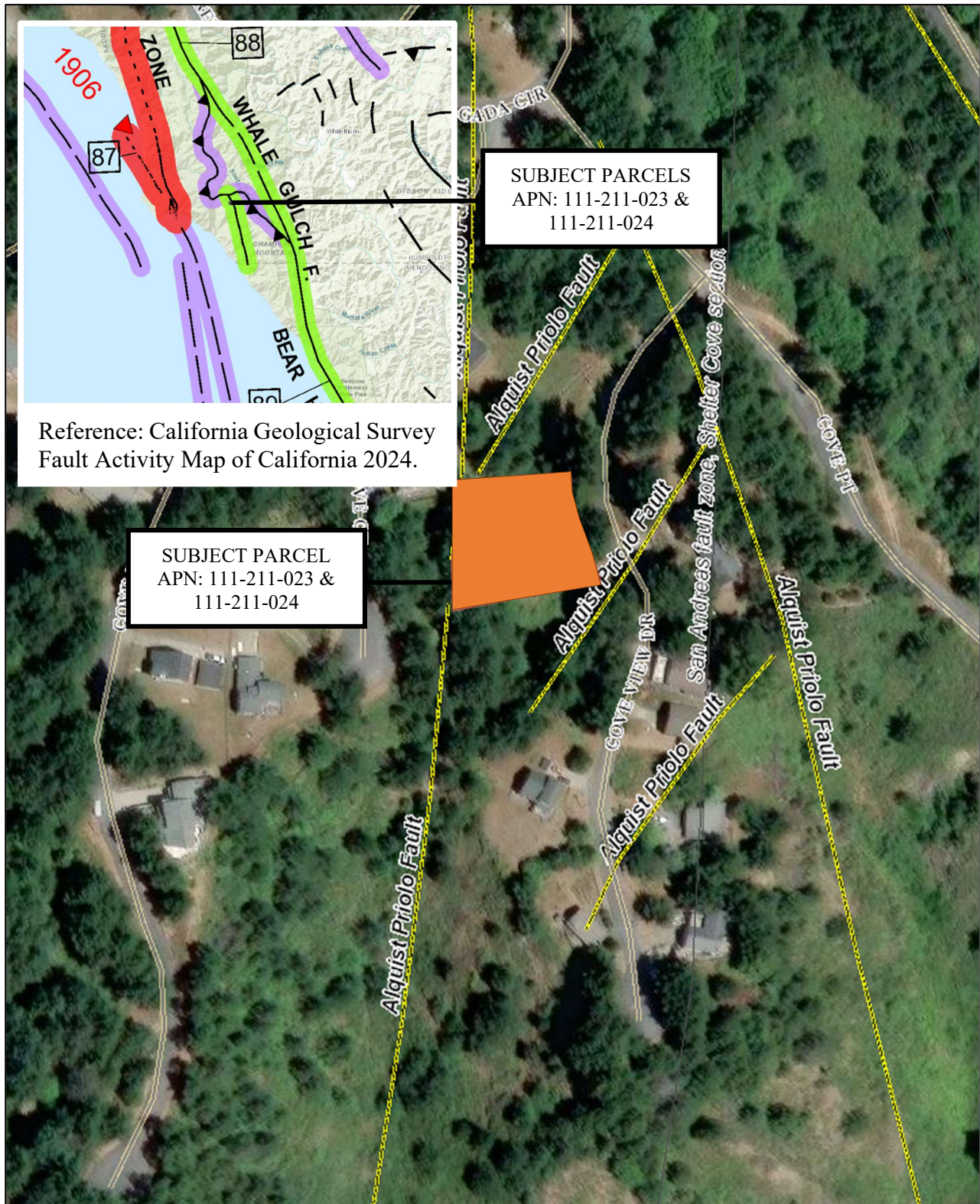


Flood Map, 100-yr





Fault Activity Map





Seismic Design Parameters

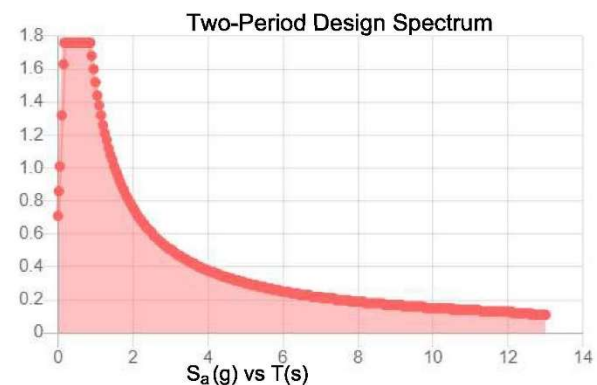
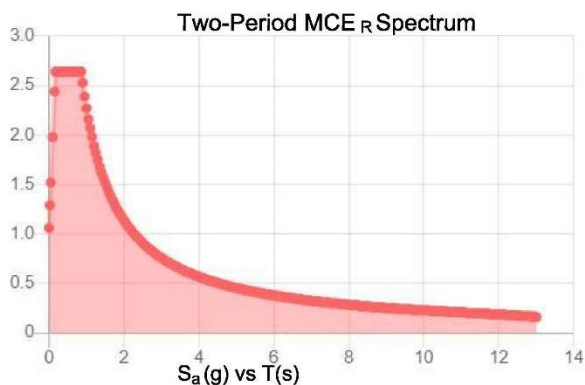
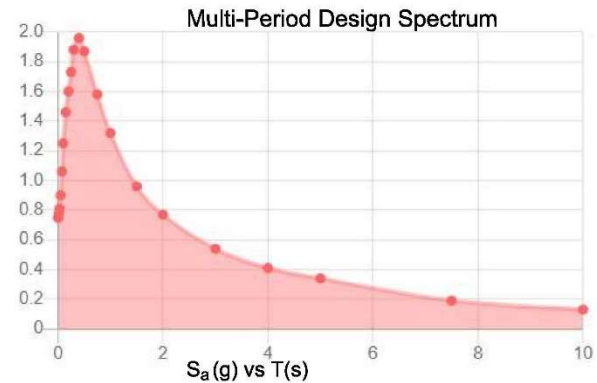
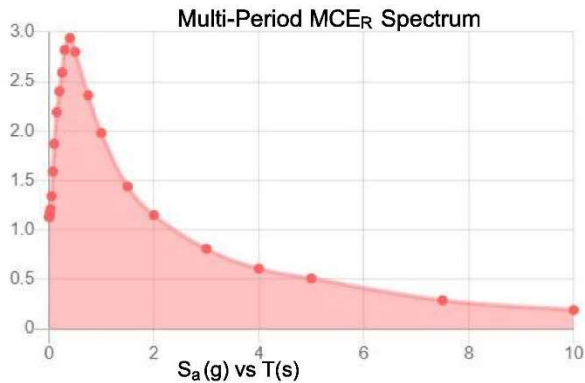


Site Soil Class: D - Stiff Soil

Results:

PGA _M :	0.95	T _L :	12
S _{MS} :	2.64	S _S :	2.83
S _{M1} :	2.27	S ₁ :	0.91
S _{DS} :	1.76	V _{S30} :	260
S _{D1} :	1.52		

Seismic Design Category: E



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.



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APN: III-211-023

Soil Profile

PROJECT NAME:	RAND	DATE OF EXCAVATION:	07-16-24
PROJECT #:	24-6073-2	EXCAVATION METHOD:	EXCAVATOR / HAND
SITE APN:	033-170-023	WEATHER CONDITIONS:	DRY ANTECEDENT CONDITIONS, SUNNY DAY
TEST HOLE #:	1	LOGGED BY:	LBA

DEPTH (ft)	DESCRIPTION	COLOR	SAMPLE DEPTH	SOIL CLASS
0	GRASS COVER			
-	TOP SOIL , ROOTS			LOAM
0.5				
-				
1.0	MUNSELL COLOR: 10 YR 3/3 - dark brown COARSE (%): ~26% ROOTS: medium, fine STRUCTURE: granular, crumb CONSISTENCY: Moist: loose ; Wet: slightly-sticky , non-plastic GROUNDWATER: no signs of groundwater observed			SANDY CLAY LOAM
-				
1.5				
-				
2.0	END OF EXCAVATION			
-				
2.5				
-				
3.0				
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3.5				
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9.5				
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10.0				



Soil Texture

PROJECT NAME:	RAND	DATE OF EXCAVATION:	07-16-24
PROJECT #:	24-6073-2	EXCAVATION METHOD:	EXCAVATOR / HAND
SITE APN:	033-170-023	WEATHER CONDITIONS:	DRY ANTECEDENT CONDITIONS, SUNNY DAY
TEST HOLE #:	1	LOGGED BY:	CPL
TH1	SAMPLE NUMBER		
2.0	DEPTH (ft)		
909.0	TOTAL DRIED SAMPLE WEIGHT (gm)		
236.3	COARSE WEIGHT (gm)		
75.0	A. OVENDRY WEIGHT (gm)		
9:01:00 AM	B. STARTING TIME (hh:mm:ss)		
72.0	C. TEMP @ 40 SEC. (°F)		
35.0	D. HYDROMETER READING @ 40 SEC. (gm/l)		
-5.7	E. COMPOSITE CORRECTION (gm/l)		
29.3	F. TRUE DENSITY @ 40 SEC. (gm/l) [D-E]		
70.7	G. TEMP @ 2.0 HRS. (°F)		
23.0	H. HYDROMETER READING @ 2.0 HRS. (gm/l)		
-6.0	I. COMPOSITE CORRECTION (gm/l)		
17.0	J. TRUE DENSITY @ 2.0 HRS. (gm/l) [H-I]		
60.9	K. % SAND $[100-(F/A \cdot 100)]$		
22.7	L. % CLAY $[J/A \cdot 100]$		
16.3	M. % SILT $[100-K-L]$		
SANDY LOAM	N. USDA TEXTURE		
2	O. SOIL PERCOLATION SUITABILITY CHART ZONE		
39.1	P. COMBINED % SILT AND CLAY $[L+M]$		
26.0	Q. COARSE % BY WEIGHT $[COARSE\ WEIGHT/A \cdot 100]$		
3.3	R. % COARSE ADJUSTMENT $[0.000006Q^3+0.00012Q^2+0.11936Q-0.01882]$		



Soil Chart

PROJECT NAME:	RAND	DATE OF EXCAVATION:	07-16-24
PROJECT #:	24-6073-2	EXCAVATION METHOD:	EXCAVATOR / HAND
SITE APN:	033-170-023	WEATHER CONDITIONS:	DRY ANTECEDENT CONDITIONS, SUNNY DAY
TEST HOLE #:	1	LOGGED BY:	CPL

